PAPER 15

GROUP III ■ FINAL COURSE

BUSINESS STRATEGY
& STRATEGIC COST MANAGEMENT (BSCM)

The Institute of Cost Accountants of India
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FINAL : PAPER - 15

BUSINESS STRATEGY & STRATEGIC COST MANAGEMENT

FINAL

STUDY NOTES

The Institute of Cost Accountants of India
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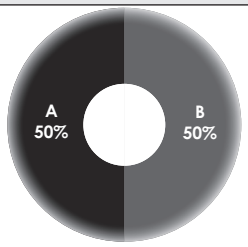
Syllabus

Syllabus Structure

A	Business Strategy	50%
B	Strategic Cost Management	50%



ASSESSMENT STRATEGY

There will be written examination (including case study / caselet analysis) paper of three hours

OBJECTIVES

On completion of this subject students should have developed skills of analysis, evaluation and synthesis in cost and management accounting and, in the process, created an awareness of current developments and issue in the area. The subject covers the complex modern industrial organizations within which the various facets of decision-making and controlling operations take place; the subject includes discussion of costing systems and activity based costing, activity management, and implementation issues in modern costing systems.

Learning Aims

The syllabus aims to test the student's ability to:

- Understand the nature of strategic competitiveness and develop the ability to analyze the competitive environment facing a firm, assess the attractiveness of the industry and isolate potential sources of competitive advantage and disadvantage
- Develop business level strategies by defining the type of advantage sought, scope of operations and activities required to deliver the chosen strategy. Assess the likely sustainability of firm strategies and competitive positions
- Identify the conventions and doctrines of managerial and cost accounting and other generally accepted principles which may be applied in the contemporary cost management models
- Identify major contemporary issues that have emerged in managerial accounting
- Discuss a number of issues relating to the design and implementation of cost management models in modern firms

Skill set required

Level C : Requiring skill levels of knowledge, comprehension, application, analysis, synthesis and evaluation

Section A : Business Strategy	**50%**
1. Business Strategy	
2. Strategy Development	
3. Strategy Position	
4. Strategy Choice	
5. Strategic Integration	
Section B : Strategic Cost Management	**50%**
6. Strategic Cost Management (SCM) and Control	

7. Strategic Decision - Making	
8. Budgetary Control and Standard Costing in Profit Planning	
9. Process Control and Activity Based Cost Management, JIT& ERP	
10. Cost of Quality and Total Quality Management	
11. Application of Operation Research and Statistical Tools in Strategic Decision Making (Advanced level)	
12. Entrepreneurial approach to Cost Management – with reference to core competencies	

SECTION A: BUSINESS STRATEGY [50 MARKS]

1. Business Strategy

(a) Introduction to Business Strategy
(b) Nature of Business strategy and strategic decisions
(c) Characteristics of strategic decisions
(d) Levels of strategy
(e) Vocabulary of strategy
(f) Strategic Management, The Strategic Position, Strategic Choices, Strategy into Action
(g) Designing and Managing Multi-business firm
(h) Implementation and limits of Business Strategy

2. Strategy Development

(a) Process of strategy development
(b) Strategic planning systems
(c) Strategic leadership
(d) Organizational politics
(e) Logical incrementalism
(f) The learning organization-imposed strategy
(g) Multiple process of strategy development, intended and realized strategies
(h) Strategic draft- strategic management un uncertain and complex conditions

3. Strategic Position

(a) The Strategic Position – the macro environment, PESTEL framework
(b) Structural drivers of change
(c) Differential impact of environmental influences – scenarios, industries & structures
(d) Sources of competition – 5 Forces framework, competencies & core competencies, strategic groups & organizational fields
(e) Customer Value – strategic gaps, SWOT
(f) Linkages – importance, performing better than competitors
(g) Benchmarking, industry norms and standards, experience learning curve

4. Strategic Choice

(a) Corporate Level Strategy, the Corporate portfolio, Growth Share Matrix, BCG,GE, Arthur D. Little Business Level Strategy, forces influencing business strategy
(b) Bases of Competitive Advantage, pricing based strategies, added value or differentiation strategy, hybrid strategy, focused differentiation, failure strategies, differentiation vs.legitimacy
(c) Sustaining competitive advantage, sustaining low price advantage, sustaining differentiation based advantage, competition and collaboration

(d) Game theory – simultaneous games, sequential games, repeated games, changing the rules of games

(e) Competitive strategy in hypercompetitive conditions, overcoming traditional bases of competitive advantage, escalating basis of competition, successful hypercompetitive strategies, value chain strategy

5. Strategic Integration

(a) Vertical Integration and its alternatives

(b) Diversification and strategic cope

(c) M & A, Internal Development, Alliances

(d) Competitive Dynamics

SECTION B: STRATEGIC COST MANAGEMENT [50 MARKS]

6. Strategic Cost Management and Control

(a) Strategic Cost Management – conceptual framework, environmental influences on cost management practices, role of SCM in strategic positioning,

(b) Strategic Costing – life cycle costing, target costing, Kaizen Costing, JIT Theory and constraints, Business Process Re-engineering (BPR) and Benchmarking

(c) Cost Control and Cost Reduction – basics, process, methods and techniques of cost reduction programme

7. Strategic Decision - Making

(a) Decision-making and Pricing strategies: Inventory decision; product-development decision, product policy, plant location, managerial decision-making; Cost-plus/Mark-up Pricing ; Return on Investment Pricing ; Return on Net-worth Pricing; Evaluation of different Pricing Methods ; Pricing a new Product; sensitivity analysis in pricing decisions; Monopoly Pricing vs. Competitive Pricing; Bottom Line Pricing

(b) Costing of Service Sector – methods, pricing, performance measurement

(c) Transfer Pricing – Objectives, Methods (Cost Based, Market Price Based, Negotiated Pricing), Advantages and Disadvantages, Criteria for setting Transfer Prices, Transfer Price in different situations, Situations causing Conflicts and resolving the Conflicts;

(d) Relevant Cost Analysis : Relevant Cost, Irrelevant Costs - Sunk or Historical Cost, Committed Cost, Absorbed Cost, Situations where Fixed Costs become relevant for decision - making and its related implications

(e) Target Costing – methodology, methods of establishment of target costs, attributable costing, back-flush accounting, target selling

(f) Life Cycle Costing - Life Cycle Costing - Meaning of Life Cycle, characteristics of life cycle concept, importance and benefits of life cycle costing, Product Life Cycle Costing, Project Life Cycle Costing

(g) Kaizen Costing – concept, procedure for implementation, evaluation, benefits, challenges

8. Budgetary Control and Standard costing in profit Planning

(a) Budgetary Control, Zero Base Budgeting -

(b) Lean Accounting

(c) Responsibility Accounting

(d) Variance Analysis - Investigation of Variances, Planning and Operating Variances, Quality Cost Variances, Controllable / Non-controllable Variances, Relevant Cost Approach to Variance Analysis; Learning effect in Variance Analysis; Single and Partial Plan for standard processing costing, variance analysis under marginal costing and absorption costing; ratio analysis; application of budgetary control and standard costing in profit planning

9. Process Control and Activity Based Cost Management, JIT& ERP

(a) Process Control – Instrumentation and Modern Control System

(b) Process Modelling and Simulation

(c) Activity Based Cost Management - Concept , purpose, benefits, stages, relevance in decision-making and its application in Budgeting, Traditional Vs. ABC System – comparative analysis

(d) JIT – introduction, Benefits

(e) Failure of traditional performance measurement criteria

(f) Use of specific performance measures in JIT

(g) ERP and its application in strategic cost management

10. Cost of Quality and Total Quality Management

(a) Quality Control, Quality Assurance, Quality Management

(b) TQM – basics, stages, principles, control, corrective actions

(c) PRAISE-Steps, Problems, implementation

(d) Cost of Quality Report

(e) Continuous Process Improvement

11. Application of Operation Research and Statistical Tools in Strategic Decision Making (Advanced level)

(a) Assignment, Transportation, Linear Programming

(b) Learning Curve

(c) Simulation

(d) Network Analysis

(e) Time Series Analysis-Time series analysis including moving totals and averages, treatment of seasonality, trend analysis using regression analysis and application of these techniques in forecasting product and service volume

12. Entrepreneurial approach to Cost Management – with reference to core competencies

(a) Strategic advantages and long-term perspective of cost management

(b) Strategic cost benefit analysis of different business restricting propositions and strategic business decision-making aspects

(c) Objective based costing

(d) Value Analysis, Value Chain Analysis and Value Engineering

(e) Profitability analysis, Process value analysis, Activity analysis, linkage analysis, application of linkage analysis in cost reduction and value addition

(f) Business Process Outsourcing (BPO) – introduction, concept, major areas, advantages, types, drawbacks

(g) Value Management – introduction, meaning, VCM architecture, methodology, advantages

(h) IGPG (International Good Practices & Governance) – Public Accountants

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Study Note 10 : Process Control and Activity based Cost Management, JIT & ERP

Study Note 11 : Application of OperationS Research and Statistical Tools in Strategic Decision Making

Study Note 12 : Enterpreneurial Approach to Cost Management with Reference to Core Competencies

Section A

Business Strategy

Study Note - 1

BUSINESS STRATEGY

This Study Note includes

1.1 STRATEGY

The concept of strategy is central to understanding the process of strategic management. The term 'strategy' is derived from the Greek word 'strategos', which means generalship. i.e. strategy is art of war, the skill in managing any affair or the use of a trick in order to succeed in some purpose. In business parlance, there is no definite meaning assigned to strategy. It is often used loosely to mean a number of things.

A strategy could be

- A plan or course of action or a set of decision rules making a pattern or creating a common thread;
- The pattern or common thread related to the organisation's activities which are derived from the policies, objectives and goals;
- Related to pursuing those activities which move an organization from its current position to a desired future state;
- Concerned with the resources necessary for implementing a plan or following a course of action;
- Connected to the strategic positioning of a firm, making trade-offs between its different activities and creating a fit among these activities; and
- The planned or actual coordination of the firm's major goals and actions, in time and space that continuously co-align the firm with its environment.

In simple terms, a strategy is the means to achieve objectives. In complex terms, it may possess all the characteristics mentioned above.

Let us we take few definitions to understand the strategy—

According to Alfred D. Chandler, strategy is the determination of the basic long-term goals and objectives of an enterprise and the adoption of the courses of action and the allocation of resources necessary for carrying out these goals.

According to William F. Glueck, strategy is a unified, comprehensive and integrated plan designed to assure that basic objectives of the enterprise are achieved.

According to Kenneth Andrews, strategy is the patterns of objectives, purpose, goals and major policies and plans for achieving these goals stated in such a way so as to define what the company is in or is to be and the kind of company it is or is to be.

For example, a company which was profitable in the past by making advertisement in T.V. but in present competitive situation, this company rethinks to give a free gift with the old product. This new course of action is called strategy.

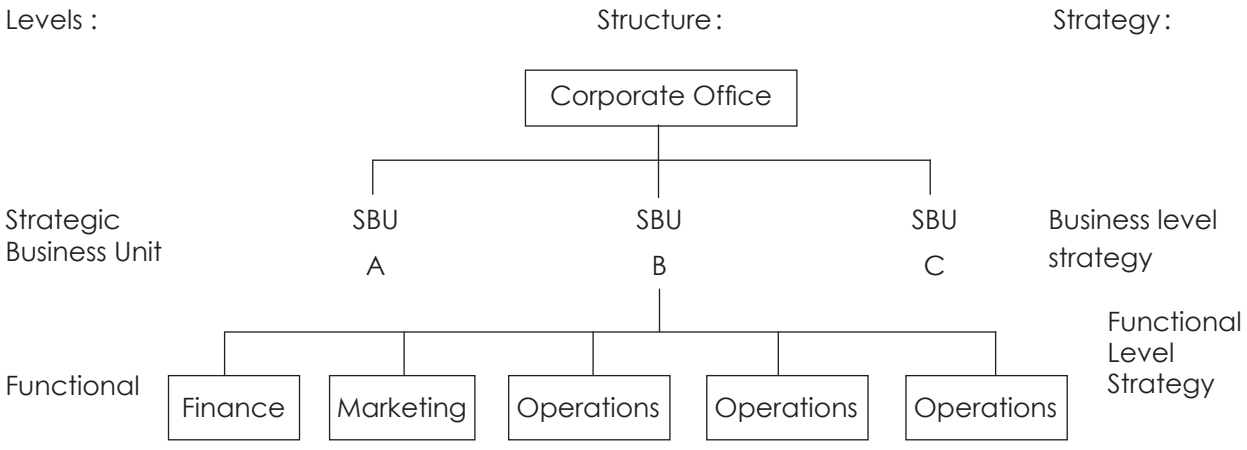
1.2 LEVELS OF STRATEGY

It is not uncommon to find many companies, or a group of companies, that while being under the same top management, are working in different business lines with regard to either products/services, markets or technology. Some examples are as follows :

- Hindustan Levers, the venerable multinational subsidiary, organizes itself into four businesses of home and personal care, foods, new ventures and exports.
- Finolex Group is a business conglomerate with interests in diverse areas such as telecommunications, petrochemicals, irrigation and education.

For such companies, a single strategy is not only inadequate but also inappropriate. The need is for multiple strategies at different levels. In order to segregate different units or segments, each performing a common set of activities, many companies organize on the basis of operating divisions or, simply, divisions. These divisions may also be known as profit centres or strategic business units (SBUs). An SBU, as defined by Sharplin, is "any part of a business organization which is treated separately for strategic management purpose."

The following figure depicts the three levels of strategic management as structured in practice.



It is the classical corporate structure, comprises three fully operative levels: the corporate level, the business level, and the functional level.

1. Corporate Strategy : Corporate level strategy is the top management plan to direct and run the enterprise as a whole. It represents the pattern of industrial actions and goal underlying the organisation's strategic interest in different business, divisions, product lines, customer groups, technologies etc. Corporate strategy emphasises upon the fact that how one should manage the scope of the various activities and how the resources should be allocated over the different activities.

The highest level of strategic management involves establishing the corporate-level strategies. Corporate-level strategies are concerned with defining how the business will remain sustainable in the long term. They are focused on maximising long term profitability and business growth. Corporate-level strategies allow you to focus your organisations investment on areas of the business that will help you to achieve your long term goals and objectives.

Corporate level strategy fundamentally is concerned with the selection of businesses in which the company should compete and with the development and coordination of that portfolio of businesses.

Corporate level strategy is concerned with:

- Reach - defining the issues that are corporate responsibilities; these might include identifying the overall goals of the corporation, the types of businesses in which the corporation should be involved, and the way in which businesses will be integrated and managed.
- Competitive Contact - defining where in the corporation competition is to be localized. Take the case of insurance: In the mid-1990's, Aetna as a corporation was clearly identified with its commercial and property casualty insurance products. The conglomerate Textron was not. For Textron, competition in the insurance markets took place specifically at the business unit level, through its subsidiary, Paul Revere. (Textron divested itself of The Paul Revere Corporation in 1997.)
- Managing Activities and Business Interrelationships - Corporate strategy seeks to develop synergies by sharing and coordinating staff and other resources across business units, investing financial resources across business units, and using business units to complement other corporate business activities. Igor Ansoff introduced the concept of synergy to corporate strategy.
- Management Practices - Corporations decide how business units are to be governed: through direct corporate intervention (centralization) or through more or less autonomous government (decentralization) that relies on persuasion and rewards.

Corporations are responsible for creating value through their businesses. They do so by managing their portfolio of businesses, ensuring that the businesses are successful over the long-term, developing business units, and sometimes ensuring that each business is compatible with others in the portfolio.

2. Business Level Strategy : A business strategy is a report that shows the plans of the entire business. It is a plan that is often used so that they can attract financing from big investors as well as creditors. This is a plan designed to give information regarding a new venture so that they can convince financial backers to invest in the said business. It describes the market opportunities that the business intends to develop, the process on how they are going to do it and the resources that are required to make it possible.

"**Business strategy** is less a function of grandiose predictions than it is a result of being able to respond rapidly to real changes as they occur. That's why strategy has to be dynamic and anticipatory." - **Jack Welch.**

The definition of business strategy is a long term plan of action designed to achieve a particular goal or set of goals or objectives.

Strategy is management's game plan for strengthening the performance of the enterprise. It states how business should be conducted to achieve the desired goals. Without a strategy management has no roadmap to guide them.

Creating a business strategy is a core management function. It must be said that having a good strategy and executing the strategy well, does not guarantee success. Organisations can face unforeseen circumstances and adverse conditions though no fault of their own.

Business strategies demonstrate the following roles:

1. It is applied to **encourage people to invest** in an enterprise.
2. It is also a tool used to **assure creditors about the credit worthiness** of the enterprise.
3. Another role is to **persuade banks to lend or perhaps invest money**.
4. Last, but not least, business strategy **helps you stay focused** on what's important for your business in order to achieve your desired results. It saves your time, energy and money.

And since this is necessary, a strategy needs to:

- Show the lender or the investor that they have a big chance of being repaid and that they will be getting **good returns on their investment**.
- Build the necessary confidence for the firm and the **capabilities of the owner**.
- Show the investors that there is a very **good market for the service or product that you offer**.
- Show you a clear picture **where you're heading and how to get there**.

A good business strategy is the base ingredient for a successful business. However, there are many different kinds of business strategies. The best business strategy should be able to guide your company into a direction wherein the expected internal pressure due to business continuity meets the great demand of the fast changing world for the revolutionary business plans.

There are basically three types of strategies in which business holders must concern themselves:

At the business unit level, the strategic issues are less about the coordination of operating units and more about developing and sustaining a competitive advantage for the goods and services that are produced. At the business level, the strategy formulation phase deals with:

- positioning the business against rivals.
- anticipating changes in demand and technologies and adjusting the strategy to accommodate them.
- influencing the nature of competition through strategic actions such as vertical integration and through political actions such as lobbying.

Michael Porter identified three generic strategies (cost leadership, differentiation, and focus) that can be implemented at the business unit level to create a competitive advantage and defend against the adverse effects of the five forces.

3. Functional Level Strategy :- Functional strategy involves decision making at the operational level with respect to specific functional areas – production, marketing, personnel, finance, etc. Decisions at the functional levels are often described as 'tactical' decision. But these decision are necessarily guided by overall strategic consideration and must be consistent with the frame work of business strategy. For example, finance policy should provide guidelines for finance management in accordance with the chosen strategy providing the overall direction of business.

The functional level of the organization is the level of the operating divisions and departments. The strategic issues at the functional level are related to business processes and the value chain. Functional level strategies in marketing, finance, operations, human resources, and R&D involve the development and coordination of resources through which business unit level strategies can be executed efficiently and effectively.

Functional-level strategies are focused on improving the effectiveness of a business at an operational level. Functional-level strategies are aimed at improving the efficiency and effectiveness of manufacturing, marketing, customer service, resource management and product development. They also aim to increase the level of innovation in the business with a focus on meeting customer needs.

Functional strategies have the narrowest scope of the three strategy levels. They add the details and specific targets to the overall management plan and are used to implement actions and practices in key business activities.

Functional units of an organization are involved in higher level strategies by providing input into the business unit level and corporate level strategy, such as providing information on resources and capabilities on which the higher level strategies can be based. Once the higher-level strategy is developed, the functional units translate it into discrete action-plans that each department or division must accomplish for the strategy to succeed.

A clear understanding of the three strategy levels will help you to set realistic objectives, develop plans for achieving them and ensure that your business remains sustainable in the long term. The three strategy levels are not completely independent of each other and must be developed and implemented in a coordinated manner.

The Advantages of Strategic Management

- **Discharges Board Responsibility**

  The first reason that most organizations state for having a strategic management process is that it discharges the responsibility of the Board of Directors.

- **Forces an Objective Assessment**

  Strategic management provides a discipline that enables the board and senior management to actually take a step back from the day-to-day business to think about the future of the organization. Without this discipline, the organization can become solely consumed with working through the next issue or problem without consideration of the larger picture.

- **Provides a Framework for Decision-Making**

  Strategy provides a framework within which all staff can make day-to-day operational decisions and understand that those decisions are all moving the organization in a single direction. It is not possible (nor realistic or appropriate) for the board to know all the decisions the executive director will have to make, nor is it possible (nor realistic or practical) for the executive director to know all the decisions the staff will make. Strategy provides a vision of the future, confirms the purpose and values of an organization, sets objectives, clarifies threats and opportunities, determines methods to leverage strengths, and mitigate weaknesses (at a minimum). As such, it sets a framework and clear boundaries within which decisions can be made. The cumulative effect of these decisions (which can add up to thousands over the year) can have a significant impact on the success of the organization. Providing a framework within which the executive director and staff can make these decisions helps them better focus their efforts on those things that will best support the organization's success.

- **Supports Understanding & Buy-In**

  Allowing the board and staff participation in the strategic discussion enables them to better understand the direction, why that direction was chosen, and the associated benefits. For some people simply knowing is enough; for many people, to gain their full support requires them to understand.

- **Enables Measurement of Progress**

  A strategic management process forces an organization to set objectives and measures of success. The setting of measures of success requires that the organization first determine what is critical to its ongoing success and then forces the establishment of objectives and keeps these critical measures in front of the board and senior management.

- **Provides an Organizational Perspective**

  Addressing operational issues rarely looks at the whole organization and the interrelatedness of its varying components. Strategic management takes an organizational perspective and looks at all the components and the interrelationship between those components in order to develop a strategy that is optimal for the whole organization and not a single component.

The Disadvantages of Strategic Management

- **The Future Doesn't Unfold as Anticipated**

  One of the major criticisms of strategic management is that it requires the organization to anticipate the future environment in order to develop plans, and as we all know, predicting the future is not an easy undertaking. The belief being that if the future does not unfold as anticipated then it may invalidate the strategy taken. Recent research conducted in the private sector has demonstrated that organizations that use planning process achieve better performance than those organizations who don't plan - regardless of whether they actually achieved their intended objective. In addition, there are a variety of approaches to strategic planning that are not as dependent upon the prediction of the future.

- **It Can be Expensive**

  There is no doubt that in the not-for-profit sector there are many organizations that cannot afford to hire an external consultant to help them develop their strategy. Today there are many volunteers that can help smaller organizations and also funding agencies that will support the cost of hiring external consultants in developing a strategy. Regardless, it is important to ensure that the implementation of a strategic management process is consistent with the needs of the organization, and that appropriate controls are implemented to allow the cost/benefit discussion to be undertaken, prior to the implementation of a strategic management process.

- **Long Term Benefit vs. Immediate Results**

  Strategic management processes are designed to provide an organization with long-term benefits. If you are looking at the strategic management process to address an immediate crisis within your organization, it won't. It always makes sense to address the immediate crises prior to allocating resources (time, money, people, opportunity, cost) to the strategic management process.

- **Impedes Flexibility**

  When you undertake a strategic management process, it will result in the organization saying "no" to some of the opportunities that may be available. This inability to choose all of the opportunities presented to an organization is sometimes frustrating. In addition, some organizations develop a strategic management process that become excessively formal. Processes that become this "established" lack innovation and creativity and can stifle the ability of the organization to develop creative strategies. In this scenario, the strategic management process has become the very tool that now inhibits the organization's ability to change and adapt.

A third way that flexibility can be impeded is through a well-executed alignment and integration of the strategy within the organization. An organization that is well aligned with its strategy has addressed its structure, board, staffing, and performance and reward systems. This alignment ensures that the whole organization is pulling in the right direction, but can inhibit the organization's adaptability. Again, there are a variety of newer approaches to strategy development used in the private sector (they haven't been widely accepted in the not-for-profit sector yet) that build strategy and address the issues of organizational adaptability.

Like any process or tool, there are both advantages and disadvantages to a strategic management process. Unfortunately, many of the disadvantages are because of inappropriate application (often by poor consultants) as opposed to inherent limitations.

1.3 STRATEGIC MANAGEMENT NATURE AND VALUE

Strategic management is defined by William F. Glueck as "a stream of decisions and actions which leads to the development of an effective strategy or strategies to help achieve objectives."

Strategic management according to Alfred D. Chandler is "determination of the basic long-term goals and objectives of an enterprise and adoption of course of action and allocation of resources necessary to carry out these goals."

Recently Harrison & St. John define Strategic Management as the process through which organisations analyse and learn from their internal and external environments, establish strategic direction, create strategies that are intended to help achieve established goals, and execute these strategies, all in an effort to satisfy key organisational stakeholders.

So Strategic Management is considered as either decision making and planning or a set of activities related to the formulation and implementation of strategies to achieve organisational objectives.

Strategic management analyzes the major initiatives taken by a company's top management on behalf of owners, involving resources and performance in external environments. It entails specifying the organization's mission, vision and objectives, developing policies and plans, often in terms of projects and programs, which are designed to achieve these objectives, and then allocating resources to implement the policies and plans, projects and programs.

Strategic Management is all about identification and description of the strategies that managers can carry so as to achieve better performance and a competitive advantage for their organization. An organization is said to have competitive advantage if its profitability is higher than the average profitability for all companies in its industry.

Strategic management can also be defined as a bundle of decisions and acts which a manager undertakes and which decides the result of the firm's performance. The manager must have a thorough knowledge and analysis of the general and competitive organizational environment so as to take right decisions. They should conduct a SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats), i.e., they should make best possible utilization of strengths, minimize the organizational weaknesses, make use of arising opportunities from the business environment and shouldn't ignore the threats. Strategic management is nothing but planning for both predictable as well as unfeasible contingencies.

It is applicable to both small as well as large organizations as even the smallest organization face competition and, by formulating and implementing appropriate strategies, they can attain sustainable competitive advantage.

Strategic Management is a way in which strategists set the objectives and proceed about attaining them. It deals with making and implementing decisions about future direction of an organization. It helps us to identify the direction in which an organization is moving.

Strategic management is a continuous process that evaluates and controls the business and the industries in which an organization is involved; evaluates its competitors and sets goals and strategies to meet all existing and potential competitors; and then reevaluates strategies on a regular basis to determine how it has been implexmented and whether it was successful or does it needs replacement.

Strategic Management gives a broader perspective to the employees of an organization and they can better understand how their job fits into the entire organizational plan and how it is co-related to other organizational members. It is nothing but the art of managing employees in a manner which maximizes the ability of achieving business objectives. The employees become more trustworthy, more committed and more satisfied as they can co-relate themselves very well with each organizational task. They can understand the reaction of environmental changes on the organization and the probable response of the organization with the help of strategic management. Thus the employees can judge the impact of such changes on their own job and can effectively face the changes. The managers

and employees must do appropriate things in appropriate manner. They need to be both effective as well as efficient.

One of the major role of strategic management is to incorporate various functional areas of the organization completely, as well as, to ensure these functional areas harmonize and get together well. Another role of strategic management is to keep a continuous eye on the goals and objectives of the organization.

Strategic management is defined as the set of decisions and actions that result in the formulation and implementation of plans designed to achieve a company's objectives. It comprises nine critical tasks:

1. Formulate the company's mission, including broad statements about its purpose, in the formulation and philosophy, and goals.
2. Conduct an analysis that reflects the company's internal conditions and capabilities.
3. Assess the company's external environment, including both the competitive and the general contextual factors.
4. Analyze the company's options by matching its resources with the external environment.
5. Identify the most desirable options by evaluating each option in light of the company's mission.
6. Select a set of long-term objectives and grand strategies that will achieve the most desirable options.
7. Develop annual objectives and short-term strategies that are compatible with the selected set of long-term objectives and grand strategies.
8. Implement the strategic choices by means of budgeted resource allocations in which the matching of tasks, people, structures, technologies, and reward systems is emphasized.
9. Evaluate the success of the strategic process as an input for future decision making.

In simple terms the purpose of strategic management is to achieve sustained strategic-competitiveness of the firm and above average returns of the organization. This would be dome by developing and implementing a value creating strategy. By implementing a value creating strategy that competitors present and potential are not simultaneously implementing and that the competitors are unable to duplicate benefits of such strategy, the organization thus achieves a sustained or sustainable competitive advantage.

1.4 STRATEGIC MANAGEMENT PROCESS

In today's highly competitive business environment, budget-oriented planning or forecast-based planning methods are insufficient for a large corporation to survive and prosper. The firm must engage in **strategic planning** that clearly defines objectives and assesses both the internal and external situation to formulate strategy, implement the strategy, evaluate the progress, and make adjustments as necessary to stay on track.

Strategic management is defined as the dynamic process of formulation, implementation, evaluation and control of strategies to realize the organisation's strategic intent.

This definition states the four phases in the strategic management process as formulation, implementation and evaluation and control.

Each phase of Strategic Management process consists of a number of elements which are noted below:-

(i) Establishing the hierarchy of strategic intent (aim):

(a) Creating and communicating a vision,

(b) Designing a mission statement,

(c) Defining the business,

(d) Setting objectives,

(ii) Formulation of strategies :

(a) Performing environmental appraisal,

(b) Doing organisational appraisal,

(c) Considering corporate-level strategies,

(d) Considering business-level strategies,

(e) Undertaking strategic analysis,

(f) Exercising strategic choice,

(g) Formulating strategies,

(h) Preparing a strategic plan

(iii) Implementation of strategies :

(a) Activating strategies,

(b) Designing structures and systems,

(c) Managing behavioural implementation,

(d) Managing functional implementation,

(e) Operationalising strategies,

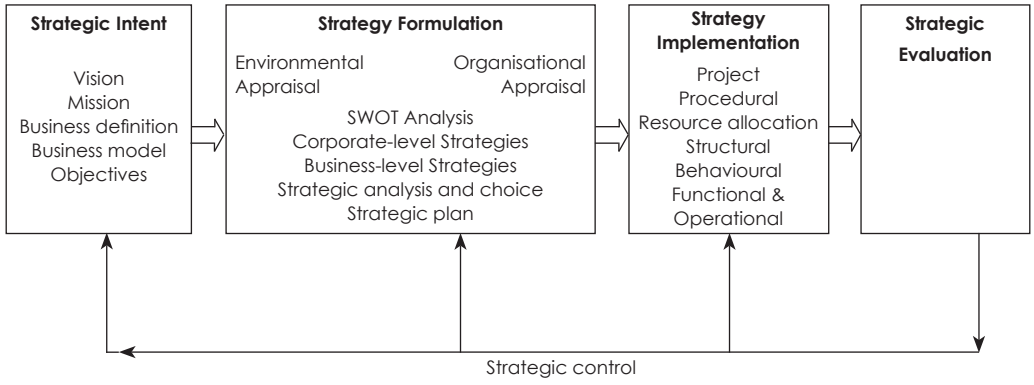
(iv) Performing strategic evaluation and control:

(a) Performing strategic evaluation,

(b) Exercising strategic control, and

(c) Reformulating strategies.

The four phases are shown in the following figure :



Strategic Intent :

By strategic intent we refer to the purposes the organization strives for. These may be expressed in terms of a hierarchy of strategic intent. Strategic intent is a statement that provides a point of view of the means by which your organization aims to achieve its vision in the long term. It therefore provides a sense of direction and the opportunity to explore new competitive possibilities. Moreover, strategic intent provides clarity, focus and inspires employees to work harder in order to achieve the company's vision.

Vision Statement

A vision statement is sometimes called a picture of your company in the future but it's so much more than that. Your vision statement is your inspiration, the framework for all your strategic planning.

A vision statement may apply to an entire company or to a single division of that company. Whether for all or part of an organization, the vision statement answers the question, "Where do we want to go?"

What you are doing when creating a vision statement is articulating your dreams and hopes for your business. It reminds you of what you are trying to build.

While a vision statement doesn't tell you how you're going to get there, it does set the direction for your business planning. That's why it's important when crafting a vision statement to let your imagination go and dare to dream – and why it's important that a vision statement captures your passion.

Unlike the mission statement, a vision statement is for you and the other members of your company, not for your customers or clients.

When writing a vision statement, your mission statement and your core competencies can be a valuable starting point for articulating your values. Be sure when you're creating one not to fall into the trap of only thinking ahead a year or two. Once you have one, your vision statement will have a huge influence on decision making and the way you allocate resources.

Vision Statements: Reviews and Ideas

To find the best examples of vision statements, consider these statements made by some of the world's most innovative and successful companies:

Online Retailer

"We intend to provide our customers with the best online shopping experience from beginning to end, with a smart, searchable website, easy-to-follow instructions, clear and secure payment methods, and fast, quality delivery."

From this statement example, you can clearly tell that this company is an online retailer. You can also tell they have put thought into the statement by making a list of goals. They don't simply say that they

want to be "the best" online shopping site – they give a list of ways in which they intend to do that. This is a quality vision statement because it outlines the specific future they intend to create for themselves, but it doesn't give specific steps on how they will do it (better saved for a mission statement).

Hair Salon

"Our salon will change the way you think about a haircut. Full service comfort, friendly staff, a relaxing atmosphere, and the best prices in town give you an experience that will leave you glowing both inside and out."

Once again, it's clear from this vision statement what type of business is behind it. It's also a good, clear list of goals, without being too specific.It paints an overall picture of a pleasant, successful business that the company hopes to become, and since the vision statement isn't just a vision of your future – it's also a vision you're presenting to your customers about who you are – it's important that it do just that.

Apple Computer

"We believe that we are on the face of the earth to make great products and that's not changing. We are constantly focusing on innovating. We believe in the simple not the complex. We believe that we need to own and control the primary technologies behind the products that we make, and participate only in markets where we can make a significant contribution. We believe in saying no to thousands of projects, so that we can really focus on the few that are truly important and meaningful to us. We believe in deep collaboration and cross-pollination of our groups, which allow us to innovate in a way that others cannot. And frankly, we don't settle for anything less than excellence in every group in the company, and we have the self-honesty to admit when we're wrong and the courage to change. And I think regardless of who is in what job those values are so embedded in this company that Apple will do extremely well."- Tim Cook, CEO of Apple Computer (Quoted on CNN Money.com).

PepsiCo

"PepsiCo's responsibility is to continually improve all aspects of the world in which we operate - environment, social, economic - creating a better tomorrow than today. Our vision is put into action through programs and a focus on environmental stewardship, activities to benefit society, and a commitment to build shareholder value by making PepsiCo a truly sustainable company." (Quoted from Pepsi Co.com.)

Amazon

"Our [Amazon's] vision is to be earth's most customer centric company; to build a place where people can come to find and discover anything they might want to buy online." (Quoted from Amazon.com)

Mission Statement

A mission statement is a statement that defines the essence or purpose of a company – what it stands for i.e. what broad products or services it intends to offer customers. The mission statement also gives readers a window on the **raison d'être** of the company and was initially designed as a means by which potential shareholders and investors could understand the purpose of the company that they were considering investing in. You should also think of a mission statement as a cross between a slogan and a mini executive summary.

Just as slogans and executive summaries can be used in many ways, so too can a mission statement. An effective mission statement should be concise enough for you to describe your company 's purpose and ideals in less than 30 seconds.

A mission statement defines what an organization is, why it exists, its reason for being. At a minimum, your mission statement should define who your primary customers are, identify the products and services you produce, and describe the geographical location in which you operate.

If you don't have a mission statement, create one by writing down in one sentence what the purpose of your business is. Ask two or three of the key people in your company to do the same thing. Then discuss the statements and come up with one sentence everyone agrees with. Once you have finalized your mission statement, communicate it to everyone in the company.

It's more important to communicate the mission statement to employees than to customers. Your mission statement doesn't have to be clever or catchy--just accurate.

If you already have a mission statement, you will need to periodically review and possibly revise it to make sure it accurately reflects your goals as your company and the business and economic climates evolve. To do this, simply ask yourself if the statement still correctly describes what you're doing.

If your review results in a revision of the statement, be sure everyone in the company is aware of the change. Make a big deal out of it. After all, a change in your mission probably means your company is growing-and that's a big deal.

Once you have designed a niche for your business, you're ready to create a mission statement. A key tool that can be as important as your business plan, a mission statement captures, in a few succinct sentences, the essence of your business's goals and the philosophies underlying them. Equally important, the mission statement signals what your business is all about to your customers, employees, suppliers and the community.

The mission statement reflects every facet of your business: the range and nature of the products you offer, pricing, quality, service, marketplace position, growth potential, use of technology, and your relationships with your customers, employees, suppliers, competitors and the community.

The mission statement ensures some transparency for investors and employees alike so they can have some confidence as to any potential use of their resources be they capital investment or labour. A mission statement is also designed to ensure that all stakeholders are clear on the overarching purpose of the company so everyone can be focused on the same goals and objectives. When someone reads a mission statement in a business plan they are looking to get a feel for the range of activities that the company will focus on, in other words its core purpose and what it stands for.

Characteristics of a Mission Statement :

A mission statement defines the basic reason for the existence of the organization. Such a statement reflects the corporate philosophy, identity, character and image of an organization. In order to be effective, a mission statement should possess the following seven characteristics :

(i) It should be feasible – a mission should always aim high but it should not be an impossible statement. It should be realistic and achievable – its followers must find it to be credible.

(ii) It should be precise – a mission statement should not be so narrow as to restrict the organisation's activities, nor should it be too broad to make itself meaningless.

(iii) It should be clear – a mission should be clear enough to lead to action. It should not just be a high-sounding set of platitudes meant for publicity purposes.

(iv) It should be motivating – a mission statement should be motivating for members of the organization and of the society and they should feel it worthwhile working for such an organization or being its customers.

(v) It should be distinctive – a mission statement which is indiscriminate is likely to have little impact.

(vi) It should indicate the major components of strategy – a mission statement, along with the organizational purpose should indicate the major components of the strategy to be adopted.

(vii) It should indicate how objectives are to be accomplished – besides indicating the broad strategies to be adopted, a mission statement should also provide clues regarding the manner in which the objectives are to be accomplished.

Dell Mission Statement:

"Dell's mission is to be the most successful computer company in the world at delivering the best customer experience in markets we serve. In doing so, Dell will meet customer expectations of:

- Highest quality
- Leading technology
- Competitive pricing
- Individual and company accountability
- Best-in-class service and support
- Flexible customization capability
- Superior corporate citizenship
- Financial stability"

Larsen and Toubro: Corporate Social Responsibility Mission Statement - Mission statement for businesses are planned carefully. Here is what the largest construction firm in India, says about its CSR mission. Focus on the excellent way this firm has defined its CSR mission.

L&T believes that the true and full measure of growth, success and progress lies beyond balance sheets or conventional economic indices. It is best reflected in the difference that business and industry make to the lives of people. Through its social investments, L&T addresses the needs of communities residing in the vicinity of its facilities, taking sustainable initiatives in the areas of health, education, environment conservation, infrastructure and community development.

Business

Human beings are continuously engaged in some activity or other in order to satisfy their unlimited wants. Every day we come across the word 'business' or 'businessman' directly or indirectly. Business has become essential part of modern world.

Business is an economic activity, which is related with continuous and regular production and distribution of goods and services for satisfying human wants.

All of us need food, clothing and shelter. We also have many other household requirements to be satisfied in our daily lives. We met these requirements from the shopkeeper. The shopkeeper gets from wholesaler. The wholesaler gets from manufacturers. The shopkeeper, the wholesaler, the manufacturer are doing business and therefore they are called as Businessman.

Definitions of Business

Stephenson defines business as, "The regular production or purchase and sale of goods undertaken with an objective of earning profit and acquiring wealth through the satisfaction of human wants."

According to **Dicksee**, "Business refers to a form of activity conducted with an objective of earning profits for the benefit of those on whose behalf the activity is conducted."

Lewis Henry defines business as, "Human activity directed towards producing or acquiring wealth through buying and selling of goods."

Thus, the term business means continuous production and distribution of goods and services with the aim of earning profits under uncertain market conditions.

Features of Business

Characteristics or features of business are discussed in following points :-

1. Exchange of goods and services

All business activities are directly or indirectly concerned with the exchange of goods or services for money or money's worth.

2. Deals in numerous transactions

In business, the exchange of goods and services is a regular feature. A businessman regularly deals in a number of transactions and not just one or two transactions.

3. Profit is the main Objective

The business is carried on with the intention of earning a profit. The profit is a reward for the services of a businessman.

4. Business skills for economic success

Anyone cannot run a business. To be a good businessman, one needs to have good business qualities and skills. A businessman needs experience and skill to run a business.

5. Risks and Uncertainties

Business is subject to risks and uncertainties. Some risks, such as risks of loss due to fire and theft can be insured. There are also uncertainties, such as loss due to change in demand or fall in price cannot be insured and must be borne by the businessman.

6. Buyer and Seller

Every business transaction has minimum two parties that is a buyer and a seller. Business is nothing but a contract or an agreement between buyer and seller.

7. Connected with production

Business activity may be connected with production of goods or services. In this case, it is called as industrial activity. The industry may be primary or secondary.

8. Marketing and Distribution of goods

Business activity may be concerned with marketing or distribution of goods in which case it is called as commercial activity.

9. Deals in goods and services

In business there has to be dealings in goods and service.

Goods may be divided into following two categories :-

(i) **Consumer goods** : Goods which are used by final consumer for consumption are called consumer goods e.g. T.V., Soaps, etc.

(ii) **Producer goods** : Goods used by producer for further production are called producers goods e.g. Machinery, equipments, etc. Services are intangible but can be exchanged for value like providing transport, warehousing and insurance services, etc.

10. To Satisfy human wants

The businessman also desires to satisfy human wants through conduct of business. By producing and supplying various commodities, businessmen try to promote consumer's satisfaction.

11. Social obligations

Modern business is service oriented. Modern businessmen are conscious of their social responsibility. Today's business is service-oriented rather than profit-oriented.

Business Model

Business models have an intimate relationship with the strategy of an organization. Strategies result in choices; a business model can be used to help analyse and communicate these strategic choices. Companies in the same industry, competing with each other, can rely on different models as a matter of strategic choice. Tata Consultancy Services adopts a traditional fixed-price, fixed-time business model, where payments by clients are based on time related milestones. Infosys and Wipro have a time and material business model where clients pay on an ongoing basis, depending on the amount of work done rather than the time elapsed.

From the abstraction that strategies actually are, business models are down-to-earth prescriptions to implement the strategies. Strategies are not expected to answer the question : how to make money? Business model can enable us to do precisely that.

Goals and Objectives

Goals and objectives provide the foundation for measurement. Goals are outcome statements that define what an organization is trying to accomplish, both programmatically and organizationally. Goals are usually a collection of related programs, a reflection of major actions of the organization, and provide rallying points for managers. For example, Wal-Mart might state a financial goal of growing its revenues 20% per year or have a goal of growing the international parts of its empire. Try to think of each goal as a large umbrella with several spokes coming out from the center. The umbrella itself is a goal.

In contrast to goals, objectives are very precise, time-based, measurable actions that support the completion of a goal. Objectives typically must (1) be related directly to the goal; (2) be clear, concise, and understandable; (3) be stated in terms of results; (4) begin with an action verb; (5) specify a date for accomplishment; and (6) be measurable. Apply our umbrella analogy and think of each spoke as an objective. Going back to the Wal-Mart example, and in support of the company's 20% revenue growth goal, one objective might be to "open 20 new stores in the next six months." Without specific objectives, the general goal could not be accomplished—just as an umbrella cannot be put up or down without the spokes. Importantly, goals and objectives become less useful when they are unrealistic or ignored. For instance, if your university has set goals and objectives related to class sizes but is unable to ever achieve them, then their effectiveness as a management tool is significantly decreased.

Difference between objectives and goals.

The points of difference between the two are as follows:

- The goals are broad while objectives are specific.
- The goals are set for a relatively longer period of time.
- Goals are more influenced by external environment.
- Goals are not quantified while objectives are quantified.

Broadly, it is more convenient to use one term rather than both. The difference between the two is simply a matter of degree and it may vary widely.

Need for Establishing Objectives

The following points specifically emphasize the need for establishing objectives:

- Objectives provide **yardstick to measure performance** of a department or SBU or organization.
- Objectives serve as a **motivating force**. All people work to achieve the objectives.
- Objectives help the organization to **pursue its vision and mission.** Long term perspective is translated in short-term goals.
- Objectives **define the relationship** of organization with internal and external **environment.**
- Objectives provide a **basis for decision-making**. All decisions taken at all levels of management are oriented towords accomplishment of objectives.

What Objectives are Set

According to Peter Druker, objectives be set in the area of market standing, innovation productivity, physical and financial resources, profitability, manager performance and development, worker performance and attitude and public responsibility. Researchers have identified the following areas for setting objectives:

Profit Objective – It is the most important objective for any business enterprise. In order to earn a profit, an enterprise has to set multiple objectives in key result areas such as market share, new product development, quality of service etc. Ackoff calls them performance objectives.

Marketing Objective may be expressed as: "to increase market share to 20 percent within five years. or " to increase total sales by 10 percent annually. They are related to a functional area.

Productivity Objective may be expressed in terms of ratio of input to output. This objective may also be stated in terms of cost per unit of production.

Product Objective may be expressed in terms of product development, product diversification, branding etc.

Social Objective may be described in terms of social orientation. It may be tree plantation or provision of drinking water or development of parks or setting up of community centers.

Financial Objective relate to cash flow, debt equity ratio, working capital, new issues, stock exchange operations, collection periods, debt instruments etc. For example a company may state to decrease the collection period to 30 days by the end of this year.

Human resources objective may be described in terms of absenteeism, turnover, number of grievances, strikes and lockouts etc. An example may be "to reduce absenteeism to less then 10 percent by the end of six months.

Characteristics of Objectives

The following are the characteristic of corporate objectives:

(i) They form a **hierarchy.** It begins with broad statement of vision and mission and ends with key specific goals. These objectives are made achievable at the lower level.

(ii) It is impossible to identify even one major objective that could cover all possible relationships and needs. Organizational problems and relationship cover a multiplicity of variables and cannot be integrated into one objectives. They may be economic objectives, social objectives, political objectives etc. Hence, **multiplicity of objectives** forces the strategists to balance those diverse interests.

(iii) A **specific time horizon** must be laid for effective objectives. This timeframe helps the strategists to fix targets.

(iv) Objectives must be within reach and is also challenging for the employees. If objectives set are beyond the reach of managers, they will adopt a defeatist attitude. **Attainable objectives** act as a motivator in the organization.

(v) Objectives should be **understandable**. Clarity and simple language should be the hallmarks Vague and ambiguous objectives may lead to wrong course of action.

(vi) Objectives must be **concrete**. For that they need to be quantified. Measurable objectives helps the strategists to monitor the performance in a better way.

(vii) There are many constraints internal as well as external which have to be considered in objective setting. As different objectives compete for scarce resources, objectives should be **set within constraints**.

Process of Setting Objectives

Glueek identifies four factors that should be considered for objective setting. These factors are: the forces in the environment, realities of an enterprise's resources and internal power relations, the value system of top executives and awareness of the management of the past objectives. They are briefly narrated below:

(i) **Environmental forces**, both internal and external, may influence the interests of various stake holders. Further, these forces are dynamic by nature. Hence objective setting must consider their influence on its process.

(ii) As objectives should be realistic, the efforts be made to set the objectives in such a way so that objectives may become attainable. For that, **existing resources of enterprise and internal power structure** be examined carefully.

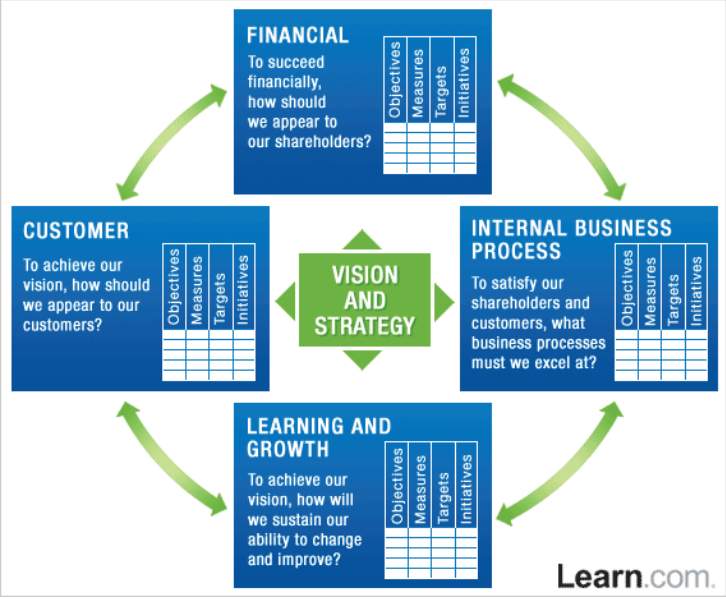
(iii) **The values of the top management** influence the choice of objectives. A philanthropic attitude may lead to setting of socially oriented objectives while economic orientation of top management may force them to go for profitability objective.

(iv) Past is important for strategic reasons. Organizations cannot deviate much from the past. Unnecessary deviations will bring problems relating to resistance to change. Management must **understand the past** so that it may integrate its objectives in an effective way.

Balanced Scorecard Approach to Objective-setting

The performance management system called balanced scorecard, developed by Robert S. Kaplan and David Norton of Havard Business School, seeks to do away with the undue emphasis on short term financial objectives and seeks to improve organizational performance by focusing attention on measuring and managing a wide range of non-financial, operational objectives. Later, the system application was enlarged to include its usage as a comprehensive strategic planning technique.

In doing so, the balance scorecard approach advocates a top-down approach to performance management, starting with strategic intent being expressed through the organization, down to operationally relevant targets.



The balanced scorecard takes four perspectives:

- **Financial** - satisfying the stakeholders in the company - owners, employees, suppliers. The objectives of this perspective would be to achieve a certain level of profitability, or growth. Examples are revenues, earnings, return on capital and cash flow.
- **Customer or Market** - satisfying the customers such that they buy product and services to support the Financial perspective. e.g. increase customer satisfaction, introduce a new product, market share, customer satisfcation measures and customer loyalty.
- **Internal Business Processes** - supporting the Financial and Customer perspectives through having appropriate and well operated processes or procedures e.g. the sales process, the product implementation process etc.
- **Learning, Innovation and Growth** - supporting the Financial, Customer and Internal Business Process perspectives through having the ability to change, improve and innovate through the acquisition of new knowledge, skills and technology.

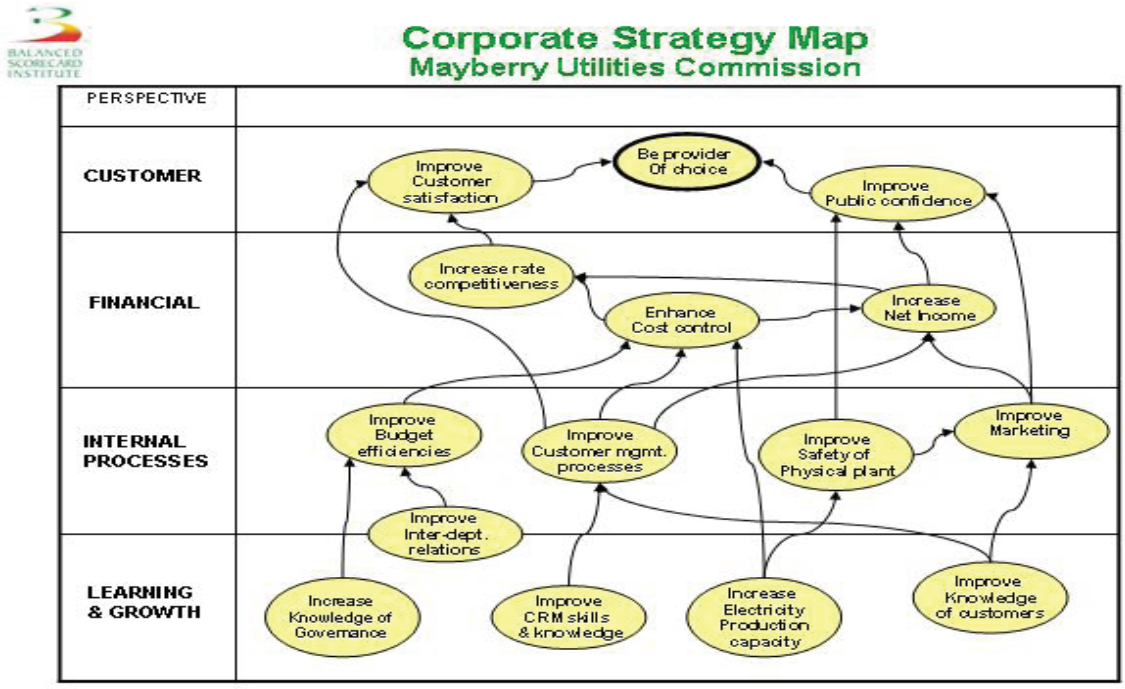
For each perspective you establish goals or objectives and form a consolidated and coherent structure or strategy map of objectives that support one another to bring the company/ organisation to meet their commitments to their stakeholders.

For each set of objectives for each perspective, to need to set Key Performance Indicators (KPIs) so you can establish your progress towards your goals. Some of these KPIs should be lead measures e.g. Number of Sales enquiries and some should be lag measures e.g. sales invoiced total. Ideally you want to create a balanced scorecard dashboard to monitor progress.

Strategy Map

Businesses and companies create strategy maps to showcase their plans for success. Robert Kaplan and David Norton developed the strategy mapping concept while they were working on their "balanced scorecard." The strategy map is broken down into subtopics that all work toward the business' ultimate goal.

A strategy map is a visual illustration of a business' strategy for turning its resources into accomplishments. Resources don't include only concrete assets, but also refer to knowledge and customs. These assets are applied in a way that will help the company to reach its objectives. Strategy mapping shows the relationship between the company's resources and objectives via a detailed picture.



The top of the strategy map shows the business' main objective, which is the No. 1 reason why the business exists. Next, financial strategies like productivity and revenue growth are included in the map. Revenue can be increased by either raising the number of highly valued customers or by raising the amount of revenue per customer. Productivity can be improved by cutting out any activity that doesn't ultimately add value to the business.

The business must decide whether it would most like to reach operational excellence, solid customer relationships or product leadership. While a lot of companies skip this step, it's crucial to determine which business practices aren't helping your company to achieve its goal. Clearly focusing your business proposition will streamline what areas need the most attention.

The last portion of the strategy map includes employees, technology and corporate culture. These assets are necessary to actually put the strategy map into action. The business' overall performance in all areas rests on the performance of the corporation's players.

Strategy mapping is used to help businesses and companies manage their approach. With a strategy map, management can detect which areas of the business need to be improved. A problem in the business plan is evident if the different areas of the strategy map don't logically and easily flow into the next one. Strategy mapping lays out the business' direction and encourages employees come together to discuss and share ideas.

Critical success factors (CSFs)

Critical success factors (CSFs), sometimes referred to as strategic factors or key factors for success, are those which are crucial for organisational success. When strategists consciously look for such factors and take them into consideration for strategic management, they are likely to be more successful, while putting in relatively less efforts.

A shoe manufacturing company may consider the following CSFs: high manufacturing quality, cost efficiency, sophisticated retailing, a flexible product mix and creation of a product image. Toothpaste is a very personal product and so, it enjoys a high brand loyalty. Besides this, four qualities are important in toothpastes: form, flavour, foam and freshness. A company manufacturing toothpaste has to excel in these qualities besides building up a high loyalty, in order to be successful. In general, service organisations exist on the basis of the quality of their customer service. But there are other CSFs too. A courier service, for instance, is critically dependent on three factors: speedy despatch, reliability and price. Observe from these examples that if organisations keep in view the relevant CSFs, these can be used for objective-setting as well as for exercising a strategic choice.

Some points regarding CSFs are worth noting:

1. A set of CSFs is the result of asking the question: what do we need to do in order to be successful in a particular context.
2. CSFs are based on practical logic, heuristic or a rule of thumb rather than on an elaborate procedure or an esoteric theoretical model.
3. CSFs are the results of long years of managerial experience, which leads to the development of intuition, judgement and hunch for use in strategic decision-making.
4. An analysis of what relevant CSFs operate in a particular context could be based on the manager's statements, expert opinions and organisational success stories.
5. CSFs could also be generated internally through creative techniques such as brainstorming.
6. The use of CSFs in objectives-setting and strategic choice distinguishes the successful organisations from the unsuccessful ones.
7. CSFs are used to pinpoint the key result areas, determining objectives in those areas and devising measures of performance for judging the objective-achieving capability of any organisation.

CSFs need key performance indicators in order to be measured.

Key Performance Indicators (KPIs)

Key Performance Indicators, also known as KPI or Key Success Indicators (KSI), help an organization define and measure progress toward organizational goals.

Once an organization has analyzed its mission, identified all its stakeholders, and defined its goals, it needs a way to measure progress toward those goals. Key Performance Indicators are those measurements.

What Are Key Performance Indicators (KPI)

Key Performance Indicators are quantifiable measurements, agreed to beforehand, that reflect the critical success factors of an organization. They will differ depending on the organization.

- A business may have as one of its Key Performance Indicators the percentage of its income that comes from return customers.
- A school may focus its Key Performance Indicators on graduation rates of its students.

- A Customer Service Department may have as one of its Key Performance Indicators, in line with overall company KPIs, percentage of customer calls answered in the first minute.
- A Key Performance Indicator for a social service organization might be number of clients assisted during the year.

Key Performance Indicators Reflect The Organizational Goals

An organization that has as one of its goals "to be the most profitable company in our industry" will have Key Performance Indicators that measure profit and related fiscal measures. "Pre-tax Profit" and "Shareholder Equity" will be among them. However, "Percent of Profit Contributed to Community Causes" probably will not be one of its Key Performance Indicators. On the other hand, a school is not concerned with making a profit, so its Key Performance Indicators will be different. KPIs like "Graduation Rate" and "Success In Finding Employment After Graduation", though different, accurately reflect the schools mission and goals.

Key Performance Indicators Must Be Quantifiable

If a Key Performance Indicator is going to be of any value, there must be a way to accurately define and measure it. "Generate More Repeat Customers" is useless as a KPI without some way to distinguish between new and repeat customers. "Be The Most Popular Company" won't work as a KPI because there is no way to measure the company's popularity or compare it to others.

It is also important to define the Key Performance Indicators and stay with the same definition from year to year. For a KPI of "Increase Sales", you need to address considerations like whether to measure by units sold or by rupee value of sales. Will returns be deducted from sales in the month of the sale or the month of the return? Will sales be recorded for the KPI at list price or at the actual sales price?

You also need to set targets for each Key Performance Indicator. A company goal to be the employer of choice might include a KPI of "Turnover Rate". After the Key Performance Indicator has been defined as "the number of voluntary resignations and terminations for performance, divided by the total number of employees at the beginning of the period" and a way to measure it has been set up by collecting the information in an HRIS, the target has to be established. "Reduce turnover by five percent per year" is a clear target that everyone will understand and be able to take specific action to accomplish.

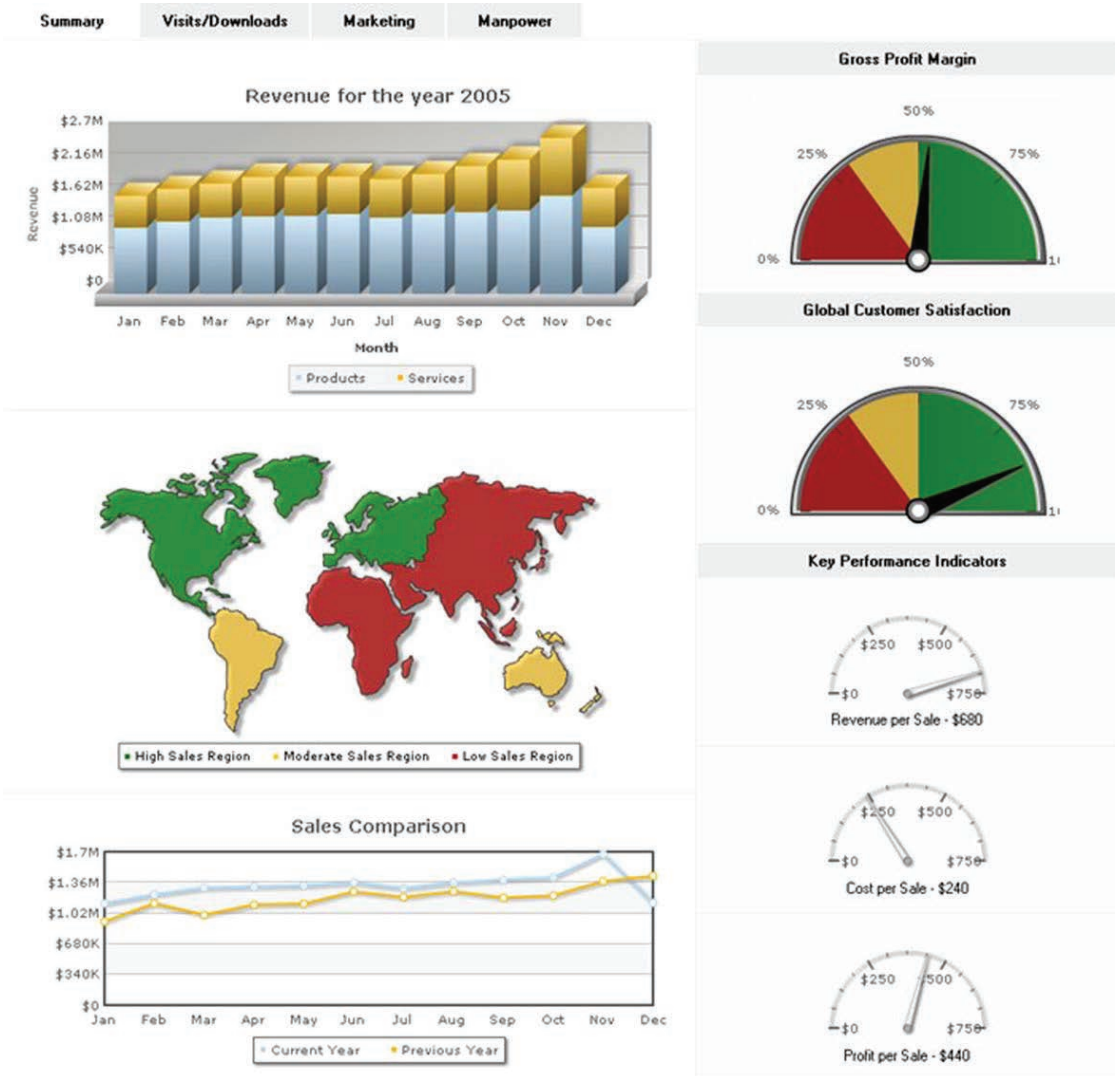
Business Dashboard

Dashboards often provide at-a-glance views of KPIs (key performance indicators) relevant to a particular objective or business process (e.g. sales, marketing, human resources, or production). The term dashboard originates from the automobile dashboard where drivers monitor the major functions at a glance. Dashboards give signs about a business letting you know something is wrong or something is right. The corporate world has tried for years to come up with a solution that would tell them if their business needed maintenance or if the temperature of their business was running above normal. Dashboards typically are limited to show summaries, key trends, comparisons, and exceptions. There are four Key elements to a good dashboard:

1. Simple, communicates easily
2. Minimum distractions...it could cause confusion
3. Supports organized business with meaning and useful data
4. Applies human visual perception to visual presentation of information

In management information systems, a **dashboard** is

"An easy to read, often single page, real-time user interface, showing a graphical presentation of the current status (snapshot) and historical trends of an organization's key performance indicators (KPIs) to enable instantaneous and informed decisions to be made at a glance."



Startegy Formulation

Strategy formulation requires a series of steps performed in sequential order. The steps must be taken in order because they build upon one another. However, there are two processes that are continually performed throughout strategy formulation: **environmental scanning** and **continuous implementation**. Environmental scanning is simply the process of paying attention to the external environment for factors that may affect your organization's performance, which will need to be addressed in the strategy formulation process. For example, you will pay attention to what your competitor is doing and make adjustments to your strategic plan as necessary throughout the process. Continuous implementation is simply implementing parts of the strategy that must be implemented in order for the next step of the strategy formulation process to be undertaken.

Environmental appraisal technique prepares threat and opportunity profile for an organisation. This profile divides the environment in different sectors and analyses the impact of each sector on the organisation. It helps an organisation in formulating appropriate strategies to take advantage of opportunities and counter the threats in its environment.

Organisational appraisal determines the capability of organisation in terms of strengths and weakness that lie in the different functional areas.

SWOT analysis is a systematic approach to find the strengths, weakness, opportunities and threats relating to an organisation and its environment. Before the formulation of strategy, it is necessary to assess whether the organisation has the required strengths to succeed or whether it has weakness to take advantage of the opportunities.

Strategies are chosen at the corporate level (about the choice of direction that the firm adopt in order to achieve objectives) and the business level (about for each of its business separately).

Strategic analysis and choice process is used to make choice strategies from alternatives.

Strategic plan is a document which provides the information regarding the elements of strategy and the manner to put the strategies into action.

Strategy formulation refers to the process of choosing the most appropriate course of action for the realization of organizational goals and objectives and thereby achieving the organizational vision. The process of strategy formulation basically involves six main steps. Though these steps do not follow a rigid chronological order, however they are very rational and can be easily followed in this order.

(i) Setting Organizations' objectives - The key component of any strategy statement is to set the long-term objectives of the organization. It is known that strategy is generally a medium for realization of organizational objectives. Objectives stress the state of being there whereas Strategy stresses upon the process of reaching there. Strategy includes both the fixation of objectives as well the medium to be used to realize those objectives. Thus, strategy is a wider term which believes in the manner of deployment of resources so as to achieve the objectives.

While fixing the organizational objectives, it is essential that the factors which influence the selection of objectives must be analyzed before the selection of objectives. Once the objectives and the factors influencing strategic decisions have been determined, it is easy to take strategic decisions.

(ii) Evaluating the Organizational Environment - The next step is to evaluate the general economic and industrial environment in which the organization operates. This includes a review of the organizations competitive position. It is essential to conduct a qualitative and quantitative review of an organizations existing product line. The purpose of such a review is to make sure that the factors important for competitive success in the market can be discovered so that the management can identify their own strengths and weaknesses as well as their competitors' strengths and weaknesses.

After identifying its strengths and weaknesses, an organization must keep a track of competitors' moves and actions so as to discover probable opportunities of threats to its market or supply sources.

(iii) Setting Quantitative Targets - In this step, an organization must practically fix the quantitative target values for some of the organizational objectives. The idea behind this is to compare with long term customers, so as to evaluate the contribution that might be made by various product zones or operating departments.

(iv) Aiming in context with the divisional plans - In this step, the contributions made by each department or division or product category within the organization is identified and accordingly strategic planning is done for each sub-unit. This requires a careful analysis of macroeconomic trends.

(v) Performance Analysis - Performance analysis includes discovering and analyzing the gap between the planned or desired performance. A critical evaluation of the organizations past performance, present condition and the desired future conditions must be done by the organization. This critical evaluation identifies the degree of gap that persists between the actual reality and the long-term aspirations of the organization. An attempt is made by the organization to estimate its probable future condition if the current trends persist.

(vi) Choice of Strategy - This is the ultimate step in Strategy Formulation. The best course of action is actually chosen after considering organizational goals, organizational strengths, potential and limitations as well as the external opportunities.

Strategy Implementation

Strategy implementation is the translation of chosen strategy into organizational action so as to achieve strategic goals and objectives. Strategy implementation is also defined as the manner in which an organization should develop, utilize, and amalgamate organizational structure, control systems, and culture to follow strategies that lead to competitive advantage and a better performance. Organizational structure allocates special value developing tasks and roles to the employees and states how these tasks and roles can be correlated so as maximize efficiency, quality, and customer satisfaction-the pillars of competitive advantage. But, organizational structure is not sufficient in itself to motivate the employees.

An organizational control system is also required. This control system equips managers with motivational incentives for employees as well as feedback on employees and organizational performance. Organizational culture refers to the specialized collection of values, attitudes, norms and beliefs shared by organizational members and groups.

Following are the main **steps in implementing a strategy:**

• Developing an organization having potential of carrying out strategy successfully.
• Disbursement of abundant resources to strategy-essential activities.
• Creating strategy-encouraging policies.
• Employing best policies and programs for constant improvement.
• Linking reward structure to accomplishment of results.
• Making use of strategic leadership.

Excellently formulated strategies will fail if they are not properly implemented. Also, it is essential to note that strategy implementation is not possible unless there is stability between strategy and each organizational dimension such as organizational structure, reward structure, resource-allocation process, etc.

Strategic implementation is critical to a company's success, addressing the who, where, when, and how of reaching the desired goals and objectives. It focuses on the entire organization. Implementation occurs after environmental scans, SWOT analyses, and identifying strategic issues and goals. Implementation involves assigning individuals to tasks and timelines that will help an organization reach its goals.

Features

A successful implementation plan will have a very visible leader, such as the CEO, as he communicates the vision, excitement and behaviors necessary for achievement. Everyone in the organization should be engaged in the plan. Performance measurement tools are helpful to provide motivation and allow for followup. Implementation often includes a strategic map, which identifies and maps the key ingredients that will direct performance. Such ingredients include finances, market, work environment, operations, people and partners.

Common Mistakes

A very common mistake in strategic implementation is not developing ownership in the process. Also, a lack of communication and a plan that involves too much are common pitfalls. Often a strategic implementation is too fluffy, with little concrete meaning and potential, or it is offered with no way of tracking its progress. Companies will often only address the implementation annually, allowing management and employees to become caught up in the day-to-day operations and neglecting the long-term goals. Another pitfall is not making employees accountable for various aspects of the plan or powerful enough to authoritatively make changes.

Needs

To successfully implement your strategy, several items must be in place. The right people must be ready to assist you with their unique skills and abilities. You need to have the resources, which include time and money, to successfully implement the strategy. The structure of management must be communicative and open, with scheduled meetings for updates. Management and technology systems must be in place to track the implementation, and the environment in the workplace must be such that everyone feels comfortable and motivated.

Implementation of strategy is the process through which a chosen strategy is put into action. It involves the design and management of systems to achieve the best integration of people, structure, processes and resources in achieving organizational objectives.

Once the creative and analytical aspects of strategy formulation have been settled, the managerial priority is one of converting the strategy into operationally effective action. Indeed a strategy is never complete, even as formulation until it gains a commitment of the organization's resources and becomes embodied in organizational activities. Therefore, to bring the result, the strategy should be put to action because the choice of even the soundest strategy will not affect organizational activities and achievement of its objectives. Therefore, effective implementation of strategy is a must for the organization.

Institutionalization of Strategy

The first basic action that is required for putting a strategy into operation is its institutionalization. Since strategy does not become either acceptable or effective by virtue of being well designed and clearly announced, the successful implementation of strategy requires that the strategy framer acts as its promoter and defender. Often strategy choice becomes a personal choice of the strategist because his personality variables become an influential factor in strategy formulation. Thus, it becomes a personal strategy of the strategist. Therefore, there is an urgent need for the institutionalization of strategy because without it, the strategy is subject to being undermined. Therefore, it is the role of the strategist to present the strategy to the members of the organization in a way that appeals to them and brings their support. This will put organizational people to feel that it is their own strategy rather than the strategy imposed on them. Such a feeling creates commitment so essential for making strategy successful.

Setting Proper Organizational Climate

Setting organizational climate relevant for strategy implementation is important for making strategy to work. Organizational climate refers to the characteristics of internal environment that conditions the co-operation, the development of the individuals, the extent of commitment and dedication of people in the organization, and the efficiency with which the purpose is translated into results. Organizations whose strategy is implemented with conducive climate are more effective than those whose are not. People are the instruments in implementing a particular strategy and organizational climate is basically a people-oriented attempt. A top manager can play an important role in shaping the organizational climate not only by providing standards for what others do but also what he does because organizational climate is a matter of practice rather than the precept.

Developing Appropriate Operating Plans

Operating plans are the action plans, operational program and decisions that take place in various parts of the organization. If they are made to reflect desired strategic results, they contribute to the achievement, of organizational objectives by focusing attention on those factors, which are important. For example, in budgeting, more resources will be allocated on those factors, which are critical to the success of the organization as spelled out during the strategy formulation process. There are various ways of making sure that operating plans contribute. If every manager understands strategy, he can certainly review the program recommendations of staff advisers and line subordinates to see that they are consistent with the requirements of the strategy. Appropriate committees to see if they contribute

positively can review major program. This lends an aura of formality to the program decisions and their influences on strategy may become clear.

Developing Appropriate Organization Structure.

Organization structure is the pattern in which the various parts of the organization are interrelated or interconnected. It prescribes relationships among various positions and activities. For implementing strategy, the organization structure should be designed according to the needs of the strategy. The relationship between strategy and structure can be thought of in terms of utilizing structure for strategy implementation because structure is a means to an end, that is, to provide facilities for implementing strategy. Therefore, both should be integrated. In the absence of such integration, outcome may be confusion, misdirection and splintered effort within the organization. There can be various ways of designing an organization structure. However, the major issues involved in designing the structure to fit the strategy involve the answers of following questions.

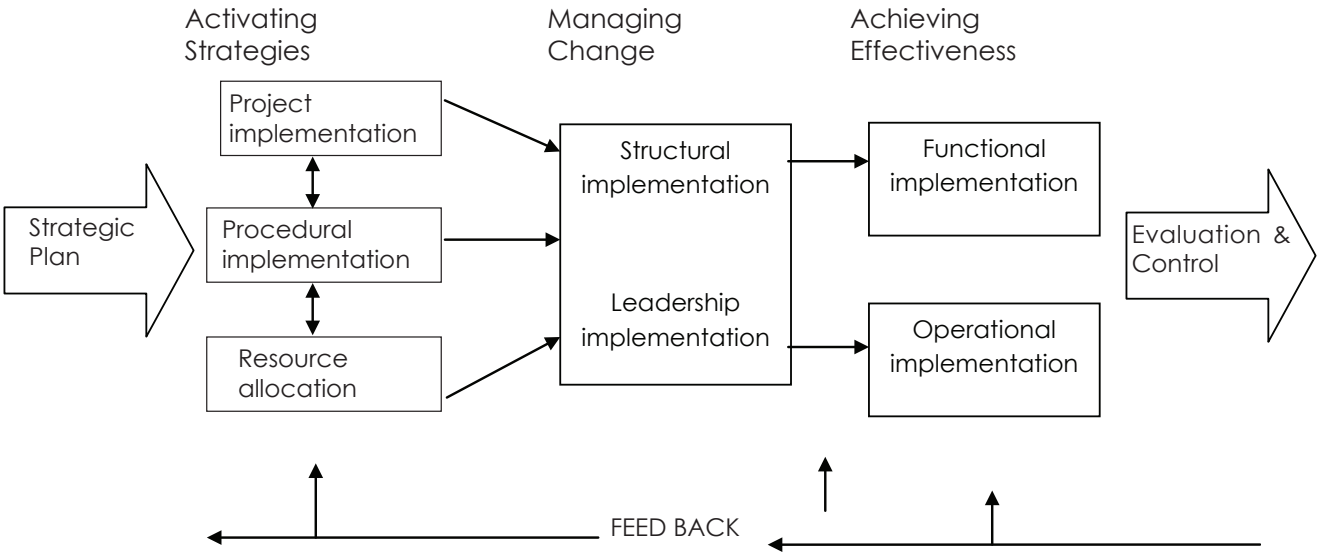
1. What should be the different units of the organization?
2. What components should join together and what components should be kept apart?
3. What is the appropriate placement and relationship of different units?

Periodic Review of Strategy

There should be periodic review of strategy to find out whether the given strategy is relevant. This is required because even the carefully developed strategies might cease to be suitable if events change, knowledge becomes more clear, or it appears that the environment will not be as originally thought. Thus, strategies should be reviewed from time to time. What should be the frequency for such a review is not universal but major strategies should be reviewed at least once a year. In fact this is done by most of the organizations who believe in relating themselves with the environment.

A model of strategy implementation

The following figure presents a model of strategy implementation that attempts to capture the major themes in strategy implementation and the activities that make up each theme. The forward linkage from strategic plan guides the implementation process and connects it to the preceding phase of strategy formulation. The feedback flowing in reverse from the following step of strategy evaluation and control moves through the implementation phase and goes back to strategy formulation establishing the backward linkage.



Strategy Evaluation and Control (SEC)

Strategic Evaluation – The purpose of strategic evaluation is to evaluate the effectiveness of a strategy in achieving organisational objectives. Thus, strategic evaluation and control could be defined as the process of determining the effectiveness of a given strategy in achieving the organistaional objectives and taking corrective action wherever required.

The nature of strategic evaluation is judgmental. Through evaluation it is checked whether the strategy is in agreement with environment and objectives.

Strategy Evaluation is as significant as strategy formulation because it throws light on the efficiency and effectiveness of the comprehensive plans in achieving the desired results. The managers can also assess the appropriateness of the current strategy in todays' dynamic world with socio-economic, political and technological innovations. Strategic Evaluation is the final phase of strategic management.

The significance of strategy evaluation lies in its capacity to co-ordinate the task performed by managers, groups, departments etc, through control of performance. Strategic Evaluation is significant because of various factors such as - developing inputs for new strategic planning, the urge for feedback, appraisal and reward, development of the strategic management process, judging the validity of strategic choice etc.

The process of Strategy Evaluation consists of following steps-

(i) **Fixing benchmark of performance -** While fixing the benchmark, strategists encounter questions such as - what benchmarks to set, how to set them and how to express them. In order to determine the benchmark performance to be set, it is essential to discover the special requirements for performing the main task. The performance indicator that best identify and express the special requirements might then be determined to be used for evaluation. The organization can use both quantitative and qualitative criteria for comprehensive assessment of performance. Quantitative criteria includes determination of net profit, ROI, earning per share, cost of production, rate of employee turnover etc. Among the Qualitative factors are subjective evaluation of factors such as - skills and competencies, risk taking potential, flexibility etc.

(ii) **Measurement of performance -** The standard performance is a bench mark with which the actual performance is to be compared. The reporting and communication system help in measuring the performance. If appropriate means are available for measuring the performance and if the standards are set in the right manner, strategy evaluation becomes easier. But various factors such as managers contribution are difficult to measure. Similarly divisional performance is sometimes difficult to measure as compared to individual performance. Thus, variable objectives must be created against which measurement of performance can be done. The measurement must be done at right time else evaluation will not meet its purpose. For measuring the performance, financial statements like - balance sheet, profit and loss account must be prepared on annual basis.

(iii) **Analyzing Variance -** While measuring the actual performance and comparing it with standard performance there may be variances which must be analyzed. The strategists must mention the degree of tolerance limits between which the variance between actual and standard performance may be accepted. The positive deviation indicates a better performance but it is quite unusual exceeding the target always. The negative deviation is an issue of concern because it indicates a shortfall in performance. Thus in this case the strategists must discover the causes of deviation and must take corrective action to overcome it.

(iv) **Taking Corrective Action -** Once the deviation in performance is identified, it is essential to plan for a corrective action. If the performance is consistently less than the desired performance, the strategists must carry a detailed analysis of the factors responsible for such performance. If the strategists discover that the organizational potential does not match with the performance requirements, then the standards must be lowered. Another rare and drastic corrective action is

reformulating the strategy which requires going back to the process of strategic management, reframing of plans according to new resource allocation trend and consequent means going to the beginning point of strategic management process.

Importance of Strategic Evaluation

SEC helps an organisation in several ways.

(i) **Feedback:** SEC offers valuable feedback on how well things are moving ahead. It also throws light on the relevance and validity of strategic choice. It helps to answer critical questions such as: Are we moving in the proper direction? Are our assumptions about major trends are correct? Should we adjust or abort strategy?

(ii) **Reward:** SEC helps in identifying rewarding behaviours that are in tune with formulated strategies. It helps in pinpointing responsibilities for failure as well. Where people find it difficult to stick to a planned course of action due to circumstances beyond their control, managers can take note of such things and initiate suitable rectification steps immediately.

(iii) **Future Planning:** SEC offers a considerable amount of information and experience to decision makers that can be quite valuable in the formulation of new strategic plans.

Barriers in Evaluation : There are three types of barriers in evaluation the limits of control, difficulties in measurement, and motivational problems.

(i) **The limits of Control :** It is not easy for strategists to decide the limits of control. Too much control prevents mangers from taking initiative, experiment with their creative ideas and gain through calculated risk taking. On the other hand, when there is very little control people tend to go off the hook, waste resources without any fear of punishment and work at cross purposes – putting a big question mark on the very survival of the firm.

(ii) **Difficulties in Measurement :** It is not easy to find measurement techniques that are valid and reliable. Validity is the extent to which an instrument measures what it intends to measure (for example measuring the speed and accuracy of a typist in a typing test). Reliability is the confidence that an indicator will measure the same thing every time. In the absence of reliability and validity, the control system gets distorted. It may fail to measure results uniformly or measure attributes that are not required to be measured. When people are not confident about the measures used for judgement, they resist the whole process vehemently.

(iii) **Motivational Problems:** Having taken a position while formulating and implementing the strategy, strategists are often reluctant to admit their mistakes when things go off the track. They tend to shift the blame on others. This may also prevent them from hiving off unprofitable divisions, reversing wrong decisions and go in search of more viable alternations quickly.

EVALUATION CRITERIA: The critical factors that could help in evaluating a strategy may broadly be classified into two categories: quantitative factors and qualitative factors.

Quantitative Factors:

Quantitative criteria commonly employed in evaluate strategies are financial ratios, which strategists use to make three important comparisons: (i) comparing the firm's performance over different time periods (ii) comparing the firm's performance to competitors' and (iii) comparing the firm's performance to industry averages. Some key financial ratios those are particularly useful as criteria for strategy evaluation may be stated thus:

- Return on investment
- Return on equity
- Z score
- Employee turnover

- Employee satisfaction index
- Return on capital employed
- Profit margin
- Market share
- Debt to equity
- Earnings per share
- Sales growth
- Asset growth

Qualitative Factors:

Many managers feel that qualitative organizational measurements are best arrived at simply by answering a series of important questions at revealing important facets of organizational operations. Some qualitative questions that are useful in evaluating strategies.

1. Is the strategy internally consistent?
2. Is the strategy consistent with the environment?
3. Is the strategy appropriate in view of available resource?
4. Does the strategy involve an acceptable degree of risk?
5. Does the strategy have an appropriate time framework?
6. Is the strategy workable?

Strategic Control - Strategic control is aimed at assessment of the changing environment to see that the strategy is not out of the line with it. If necessary, strategies may be reformulated. Strategic controls are a very significant component of the implementation process, as it involves tracking, monitoring and evaluating the effectiveness of the strategies that have been implemented, as well as making any necessary adjustments and improvements when necessary.

It is important to observe the workplace, employees, activities, outputs etc. when new strategies have been implemented. It is important to determine whether the implementation process is effective in reaching what the strategies set out to achieve. Review progress periodically to determine whether changes are necessary, as issues or problems may not arise immediately. It is important that corrective action is taken as soon as possible and practical, in order for strategies to be effective and achieve set out goals.

Strategic control systems are the formal target-setting, measurement, and feedback systems that allow strategic managers to evaluate whether a company is achieving superior efficiency, quality, innovation, and customer responsiveness and implementing its strategy successfully.

Managers may choose to implement various control systems to monitor strategy implementation. Managers may implement formal monitoring or periodic reviews to determine the organisation's performance. Incentives may also be utilised by managers, to motivate and encourage employees to work towards the outlined goals and objectives. Such incentives may include bonuses, rewards and share allocations.

Strategic control involves tracking a strategy as it's being implemented. It's also concerned with detecting problems or changes in the strategy and making necessary adjustments. As a manager, you tend to ask yourself questions, such as whether the company is moving in the right direction, or whether your assumptions about major trends and changes in the company's environment are correct. Such questions necessitate the establishment of strategic controls.

Premise Control

Every strategy is based on certain planning premises or predictions. Premise control is designed to check methodically and constantly whether the premises on which a strategy is grounded on are still valid. If you discover that an important premise is no longer valid, the strategy may have to be changed. The sooner you recognize and reject an invalid premise, the better. This is because the strategy can be adjusted to reflect the reality.

Special Alert Control

A special alert control is the rigorous and rapid reassessment of an organization's strategy because of the occurrence of an immediate, unforeseen event. An example of such event is the acquisition of your competitor by an outsider. Such an event will trigger an immediate and intense reassessment of the firm's strategy. Form crisis teams to handle your company's initial response to the unforeseen events.

Implementation Control

Implementing a strategy takes place as a series of steps, activities, investments and acts that occur over a lengthy period. As a manager, you'll mobilize resources, carry out special projects and employ or reassign staff. Implementation control is the type of strategic control that must be carried out as events unfold. There are two types of implementation controls: strategic thrusts or projects, and milestone reviews. Strategic thrusts provide you with information that helps you determine whether the overall strategy is shaping up as planned. With milestone reviews, you monitor the progress of the strategy at various intervals or milestones.

Strategic Surveillance

Strategic surveillance is designed to observe a wide range of events within and outside your organization that are likely to affect the track of your organization's strategy. It's based on the idea that you can uncover important yet unanticipated information by monitoring multiple information sources. Such sources include trade magazines, journals such as The Wall Street Journal, trade conferences, conversations and observations.

The Control Process

Regardless of the type or levels of control systems an organization needs, control may bedepicted as a six-step feedback model:

1. Determine What to Control:

The first step in the control process is determining the major areas to control. Managers usually base their major controls on the organizational mission, goals and objectives developed during the planning process. Managers must make choices because it is expensive and virtually impossible to control every aspect of the organization's.

2. Set Control Standards:

The Second step in the control process is establishing standards. A control standard is a target against which subsequent performance will be compared. Standards are the criteria that enable managers to evaluate future, current, or past actions. They are measured in a variety of ways, including physical, quantitative, and qualitative terms. Five aspects of the performance can be managed and controlled: **quantity, quality, time, cost, and behavior.**

Standards reflect specific activities or behaviors that are necessary to achieve organizational goals. Goals are translated into performance standards by making them measurable. An organizational goal to increase market share, may be translated into a top-management performance standard for example, to increase market share by 10 percent within a twelve month period. Helpful measures of strategic performance include: sales (total, and by division, product category, and region), sales growth, net profits, return on sales, assets, equity, and investment cost of sales, cash flow, market share, product quality, value added, and employees productivity.

Quantification of the objective standard is sometimes difficult. For example, consider the goal of product leadership. An organization compares its product with those of competitors and determines the extent to which it pioneers in the introduction of basis product and product improvements. Such standards may exist even though they are not formally and explicitly stated.

Setting the timing associated with the standards is also a problem for many organizations. It is not unusual for short term objectives to be met at the expense of long-term objectives. Management must develop standards in all performance areas touched on by established organizational goals. The various forms of standards are depend on what is being measured and on the managerial level responsible for taking corrective action.

3. Measure Performance:

Once standards are determined, the next step is measuring performance. The actual performance must be compared to the standards. Many types of measurements taken for control purposes are based on some form of historical standard. These standards can be based on data derived from the **PIMS (profit impact of market strategy)** program, published information that is publicly available, ratings of product / service quality, innovation rates, and relative market shares standings. Strategic control standards are based on the practice of **competitive benchmarking** - the process of measuring a firm's performance against that of the top performance in its industry. The proliferation of computers tied into networks has made it possible for managers to obtain up-to-minute status reports on a variety of quantitative performance measures. Managers should be careful to observe and measure in accurately before taking corrective action.

4. Compare Performance to Standards:

The comparing step determines the degree of variation between actual performance and standard. If the first two phases have been done well, the third phase of the controlling process - comparing performance with standards - should be straightforward. However, sometimes it is difficult to make the required comparisons (e.g., behavioral standards). Some deviations from the standard may be justified because of changes in environmental conditions, or other reasons.

5. Determine the Reasons for the Deviations:

The fifth step of the control process involves finding out: "why performance has deviated from the standards?" Causes of deviation can range from selected achieve organizational objectives. Particularly, the organization needs to ask if the deviations are due to internal shortcomings or external changes beyond the control of the organization. A general checklist such as following can be helpful:

- Are the standards appropriate for the stated objective and strategies?
- Are the objectives and corresponding strategy still appropriate in light of the current environmental situation?
- Are the strategies for achieving the objectives still appropriate in light of the current environmental situation?
- Are the firm's organizational structure, systems (e.g., information), and resource support adequate for successfully implementing the strategies and therefore achieving the objectives?
- Are the activities being executed appropriate for achieving standard?

6. Take Corrective Action:

The final step in the control process is determining the need for corrective action. Managers can choose among three courses of action: (1) they can do nothing (2) they can correct the actual performance (3) they can revise the standard.

When standards are not met, managers must carefully assess the reasons why and take corrective action. Moreover, the need to check standards periodically to ensure that the standards and the associated performance measures are still relevant for the future. The final phase of controlling process

occurs when managers must decide action to take to correct performance when deviations occur. Corrective action depends on the discovery of deviations and the ability to take necessary action. Often the real cause of deviation must be found before corrective action can be taken. Causes of deviations can range from unrealistic objectives to the wrong strategy being selected to achieve organizational objectives. Each cause requires a different corrective action. Not all deviations from external environmental threats or opportunities have progressed to the point a particular outcome is likely, corrective action may be necessary.

Characteristics of an effective control system

Effective control systems tend to have certain qualities in common. These can be stated thus:

1. **Suitable:** The control system must be suitable to the needs of an organisation. It must conform to the nature and needs of the job and the area to be controlled. For example, the control system used in production department will be different from that used in sales department.
2. **Simple:** The control system should be easy to understand and operate. A complicated control system will cause unnecessary mistakes, confusion and frustration among employees. When the control system is understood properly, employees can interpret the same in a right way and ensure its implementation.
3. **Selective:** To be useful, the control system must focus attention on key, strategic and important factors which are critical to performance. Insignificant deviations need not be looked into. By concentrating attention on important aspects, managers can save their time and meet problems head-on in an effective manner.
4. **Sound and economical** : The system of control should be economical and easy to maintain. Any system of control has to justify the benefits that it gives in relation to the costs it incurs. To minimize costs, management should try to impose the least amount of control that is necessary to produce the desired results.
5. **Flexible:** Competitive, technological and other environmental changes force organizations to change their plans. As a result, control should be necessarily flexible. It must be flexible enough to adjust to adverse changes or to take advantage of new opportunities.
6. **Forward-looking:** An effective control system should be forward-looking. It must provide timely information on deviations. Any departure from the standard should be caught as soon as possible. This helps managers to take remedial steps immediately before things go out of gear.
7. **Reasonable:** According to Robbins, controls must be reasonable. They must be attainable. If they are too high or unreasonable, they no longer motivate employees. On the other hand, when controls are set at low levels, they do not pose any challenge to employees. They do not stretch their talents. Therefore, control standards should be reasonable–they should challenge and stretch people to reach higher performance without being demotivating.
8. **Objective:** A control system would be effective only when it is objective and impersonal. It should not be subjective and arbitrary. When standards are set in clear terms, it is easy to evaluate performance. Vague standards are not easily understood and hence, not achieved in a right way. Controls should be accurate and unbiased. If they are unreliable and subjective, people will resent them.
9. **Responsibility for failures:** An effective control system must indicate responsibility for failures. Detecting deviations would be meaningless unless one knows where in the organisation they are occurring and who is responsible for them. The control system should also point out what corrective actions are needed to keep actual performance in line with planned performance.
10. **Acceptable:** Controls will not work unless people want them to. They should be acceptable to chose to whom they apply, controls will be acceptable when they are (i) quantified, (ii) objective (iii) attainable and (iv) understood by one and all.

1.5 STRATEGIC DECISION

Organisation is a goal seeking entity or a firm is a goal seeking organisation. It seeks goals through two distinct processes.

(i) **Logistic process**

(ii) **Management process**

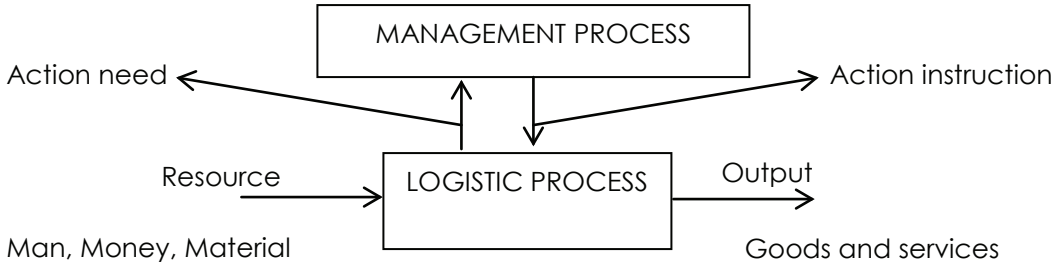
Logistic process is the process that deals with the conversion of resources like man, material, money, resources taken from environment into goods and services that are once again returned back to environment.

This logistic process is guided by management process. As a result of the above two process we get three decision.

(i) Strategic Decision

(ii) Administrative Decision

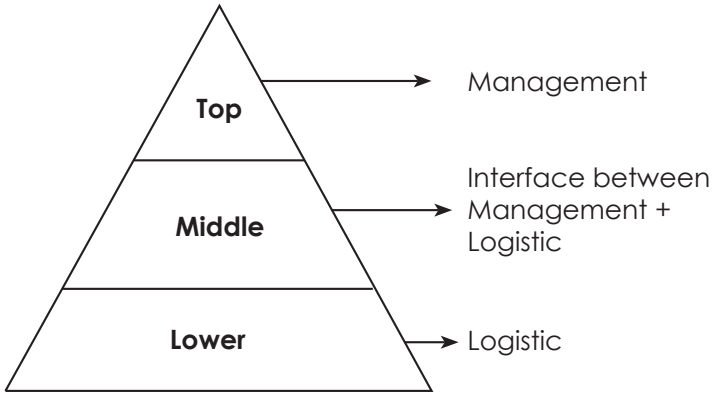
(iii) Operating Decision



(i) Strategic Decision : Decision that are concerned with the linkage of the firm with its environment. Strategic decisions are concerned with the selection of product mix which the firm will produce and selection of markets in which it will sell its products.

(ii) Administrative Decision : Decision relating to the co-ordination of activities – who reports to whom – how tasks are co-ordinated and integrated – organisation structure – Administrative set up. i.e. Administrative Decisions are concerned with establishing authority – responsibility relationship , location of facilities , personnel training, distribution channels etc.

(iii) Operating Decision : Decision relating to the determination of operating level of the organisation i.e. Operating Decisions are concerned with day to day operations of resource allocation, applying controls etc.



Make a comparison study of 3 decision classes.

	Strategic	**Administrative**	**Operating**
Definition	Decision that are concerned with the linkage of the firm with its environment.	Decision relating to the co-ordination of activities.	Decision relating to the determination of operating level of the organization.
Problem	Selection of product mix which the firm will produce, allocation of resources and selection of markets so that Return on Investment (ROI) is optimum.	Establishing authority & responsibility relationship, location of facilities, personnel training, distribution channels etc for getting optimum performance.	Selection of day to day operations of resource allocation, scheduling, applying controls etc. for getting optimum ROI.
Nature of problem	Allocation of total resources among product-market opportunities.	Organisation, acquisition and development of resources.	Budgeting of resources among functional areas. Scheduling resource application and conversion. Supervision and control.
Key Decisions	Objectives and goals, Diversification strategy, Expansion strategy, Administrative strategy, Finance strategy , Timing of growth.	Organisation structure of information authority, and responsibility flows; Structure of resource-conversion, work flows, distribution systems, facilities location, Resource acquisition and development: financing, facilities and equipment, personnel, raw material etc.	Operating objectives and goals. Pricing and output levels Operating levels:- production schedules, inventory levels, warehousing, etc. Marketing policies and strategies R&D policies and strategy.
Key Charac-teristics	Decision centralised, Decision not self-regenerative.	Conflict between strategy and operations, Conflict between individual and institutional objectives. Strong combination between economic and social variables.	Decentralised decisions. Risk and uncertainty, Repetitive decisions, Large volume decisions, Decisions self-regenerative.

Strategic Decision-making

Strategic decision concept is based on strategy which is a major action in an organisation. Strategic decision making is a major choice of actions concerning allocation of resource and contribution to the achievement of organisational objectives. It has following characteristics:-

(i) The strategic decision affects the whole part of organisation and largely relates to the responsibilities of senior management.

(ii) It contributes directly to the achievement of objectives.

(iii) It has normally three elements ----

(a) Action element, which specifies the work to be done.

(b) Result element, which specifies the desired result to be achieved through the implementation of decision.

(c) Commitment element, which directs to undertake the course of action, makes personnel involvement for attaining the objective and allocates resources to them.

It is normally a non programmed decision which is made under the condition of partial ignorance.

The fundamental strategic decision relates to the choice of a mission. With regard to objective setting, the senior management is faced with alternatives regarding the different criteria to measure performance. Then they select the strategy from a number of strategic alternatives in order to adopt one specific course of action for achievement of goals and realisation of mission.

So conventional decision making is the most important function of any manager but strategic decision making is important task of senior management. Strategic decisions contribute directly to the achievement of objective but conventional decisions are derived from these.

Various theories or models have been suggested about how decisions are made. Such as rational-analytical, intuitive-emotional and behavioural-political.

Rational-Analytical decision model:

This model assumes —

(i) The decision maker is a unique actor whose behaviour is intelligent and rational.

(ii) He has capability to gather all necessary information and he can recall any information in any time he likes.

(iii) He can calculate all expected results from all possible alternatives.

(iv) He can rank the result of all possible solutions in the light of risk, time, resource, and fixed scale of preferences. He goes about this search in a planned, orderly, logical fashion.

(v) He can select the best alternative from the rank as final decision that has maximum gain or advantage.

This is the oldest decision theory. It has following limitations:-

(i) The decision maker is often not a unique actor.

(ii) In actual practice, the people cannot have complete information.

(iii) Expected values of all possible alternatives cannot be determined due to cost and complexity.

(iv) He cannot rank the results in uncertainty. He is forced to use his imaginations, which are subjective.

(v) A man cannot be perfectly rational so he fails to select the decision having the greatest advantages. Therefore, he satisfies i.e. he looks for a decision, which is satisfactory or good enough.

Intuitive - Emotional decision model:

The opposite of rational decision maker is the intuitive decision maker. It is useful where decisions are unstructured, non-repetitive, non-routine in nature. The decision maker prefers past experience, reflective thinking and natural impulse. It follows the following steps:-

(i) Identify the implicit favourite very early in decision.

(ii) Continue their search for additional alternatives and nearest options and calculate expected result of them.

(iii) Select the next best alternative known as confirmation decision.

(iv) Comparison made whether (i) is superior to (ii) or not.

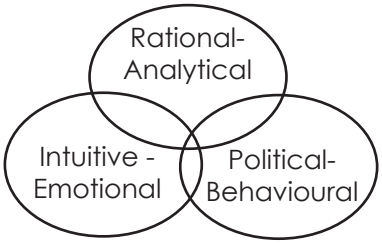
If decision is derived, that clearly favoured the implicit favourite, the decision is announced, other-wise above steps are to be repeated.

Political-Behavioural decision model :

In this model, the decision makers must consider a variety of pressures from other people affected by their decision. An organisation interacts with a variety of parties in a series of interdependent exchange relationship. e.g. owners exchange capital for dividends, customers exchange money for product etc. Each party gives the organisation something and expects something in return. The party who gets more than given is more powerful and he has more influence over decision. Decision makers do a juggling act to meet the demands of various interested parties. Through mutual adjustment, negotiation, and political compromise, they attempt to merge competing demands so that this decision is supported and implemented politically.

The human being is a mix of the rational and the emotional. There are differences between individual. There is differences in stability of environment. There is interaction between components so the three approaches are interrelated.

The best decision occurs where three approaches are intersected.



Mintzberg's analysis of strategic decisions-making (mode of decision making).

According to Henry Mintzberg there are 3 mode of strategic decisions-making – entrepreneurial, adaptive and planning.

(i) **Entrepreneurial mode** : 'Entrepreneur' is the owner and manager who has centralised control on organization. He imposes his way of thinking and 'vision of direction' in the process of strategic decision-making. This type of decision is certain, less risky having greater opportunity, that applicable to small organisations.

(ii) **Adaptive mode** – Under this mode decision is taken by board of members containing shareholders and employees having conflicting interest. In this type of decision-making approach, there is a tendency to find out "reactive (unthinking) solutions to existing problems, rather than a proactive (positive) search for new opportunities". Here decisions are "incremental" and "disjointed" that are taken in serial steps.

(iii) **Planning mode** - In this type of decision-making approach, required information is gathered and analysed, alternatives are generated and the suitable strategy is selected. This decision is made on the basis of past information, experience and available opportunities, all of which require formal analysis. It is applicable to those organisations that are of reasonable size and are not facing strong & irregular competition.

A strategy decision making is a complex process. It is made by considering following important issues:-

(i) Criteria for decision-making: The process of decision-making requires objective setting. The objective is set up according to Rational-Analytical criteria to get the maximum gain or according to Intuitive-Emotional criteria to get satisfactory result, or according to Political-Behavioural criteria where the firm moves towards its objectives in small, logical and incremental steps. In this way, objectives serve as the criteria for decision-making.

(ii) **Rationality in decision making:** Rationality means exercising a choice from alternative courses of action in such a way that it should give the best possible result. According to economists (maximiser) a decision will be rational if it leads to profit maximisation. According to behaviourists (satisfactory) rationality means bounded condition imposed by limited capacity of men. According to Incrementalilsts rationality means consideration of bargain among all interested parties existing in an organisation.

(iii) **Creativity in decision making** :- Decision must be original and creative by considering underlie strategy, including preferences of managers, their attitude towards risk, corporate obligations to society & interested parties.

(iv) **Variability in decision making** :- It is a common observation that, given an identical set of conditions two decision makers may reach totally different conclusions. This happen due to variability in decision-making. Therefore, in a unique situation, there are no set formulas that can be applied in strategic decision-making.

(v) **Person related factors in decision making** :- There are a lot of person related factors that play a role in decision making. Some of these are [a] age, knowledge, risk-taking ability, creativity which have positive role in strategic decision making. [b] Cognitive styles, which help to understand the information and to interrelate, integrate the variables. [c] Values, which are important in matters of social responsibility and business ethics issues.

(vi) **Individual vs. Group Decision making** :- Due to differences in person related factors, there are individual differences among decision makers. These differences matter in strategic decision-making. So it is necessary that the decision must be made with a perspective of understanding, and anticipating the major implication and with requisite authority to allocate resources for implementation of the decisions.

(vii) **Future oriented and long-term prosperity** :- This decision is based on future forecasting and it is expected to have significant impact on firm's future prosperity. So the approach, which has long-term commitment, should be adopted.

Dimensions of Strategic Decisions

What decisions facing a business are strategic and therefore deserve strategic management attention? Typically, strategic issues have the following dimensions.

Strategic Issues Require Top-Management Decisions: As strategic decisions overarch several areas of a firm's operations, they require top-management involvement. Usually only top management has the perspective needed to understand the broad implications of such decisions and the power to authorize the necessary resource allocations. At Marico Industries, the Kaya Skin Care initiative was the result of a need to guard against overdependence on the two mainline brands, Parachute and Saffola. At the time Mr. Rakesh Pandey, CEO, Kaya Skin Care, was looking for alternatives to reduce the overdependence, he had an offer to market laser machines for removal of unwanted body hair. However, this did not appeal to him as this was not their area of competence. Instead, he decided to get into the broader area of skincare. While most of the global players—like L'Oreal and Elizabeth Arden—followed the high-margin, low-volume route to growth, Kaya ventured into services and 360° solutions in skincare, rather than the products. The decision was based on his perception of the changing social environment in India, where people were focused on becoming more presentable, and increasing their self esteem.

Strategic Issues Require Large Amounts of the Firm's Resources : Strategic decisions involve substantial allocations of people, physical assets, or moneys that either must be redirected from internal sources or secured from outside the firm. They also commit the firm to actions over an extended period. For these reasons, they require substantial resources. Whirlpool Corporation's "Quality Express" product

delivery program exemplified a strategy that required a strong financial and personnel commitment from the company. The plan was to deliver products to customers when, where, and how they wanted them. This proprietary service uses contract logistics strategy to deliver Whirlpool, Kitchen Aid, Roper, and Estate brand appliances to 90 percent of the company's dealer and builder customers within 24 hours and to the other 10 percent within 48 hours. In highly competitive service-oriented businesses, achieving and maintaining customer satisfaction frequently involve a commitment from every facet of the organization.

Strategic Issues Often Affect the Firm's Long-Term Prosperity : Strategic decisions ostensibly commit the firm for a long time, typically five years; however, the impact of such decisions often lasts much longer. Once a firm has committed itself to a particular strategy, its image and competitive advantages usually are tied to that strategy. Firms become known in certain markets, for certain products, with certain technologies. They would jeopardize their previous gains if they shifted from these markets, products, or technologies by adopting a radically different strategy. Thus, strategic decisions have enduring effects on firms—for better or worse. For example, Commerce One created an alliance with SAP in 1999 to improve its position in the e-marketplace for business to business (B2B) sales. After taking three years to ready its e-portals, Commerce One and SAP were ready to take on the market in 2002. Unfortunately, the market changed. The "foolproof strategy" got to the market too late and the alliance failed.

For years, Toyota had a successful strategy of marketing its Sedans in Japan. With this strategy came an image, a car for an older customer, and a competitive advantage, a traditional base for Toyota. The strategy was effective, but as its customer base grew older its strategy remained unchanged. A younger customer market saw the image as unattractive and began to seek out other manufacturers. Toyota's strategic task in foreign markets is to formulate and implement a strategy that will reignite interest in its image.

Strategic Issues Are Future Oriented : Strategic decisions are based on what managers forecast, rather than on what they know. In such decisions, emphasis is placed on the development of projections that will enable the firm to select the most promising strategic options. In the turbulent and competitive free enterprise environment, a firm will succeed only if it takes a proactive (anticipatory) stance toward change.

Strategic Issues Usually Have Multifunctional or Multibusiness Consequences : Strategic decisions have complex implications for most areas of the firm. Decisions about such matters as customer mix, competitive emphasis, or organizational structure necessarily involve a number of the firm's strategic business units (SBUs), divisions, or program units. All of these areas will be affected by allocations or reallocations of responsibilities and resources that result from these decisions.

Strategic Issues Require Considering the Firm's External Environment : All business firms exist in an open system. They affect and are affected by external conditions that are largely beyond their control. Therefore, to successfully position a firm in competitive situations, its strategic managers must look beyond its operations. They must consider what relevant others (e.g., competitors, customers, suppliers, creditors, government, and labor) are likely to do.

Characteristics of Strategic Management Decisions

The characteristics of strategic management decisions vary with the level of strategic activity considered. As shown in the following table, decisions at the corporate level tend to be more value oriented, more conceptual, and less concrete than decisions at the business or functional level. For example, at Alcoa, the world's largest aluminium maker, chairman Paul O'Neill made Alcoa one of the nation's most centralized organizations by imposing a dramatic management reorganization that wiped out two layers of management. He found that this effort not only reduced costs but also enabled him to be closer to the

Hierarchy of Objectives and Strategies

Ends (What is to be achieved)	Means (How is it to be achieved?)	Strategic Decision Makers			
		Board of directors	Corporate managers	Business managers	Functional managers
Mission, including goals and philosophy		✓✓	✓✓	✓	
Long-term objectives	Grand strategy	✓	✓✓	✓✓	
Annual objectives	Short-term strategies and policies		✓	✓✓	✓✓

Note: ✓✓ indicates a principal responsibility; ✓ indicates a secondary responsibility.

front-line operations managers. Corporate-level decisions are often characterized by greater risk, cost, and profit potential; greater need for flexibility; and longer time horizons. Such decisions include the choice of businesses, dividend policies, sources of long-term financing, and priorities for growth.

Functional-level decisions implement the overall strategy formulated at the corporate and business levels. They involve action-oriented operational issues and are relatively short range and low risk. Functional-level decisions incur only modest costs, because they depend on available resources. They usually are adaptable to ongoing activities and, therefore, can be implemented with minimal cooperation. For example, the corporate headquarters of Sears, Roebuck & Company spent $60 million to automate 6,900 clerical jobs by installing 28,000 computerized cash registers at its 868 stores in the United States. Though this move eliminated many functional-level jobs, top management believed that reducing annual operating expenses by at least $50 million was crucial to competitive survival.

Because functional-level decisions are relatively concrete and quantifiable, they receive critical attention and analysis even though their comparative profit potential is low. Common functional-level decisions include decisions on generic versus brand name labeling, basic versus applied research and development (R&D), high versus low inventory levels, general-purpose versus specific-purpose production equipment, and close versus loose supervision.

Business-level decisions help bridge decisions at the corporate and functional levels. Such decisions are less costly, risky, and potentially profitable than corporate-level decisions, but they are more costly, risky, and potentially profitable than functional-level decisions. Common business-level decisions include decisions on plant location, marketing segmentation and geographic coverage, and distribution channels.

1.6 STRATEGIC POSITION

Definition

The strategic position is concerned with the impact on strategy of the external environment, internal resources and competences, and the expectations and influence of stakeholders. Together, a consideration of the environment, strategic capability, the expectations and the purposes within the cultural and political framework of the organisation provides a basis for understanding the strategic position of an organisation. - **Johnson and Scholes, 2005**

It is important to take account of the future and to assess whether the current strategy is a suitable fit with the strategic position. If not, the organisation needs to determine what changes it needs to make and whether it is capable of effecting such changes.

In summary, the strategic position forms an integral part of the strategic management process. It informs the strategic choices that need to be made and subsequently implemented.

Gary Stern identifies the six P's of positioning as Product, Public, Price, Place, Production, and Promotion

The Department of Human Services adds a seventh P –People

In battle the party who holds the higher ground usually wins. In business you must seek out your higher ground. In business the higher ground is not as evident as it is on the battlefield.

Your higher ground is the position that allows you to make the best use of your strengths that at the same time grants you a superior advantage over the competition.

Strategic positioning looks at more than just a particular product. Strategic positioning entails positioning your business or brand in the marketplace to your best advantage. This is especially important in a changing market because when the ground is shaking you need to be firmly on solid ground.

Strategic positioning is more comprehensive than product positioning. Procter & Gamble is one of the best examples of a company famous for their product positioning. But what if you're not selling soap or toothpaste?

You might think that you are safe with product positioning if you are selling to consumers. If it worked for the brand marketers at P&G why can't you use it?

The concept of brand has changed and the market is crowded. People are overwhelmed with marketing messages. That means that the chance of your message getting through and sticking is dismal - unless you hold the higher ground.

Let's look at some examples of strategic positioning.

Sony has positioned the company as a provider of innovative and higher quality (higher priced) entertainment electronics. The position that the company holds includes any of their products.

Apple has strategically repositioned the company as a provider of leading edge technology that is easy to use and redefines the market. Hence they transformed from selling "a computer for artistic people" to developers of iTunes, iPod, iPhone and the iPad.

Product positioning entails fighting for a marketing position in the mind of the customers. Strategic positioning goes beyond that by entrenching that position clearly in the minds of the leaders and staff of the business. That motivates them and guides their decision making.

One controversial decision at Apple is that Apple often bypasses its dealer network to sell directly to the public, undercutting Apple approved dealers. It doesn't make sense unless you more closely examine the strategic positioning Apple has chosen.

As you can see strategic positioning is not just about marketing although it determines marketing. Strategic positioning will drive every aspect of your business from operations to financial decisions.

General Electric, while under the leadership of Jack Welch claimed the strategic position of either number one or number two in each of its markets. Any division that did not meet this expectation was sold or closed. That's clarity and focus.

Mike Holmes of "Holmes on Homes" seems to have claimedd the strategic position of "the building contractor who really cares and tells it like he sees it." That guided his style in his contracting business. That made it easy for him to accept the offer of a TV show when it came along. He didn't go looking for the TV show. That strategic positioning also made it easy for him to decide to build homes in New Orleans after Hurricane Katrina. When you know what you want to do, you will recognize the opportunities as they present themselves.

"If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle." **Sun Tzu, The Art of War**

1.7 STRATEGIC CHOICE

Strategic choices concern the "decisions about an organization's future and the way in which it needs to respond to pressures and influences" (p. 235, Macmillan & Tampoe 2000). Strategic choice is a part of the strategic process and involves elements like the identification and evaluation of alternatives which then leads to a choice. Once you have conducted the external and internal analyses the different alternatives available to you should be clear. Identifying them is however not always easy, and asking yourself questions like what the future focus is and what the expansion plans are might facilitate the identification process of these alternatives. There are three aspects that you should consider when you choose a strategy. Porter's generic strategies help you identify the grounds you stand on, then the possible directions that should be considered, and possible methods. Strategic choices also occur at different levels, at the business level, at the corporate and at the international level. The available options can develop into different directions and different methods can be of relevance when evaluating them. A great challenge is to get choices on different levels to be consistent with each other.

Identification

Generic strategies

The generic strategies function as a foundation when you choose a future strategy. There are three generic strategies; overall cost leadership, differentiation, and focus. These strategies can be used to develop the future strategy. If you follow the cost leadership strategy, basically you sell your products cheaper than your competitors. This requires that the overall cost level in the organization is kept at a minimum. Cost leaders that you probably have heard about are companies like IKEA and Wal-Mart. Differentiation involves the offering of a unique product, where the brand or service offering makes the product unique. These two strategies are usually not compatible. Focus is about focusing on a single segment or market. This strategy can be combined with the other two and create a focused cost leadership or focused differentiation.

Directions

A company can choose four different directions that can be based on the product-market grid. The market penetration is for companies who are already present with a product in a market who wish to penetrate the market more and turn more customers into regular customers. The market development focuses on breaking new grounds for existing products. Exporting is one option. Product development is about offering new or improved products in existing markets. Diversification is the last direction available where a company offers new products in new markets.

Methods

There are two ways to get the company started in the strategic direction you choose, either through internal development or through cooperation. Internal development has usually been preferred by companies since it gives more control and lower risk, and gives the opportunity for internal development. Cooperation on the other hand might be necessary in order to gain new knowledge and access into new markets.

Evaluation

Evaluation of alternatives can be made based on three criteria; the consequent criterion, the acceptable criterion, and the possible criterion. The consequent criterion is about making sure that the decision is consistent with previous decisions and the company's objectives in order to avoid conflicts. The acceptable criterion makes sure that the choice is acceptable economically as well as politically, both internally and externally. Other possible criteria might also be relevant, like if the company has the right resources.

Making a choice

How a decision is taken and how choices are made has been subject to a number of theories. Choice can be made analytically-rationally, intuitively-emotionally, or politically-behaviorally. The two latter are the most common ones in practice, even though the first one is very useful to have in mind. Decision support tools can be very useful where certain criteria are given certain weights of importance and thereafter a ranking of the alternatives is made. Barriers to choice can be a lack of preparation, a lack of knowledge about strategic processes, narrow-mindedness, lack of control, over-optimistic capability assessment, and short-term shortcuts.

As was mentioned in the beginning, strategic choices can be made at different levels. At the business level there are several choices that a manager has to make in order to attain competitive advantage. A company is usually made up of a number of business units where each unit is responsible for its own competitive strategy since they often compete in different markets under different conditions. A competitive strategy can be viewed in different ways and there are usually several options available. The strategy clock can be used to evaluate the different options available to differentiate your firm and what kinds of strategies that are likely to fail. The strategies in the strategy clock have different focuses; there are strategies based on price, on product differentiation, a mixture of the two, or more focused strategies, and some strategies that are just doomed to fail. Regardless of what strategy you have, the competitive advantage that a company might have in the hypercompetitive markets today is only temporary, which requires more options and more choices that have to be acted on more rapidly than before. Choices you make are also likely to have an affect on the available options for others. Game theory is a theory about competitive moves in a market where every choice made affects the choices for the others.

At the corporate level the choice is about product and market diversity. There are different diversification strategies as has already been touched upon, as well as different types of integration.

At the international level the choice concerns market selection and market entry modes.

1.8 STRATEGY INTO ACTION

Strategy into Action is an embedded business process for deploying strategic goals deep into the heart of an organisation, whilst aligning leaders and engaging employees to achieve the strategic intent.

Strategy-in-action is dynamic – a continuous, evolutionary process of aligning people on a goal, getting and analyzing results, and connecting it all back to strategy formulation. The outcomes of strategy implementation are feed back into the strategy to galvanize further strategic action.

This approach to strategy improves organizational vitality and performance. It focuses on both present and future organizational health. Its goal is to optimize the performance of the entire system.

Strategy-in-action is versatile enough to work in various organizational settings, in business as well as in societal contexts.

The difference of Strategy-in-action and Traditional Planning

Traditional planning	Strategy-in-action
Stable, static	Dynamic
Linear	Nonlinear
Strategic and functional fit	Strategic tension between now and future
People as objects or recipients	People as agents and co-authors
Focus on structure	Focus on ideas and perceptions
Structural development	People-centered development
Cognitive	Both cognitive and intuitive
Competitive/adversarial	Competitive/self-improving
Either / or	Contextual
Mechanical	Organic
Separating, isolating	Integrative, comprehensive

People power

- Strategy succeeds only when people make it happen and help the organization build a sustaining competitive advantage. But we have failed to invest in educating people on strategy or in unleashing their creativity. People power has been constrained, discounted, disparaged, dismissed, and ignored. People's creativity and their ultimate potential is not recognized, let alone harnessed for success.
- This absence of true empowerment, masked by all the right buzzwords of "leadership development," "human resources" and yes, "empowerment," has led not only to huge productivity losses in organizations, but also to enormous suffering in many struggling societies. Although the world is changing fast, vast iniquities between rich and poor, between advanced and backward regions persist. The same is true inside organizations, where vast differences in competency and accomplishments separate advanced from stagnating departments.
- Tremendous untapped potential is buried in people. Leaders throughout human history understood how to mobilize this invisible potential. Moses led his people out of Egypt thousands of years ago; in the 20th century, Gandhi had a strategy to fight the mighty British Empire with the human spirit by engaging countless common people in the strategic intent of national independence.

Strategy-in-action: Critical success factors

- If one single organ does not function properly, our entire body is in harm's way. Similarly, the success factors work as a comprehensive package. Our experience teaches us that managers cannot heed only some and discard others. No matter how good a strategy, sustained success is impossible without juggling all success factors at once – much like a master juggler who keeps all the plates in the air.
- Ongoing monitoring of all these success factors is critical in sustaining success. Benchmarks and displays can be used to monitor them ongoingly, much like traditional performance displays, and can serve as early-warning systems for leaders and managers at multiple levels.

7 phases of strategy-in-action

(i) Shared understanding
(ii) Strategic intent
(iii) Strategic objectives
(iv) Indicators of success
(v) Leadership
(vi) Catalytic action
(vii) Sustaining momentum

Phase 1. Shared understanding

- Strategy-in-action begins with a group of typically 15-25 of the right thinkers and leaders – key stakeholders from all sectors of the organization that come together to reach a shared understanding of the current situation and the key elements that the strategy must address.
- Stakeholders include not only top management, but also middle management, selected front-line people, and perhaps board members, representatives of suppliers, shareholders, and customers. The group must be small enough to be intimate and effective, and large enough to include all relevant views. The very people ignored by top management are often the ones who should attend the strategic analysis session.
- Before the first strategy session, a background paper is written, often by an independent expert or a team, to maximize objectivity. The background paper seeks to establish the underpinnings of a common understanding.
- The first session serves to project the results of continuing business-as-usual, and reveals what is missing, the obstacles, and the opportunities for synergy and convergence.
- Example: In the AT&T Workplace of the Future case, both union and management leaders spent several weeks informally discussing the business environment and competitive landscape, the need for front-line employees to develop more competencies and be empowered to solve customer problems. Business unit managers began to understand that the union was committed not only to its members, but also to AT&T as a competitive business and to the professionalism of the AT&T workforce. The union-management contract was signed only after both parties agreed on all issues and on a shared strategy for addressing these issues.
- Example: When The Hunger Project and the Planning Commission of India co-hosted a national strategy session on ending chronic hunger, every relevant sector was represented in creating a consensus: government, non-governmental organizations (NGOs), business, academia, women's organizations, village leaders. Mutual accusations raged. When government representatives spoke, they accused NGO-leaders of not seeing the big picture and not listening to the government. When NGO-leaders spoke, they accused the government of living in an ivory tower and ignoring daily reality in the villages. Those of us from The Hunger Project listened in despair, ready to pack

our bags and concede failure. Finally, the late industrialist Ramkrishna Bajaj, son of Jamnalal Bajaj, the main financier of Gandhi's movement to free India, rose to remind the participants that while they were debating, over six million people worldwide had committed themselves to ending hunger in India. By the time Bajaj sat down, the atmosphere had changed. Participants were shocked that the world outside India was watching. Ramkrishna's call to action had created alignment. Participants worked together until they had a shared understanding.

- The ground rules are essential. Participants must listen and learn before jumping to conclusions. They must be honest and talk straight. They must appreciate and acknowledge – without depending on appreciation by others. They must trust other participants. They must communicate potently – without judgment or justification or excuses. They must not make decisions until there is alignment. Finally, they must be vigilant of their own beliefs and biases.
- Shared understanding must be continuously created. As strategy is implemented, obstacles and details come up, and it is easy for misunderstanding, conflict and discord to arise. In every phase of the process, shared understanding is needed newly to build the strength and confidence for implementation and continuous evolution.

Phase 2. Strategic intent

- Long-term vision serves as a stabilizer under uncertainty. Vision is defined as a statement of what is possible to achieve, is worth achieving, and represents a new quality of life for all concerned.
- The strategic intent is a magnet, a force field that pulls the present to the future. The strategic intent must be big enough to provide vision, and yet short-term enough for each participant to wrap his or her arms around it and to be energized.
- Example: The strategic intent proposed by Hunger Project experts – to "end chronic, persistent hunger in India" – did not sound right for the participants at the Delhi strategy session. They aligned on a strategic intent that expressed Gandhi's vision for all human beings to live in dignity and self-reliance: "Achieving the threshold: The chance for all our people to lead healthy and productive lives." The word "threshold" allows for measurable, defined milestones that can be used to determine where India is in delivering on the strategic intent.
- Example: In the Dallas case, the leadership faced the challenge to either close down the factory, or to revive it with a new purpose. They developed a new strategic intent to transform the plant into a world-class power systems factory.
- The ground rules for mastering the art of the strategic intent are again crucial. Participants must stand in the future accomplishment and work "back from the future," as it were, rather than working from the present toward the future. They must embrace a new relationship to failure and risk. They must show flexibility instead of being wedded to existing structures. Finally, they must be obsessed with achieving the strategic intent.

Phase 3. Indicators of success

- Indicators of success measure the achievement of the strategic intent. The indicators that are chosen are bound to run people's lives; therefore they must be chosen diligently.
- Example: At India's national strategy meeting, the participants identified the following indicators: Lowering the infant mortality rate to 50 or below. Measurement of children's height and weight, specifically the height at age seven. Nutrition assessments. Literacy rates, particularly of women. Marriage age. The percentage of the population with access to family welfare services. The percentage of the population with access to clean drinking water. Participants then selected the indicators they would initially target and drive.
- Example: The Dallas factory developed a set of success indicators before the change process began, including measurements for productivity, cost of quality, number of focused business unit teams, and reduction of management layers.

- The ground rules for indicators of success are that, first, they must be designed to force the desired behaviours. For example, how can leadership, risk-taking and innovation, or the unleashing of local creativity, be measured and monitored? The pitfall is that managers will measure the past instead of the achievement of the future. Second, all members of the organization must understand and commit to the indicators and to their targets.

Phase 4. Strategic objectives

- Strategic objectives are typically 3-5 drivers of the strategy. Each strategic objective is a major thrust that provides what is missing for achieving the strategic intent. Strategic objectives afford new vantage points and pathways.
- Strategic objectives are not merely milestones along a linear path to the goal. Each strategic objective stands on its own, yet works synergistically with the other objectives.
- Example: In the Saturn case, the joint union-management committees developed a set of strategic objectives with regard to how Saturn wanted to be recognized as a leader in both quality and customer service. Several training courses were created to facilitate goal attainment.
- Example: In India, the responsibility of designing objectives to carry out the strategic intent was left to the 22 states. This was politically smart, since the states are very powerful. Without their cooperation, national policies or directives are simply not followed. Two strategic objectives were to cause a shift in public attitudes that inhibit human development, such as attitudes toward the marriage age, toward education for girls, and toward women and girls in general; and to transform existing delivery systems for human services to achieve greater efficiency and employment opportunities for the poor.
- The ground rule for working with strategic objectives is intentionality, defined as the utilization of all our faculties without or after consideration.

Phase 5. Leadership

- The establishment and empowerment of leadership usually takes the longest. Two types of leadership must be distinguished: the leaders and the background empowerment.
- A body of committed leaders is established, consisting of individuals capable of leading by example at all levels of the organization; unyielding about the goal but flexible about the means; willing to tolerate uncertainty and not knowing the answer; and ready to respect divergent viewpoints.
- While the background of empowerment is invisible, its role of empowering the leadership body is as important as that body itself in maintaining the momentum and coherence of the strategy process. The empowerment group must possess the research and administrative capacity to facilitate the action and communication; synthesize divergent opinions into consensus; and be egoless – that is, willing to facilitate the process without getting credit at the expense of the "true owners" of the strategy.
- Example: Several bodies of leadership were essential for the success of the Workplace of the Future project. A Human Resource Board was created to leverage best practices in leadership styles, employee involvement, joint training, self-directed teams, and reward processes worldwide. The HR Board committed itself to address the needs of employees and treat them as "whole persons," i.e. as members of families, communities, and unions. The first Business Unit/Division Planning Council was created in AT&T's Data Communications Services business unit in 1992. Six other Councils, representing over 50 percent of AT&T's unionized employees, quickly succeeded it. A Joint Training Advisory Board developed a "tool box" of training modules to develop AT&T's future leadership capacity.
- Example: In India, the body of leadership also had to meet other criteria. Its members needed to carry enormous stature and reputation – that is, an outstanding record of accomplishment – and be willing to stake their reputations on the outcome of the strategy process. They needed

to hold posts at senior levels in organizations vital for fulfilling the strategic objectives; be able to mobilize human and financial resources; have access to expertise in the disciplines that were needed in the strategy; and have access to people at the grassroots level. The background-of-empowerment role was played by Hunger Project staff, who often had the ultimate thankless job: foregoing credit when things worked, yet bearing the blame when they did not.

- The ground rules for leadership and empowerment are simple but not necessarily easy to follow. Relationship is everything: the broader the foundation of relationship and partnership, the higher the accomplishment that can be built. Participants must demonstrate utmost integrity. They must check their egos – but not their commitment to collective success – at the door. They must give each other permission for coaching. They must cultivate an enabling environment.

Phase 6. Catalytic actions

- Catalytic actions act as a pressure-cooker to alter the landscape of what is possible. The new landscape of possibility informs – and transforms – the strategic process by providing rapid feedback to the strategy.
- Catalytic actions typically focus on filling gaps in existing programs or services, to eliminate duplication of efforts and to save resources; on achieving convergence of existing initiatives; and on opportunities for synergy to spark further improvements.
- Catalytic actions are of two types. Ground-breaking projects explore innovative ways of achieving the objectives. "Proof-of-principle" projects demonstrate, with sufficient authority, that successful innovations can be up-scaled or can serve as the basis for strategic decisions.
- Example: In India, catalytic projects focused on establishing "hunger-free zones" as islands of success. One project changed legislation so that women, who cannot own land, can get bank loans to build their businesses. Another trained 67,000 village officials – men and women – to be effective leaders.
- Example: Once the plant united behind the Quick JIT team, a front-line team at the Dallas Works empowered to reveal and solve problems, new ideas and requests were coming in so fast that team members had to keep a pad handy to jot them all down. The team built a growing sense at the Works that change was possible and that things could and should improve. By getting the involvement of the employees, the "Quick Jitters" catalyzed breakthroughs in productivity and inventory turns, while the vendor base, the floor space, and the cost of quality were reduced significantly.
- The ground rules for catalytic actions are simple. Participants must pick easy actions first; this builds and strengthens the sense of accomplishment and confidence. They must ask the question, "What could go wrong?" to anticipate and prevent future breakdowns. And they must catalyze rapid-fire successes, usually through bold promises and requests.

Phase 7. Sustaining momentum

- How can success be sustained? In strategy-in-action participants constantly take stock, learn from innovations elsewhere, engage others, and enrich their strategy for the next round of the process.
- Communication is paramount in this phase. Systematically communicating successes – and, yes, failures – is as important as producing those successes and failures is. Visual displays can be used to keep all participants informed.
- Breakdowns can be allies of accomplishment if they are not viewed as problems but as opportunities for innovation and learning. Every breakdown can reveal a pathway to a breakthrough.
- Example: Quick JIT team members at the Dallas Works found they were routinely working ten-hour days, seven days a week. The team met informally each morning to check what each member planned to do, to agree on priorities, and to assign work flexibly. Team members continuously

scanned issues, communicated with managers and employees, and at times got the job done when trade people were not available. Their efforts helped the factory to win the coveted Deming Prize.

- Example: Public reviews of the strategy process in India were timed to coincide with the 50th anniversary of India's independence in 1997, which maximized publicity and continued support from the government. State Council meetings are held regularly to exchange empowering information and learning, and to expand the process to new areas. The results are beyond the wildest expectations. The district of Bayad Taluka has reportedly ended hunger as measured by an infant mortality of 50 per 1,000 life births.
- The ground rules for this phase are that participants must focus on extending the process of empowerment – not on merely replicating a solution. What worked yesterday may not work today; what worked there may not work here. They must return people to their vision if the vision is buried in the concerns of the day. They must not be wedded to any structure that is not given by the strategy. And they must remember that in the heat of the action, things are unlikely to ever be balanced. It is this very imbalance that leads to the next creative leap.

Why is strategy-in-action rarely used?

There are several possible reasons why managers are reluctant to harness the power of the strategy-in-action approach:

- We have inherited a mechanistic paradigm from Newton. We believe in and rely on machines and computers. Human beings, by comparison, are bound to appear unreliable.
- Managers may experience fear of empowerment; sharing power or sensitive information with others may seem tantamount to chaos and anarchy. If executives think of empowerment as control, they will experience loss of power through empowerment of others. If they think of empowerment as the power to perform, then those who are empowered will feed power back to them – in the form of profits and performance.
- Let us admit it: whatever the ultimate benefits – working with others is a pain. If managers could produce peak results alone, by simply pushing keys at their computers, most of them would gladly do so. The only reason for teaming up in organizations is the opportunity to produce outcomes that lie far beyond the scope of any individual alone. And in today's highly competitive world, survival demands such breakthrough outcomes.

Strategy-in-Action Matrix

Unleashing Human Creativity

Warm: Nice, non-competitive	**Steam**: Innovative, competitive
Ice: Bureaucratic, stagnant	**Cold**: Competitive, burnout

Stifled human creativity

Static strategy ⟶ Dynamic Strategy

The success of the strategy-in-action model depends on the interaction between two critical dimensions: (1) To what extent is the strategy dynamic? And (2) To what extent is human creativity unleashed at all levels of the organization? The Strategy-in-Action matrix above shows four basic types of organizations derived from these two dimensions. In the lower left quadrant ("Ice"), organizations are frozen, functioning with static strategies and virtually without emphasis on human creativity. Companies involved in major capital construction projects to build roads, bridges or pipelines, and many government agencies fall into this category.

The lower right quadrant ("Cold") represents organizations that demonstrate dynamism and sensitivity to market changes, but suffer from a disconnect between strategy and people creativity. Many of the best employees in this cold environment burn out or leave the organization. Ford Motor Co. went through this stage for a number of years, prior to introducing its Taurus model, which integrated human ingenuity and strategy formulation.

In the upper left quadrant ("Warm"), organizations encourage human creativity at all levels but remain fixated on static strategies. In the early 1980s, many of the then Bell System companies introduced a people empowerment process called Quality of Working Life (QWL). While QWL encouraged and even inspired many workers to innovate their practices, workers lacked an opportunity to provide input to their organization's strategy. As a result, while working conditions improved, the Bell companies were stuck in a "warm and fuzzy" but non-competitive mode.

Finally, in the upper right corner ("Steam"), organizations constantly create the institutional capacity to enable people creativity and learning from the experience of strategy implementation, and to feed that information back into strategy. Although we have yet to see a company keep its position in the upper right quadrant over time, business organizations such as General Electric, Intel, AT&T's Dallas Works (now Lucent) and Saturn; The Hunger Project or Amnesty International in the not-for-profit sector; and the government of Namibia in the public sector, have laid claim to the quadrant of innovation-cum-competitiveness at one time or another.

Added value of 'Strategy-in-Action'

As breakthroughs in technology and communications continue to make the world a global village, proximity to success builds intensive competition and rising expectations in all societies. To deal with these challenges, leaders of organizations need dynamic and nimble learning systems that help them meet the rising demands of customers, shareowners and employees. Based on our experience, we believe that the strategy-in-action methodology provides the guidelines leaders need to manage their strategic goals and objectives successfully.

Because strategy-in-action works on people's competence, confidence and commitment as the implementers of strategy, it adds value to the organization in several important ways.

- First, it leads to a well-informed learning organization where every member of the organization shares a common understanding of the strategic intent and goals of the organization.
- Second, implementers continuously share their learning with the strategy formulators, which leads to real-time improvements of the strategy based on first-hand knowledge of market or environmental conditions. The more often the implementers have a chance to do this, the more confident they become in carrying out the essential imperatives of the strategic goals of the organization.
- Third, the success of implementation often leads to other entrepreneurial activities within the organization. For example, because of their success in managing solid waste in Bangladesh, Hunger Project implementers used their knowledge and competence in developing a new business in organic fertilizers. A similar example in business is the successful attempt of several companies in enabling call center service representatives to market products to customers, thus contributing to their organizations' EVA (Economic-Value-Added).

In sum, strategy-in-action requires investment, yes – but those who invest get a great return on investment. The so-called "soft" human factor has tremendous impact on the so-called "hard" bottom line:

- Instead of a lengthy, expensive strategy session that stifles action, catalytic actions produce both immediate and lasting results, and allow the immediate test of strategy against reality.
- Strategic criteria filter out unnecessary action. Wrong strategies are naturally eliminated, and much money is saved.
- Alignment permits ownership of difficult choices that must be made. Decisions are based on broad consensus. Even those who must sacrifice are likely to stay in the game.

- Full communication and co-creation deepens the kind of partnership that makes outstanding accomplishment possible. Shared, intrinsic commitment generates greater results than extrinsic rewards or threats.
- Vision brings clarity and meaning to day-to-day activities, and deepens employee loyalty.
- Synergy, convergence, and focus eliminate redundancies and enable big time savings – not to speak of nerves, people, and money.
- Ownership enhances individual initiative and an entrepreneurial spirit throughout the organization. The resulting leverage can create miracle output-over-input ratios of 100:1 or more.

1.9 MULTI-BUSINESS FIRM

A Multi-Business or diversified firm is a collection of individual businesses. In a multi-business firm corporate strategy takes a broad overview role that is more encompassing than crafting strategy for a single business. Major tasks include devising actions to improve long-term performance of a corporation's portfolio of businesses; capturing strategic fit benefits existing within and between business units; and evaluating profit prospects of each business unit and steering corporate resources into the most attractive strategic opportunities.

When a firm has diversified into more than one line of business, it faces a new set of strategic challenges. The primary objective of a multi-business firm is achieving higher financial performance than the firm's units would achieve if they were independent. To do this, the corporation acts as the primary if not sole source of capital for its units and manages them to ensure that they have superior economic returns over time. No public firm that fails notably in this objective can survive for long in an economy with an efficient capital market. Failures are bought by entrepreneurs and broken up or reorganized.

The concept of the multi-business organization became widely accepted when diversified firms in the United States during the early 1900's realized that they could not manage multiple businesses using a functional structure. Alfred Chandler in his classic book, Strategy and Structure, describes the rationale and process behind the transformation of these companies from functional or geographical organizations to decentralized structures centered on product divisions. The rationale was based on 1) lowering coordination costs for each business by subordinating functional activities to product division managers, and 2) streamlining resource allocation across the business units through a general office composed of corporate management. As managers world-wide recognized these benefits, the multi-divisional structure diffused across developed countries throughout the twentieth century.

As an innovation, the multi-divisional form is necessary to allow business units in a corporation sufficient control over their decisions to compete effectively in their particular product markets. However, diversified corporations also face a range of additional problems to improve the performance of their units.

The tasks of corporate management are the following:

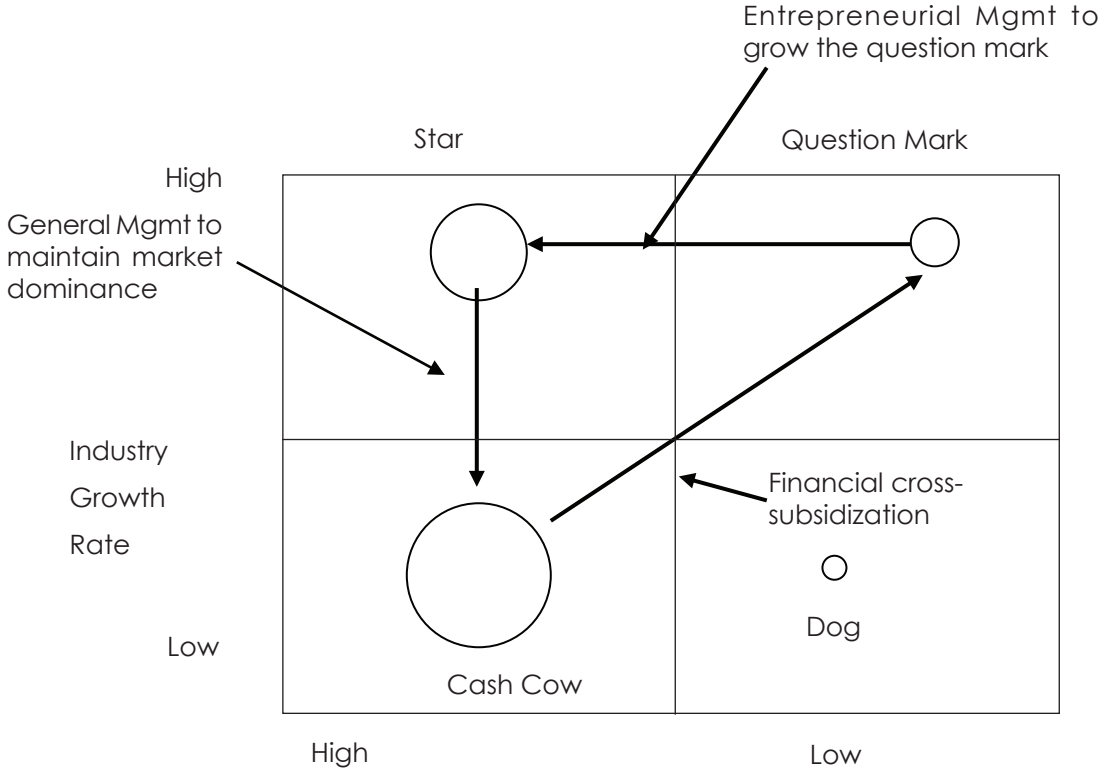
- Allocate resources across business units through internal capital market.
- Stimulate the creation of new businesses.
- Organize and manage relationships among the business units to increase value or reduce cost.
- Increase the economic contribution of the businesses through top-down initiatives.
- Develop corporate infrastructure that supports business unit value and cost drivers.
- Centralize activities across businesses to increase value or lower cost.
- Manage external relations with the press and capital markets.
- Reduce cost of capital

To succeed as a multi-business organization, the firm must analyze the advantages and disadvantages its units receive from being jointly owned. Business units may gain an advantage from efficient allocation of cheap capital to take advantage of growth opportunities. Economic benefits may also come from managing the inter-unit flow of goods and services to meet market needs and combining activities across units to increase productivity. In both ways, the firm substitutes for external markets in which its business units might otherwise buy capital or goods and services.

Managing the Portfolio of Businesses. A major and necessary task of corporate management in a multi-business firm is managing its set of business units to increase sustainable overall economic performance relative to other investment opportunities. Perhaps the best-known framework for characterizing relationships among the business units in a corporation is the growth-share matrix. The growth-share matrix highlights many of the problems in managing a business-unit portfolio. Developed in the 1960's by the Boston Consulting Group, this framework compares business units along two dimensions: the business unit's industry growth rate and business unit market share within the industry. Units are related to each other solely through cash transfers for investment in new business development.

A simplified version of the growth-share framework is shown in the figure below. In the lower left quadrant is a large unit with a dominant market share in a low growth market; this type of unit is a cash cow. In the lower right there are several units that have low market share in low growth markets; these businesses are frequently called dogs. In the upper right are a number of businesses with low market shares in high growth markets; call these units question marks. And finally in the upper left are units that have achieved high market share in fast growing markets; these businesses are stars. Top management uses cash from cash cows to invest in question marks, which have greater growth potential. Through these investments, question marks develop into stars, which dominate their markets. As the industry matures, the star maintains its dominant position through adapting to the new competitive conditions and becomes a cash cow to support the growth of new question marks.

Boston Consulting Group (BCG) Growth-Share Matrix



This framework is based on several key assumptions:

- First, the model assumes that a cash cow has the lowest costs compared to competitors, based on its greater experience associated with higher cumulative volume. High market share therefore indicates a sustainable advantage over competitors, and the goal of each unit is consequently to become the largest competitor in its product market.
- Second, cash cows generate higher cash flows but face fewer investment opportunities than new businesses. The implication is that the innovations required to maintain a cash cow's market position require less capital than the innovations and capacity expansion necessary for new business growth.
- Third, the excess cash that cash cows produce should be invested in question marks so that they can grow to achieve a dominant market share in their high growth markets. There is no reference to external sources of funds or alternative targets for funds distribution.

  These three assumptions - which imply that acquiring market share is an effective business strategy and that internal funds should be used to subsidize new business development - are key elements of the growth-share model.

  Implicit in the model, moreover, are three more assumptions that are necessary if the framework is to be useful as a guide for sustaining firm-wide growth and profitability. These assumptions highlight key tasks of managing the portfolio of business units over time:

- First, the firm has sufficient, enduring entrepreneurial skill to grow new businesses to dominance in their markets, while the markets continue to grow. This skill implies superior positioning and execution at every stage of business unit growth. As we have seen, it is unlikely that this assumption is valid without significant contributions of resources or capabilities from other units in the firm, even if every developing business within the firm has a first-mover advantage.
- Second, the firm should have the necessary general management capabilities to retain value of each business over its industries' life cycle, through the mature phase. No business unit approaching cash cow status can afford to lose its dominance through failure to execute ongoing activities or to innovate for cost reduction.
- Third, maturing business units must be sufficiently large in ultimate size to spin off enough cash to support the generation of new businesses. Even as demand and margins in traditional markets decline, cash cows need to carry the internal funding requirements of the firm.

Inadequate attention to any of these assumptions can lead to missing growth targets and insufficient capital to fund future expansion through new business development. For example, the low cost-market share model applies poorly to multi-business firms whose businesses are primarily differentiated with strong sustainable market positions, as Johnson & Johnson had before the 1980's. Further, market share may not represent the presence of lower costs but rather be the outcome of other sources of competitive advantage such as superior technological innovation, as in the case of Intel; excellent customer service and retention, as in the case of Cisco; or a broad, well-positioned product line, as in the case of Accenture.

In all cases, the problems of developing an economically viable portfolio of businesses, as indicated by the growth-share matrix, remain. New businesses must be nurtured by the old and grown to maturity, while failures, including cash cows that have lost their usefulness, must be sold or shut down. Without such an ongoing dynamic, the multi-business firm cannot add value to its businesses as a whole.

Although the problems the growth-share matrix presents for corporate management are generic, the framework's stringent assumptions regarding business unit success render it inapplicable to a broad range of multi-business firms. In addition to size, a firm's business units commonly vary on other important dimensions, increasing the complexity of the corporate manager's task. Businesses within the firm will differ in the following characteristics:

Industry characteristics, such as

- growth rate in revenues and units
- rate of change in the growth rate
- average profitability
- trend in average profitability
- key value and cost drivers across firms
- structure and dynamics of competition
- regulatory pressure
- entry barriers
- buyer and supplier power
- trend in viability of substitutes

Unit characteristics such as:

- key value drivers
- key cost drivers
- market position defendability
- economic return
- trend in economic return
- interdependence of the unit with other units

This diversity complicates substantially the problem of portfolio assessment.

Yet all portfolio analysis tools typically locate units along two dimensions, one characterizing the attractiveness of the industry in which a business competes, and the other dimension denoting the strength of the business's position within the industry. These dimensions capture the two powerful predictors of business economic performance – industry factors and market positioning. In any firm, the metrics used for these dimensions in the portfolio analysis tool should map onto the way their units compete. To the extent that the units compete on achieving a defendable cost advantage based on scale economies or the learning curve, the growth-share matrix may be appropriate. But portfolios of businesses with more complex strategies require customized arrays to allow a more useful comparison. Frameworks, such as the GE-McKinsey Business Screen, have been developed to allow the comparison of vastly different businesses within a single rubric that is focused on identifying units with the greatest probability of high economic return.

Relationships Among the Business Units – Centralization and Transfers. Portfolio management and careful allocation of capital are probably necessary but not sufficient in the early twenty-first century to produce sustainable economic performance for a multi-business firm. Management and money are critical, but more important are shared resources and capabilities across the businesses. Inter-unit transfers and shared resources in centralized activities are key elements of an effective multi-business strategy.

Rumelt's category scheme for multi-business firms

The most detailed framework for categorizing multibusiness firms was developed by Richard Rumelt in his Harvard dissertation, published in 1974 as Strategy, Structure and Economic Performance. Building on earlier research by Leonard Wrigley, Rumelt uses three ratios to categorize firms: the specialization ratio, the related ratio, and the vertical ratio. These are calculated as follows:

1. Specialization Ratio: the proportion of a firm's revenues that can be attributed to its largest single business in a given year.
2. Related Ratio: the proportion of a firm's businesses that are attributable to its largest group of related businesses, where "related" means sharing markets or sharing value chain activities such as technology, operations, logistics or procurement.
3. Vertical Ratio: the proportion of a firm's revenues that arise from by-products, intermediate products and end products of a vertically integrated sequence of processing activities.

Using these ratios, Rumelt creates nine classes of multi-business firm in the following way:

1. **Single businesses** – firms with a specialization ratio between 0.95 and 1.00 and a vertical ratio greater than or equal to 0.7.
2. **Dominant Vertical firms** – firms whose specialization ratio lies between 0.75 and 0.9 and whose vertical ratio is greater than 0.7.
3. **Dominant Constrained corporations** – firms whose specialization ratio lies between 0.75 and 0.9 and whose businesses are in general closely related to each other.
4. **Dominant Linked corporations** – companies whose specialization ratio is between 0.75 and 0.9 and whose businesses are not closely packed in terms of their interrelationships.
5. **Dominant Unrelated companies** - firms with a specialization ratio lying between 0.75 and 0.9 and a related ratio less than one half the specialization ratio plus one (RR< ½ (SR+1)).
6. **Related Constrained firms** – companies whose specialization ratio is less than 0.7, related ratio is greater than 0.7, vertical ratio is less than 0.7 and whose businesses are densely related to each other.
7. **Related Linked firms** – firms with specialization ratios less than 0.7, related ratios greater than 0.7, vertical ratios less than 0.7, and businesses that are loosely tied to each other.
8. **Acquisitive Conglomerate firms** – companies with specialization ratios less than 0.7, vertical ratios less than 0.7, related ratios less than 0.7, and a history of growth through acquisition.
9. **Passive Unrelated companies** – conglomerate firms, as in (8) above, without an aggressive history of growth.

Rumelt showed that dominant-constrained and related-constrained firms had higher financial performance than other types. This was the first evidence that multi-business firms whose business units were closely linked through common activities achieved stronger results than firms with units that were loosely tied together or not tied to each other. In short, synergy matters.

The Centralization of Activities. The centralization of activities within the corporation is akin to vertical integration in many ways. The problems of buyer control over the supplier are the same: buyer profit centers are concerned about the comparison of internal prices (or allocations) and service levels to those available from external suppliers. However, there are also significant differences.

Centralized activities are typically structured to support one type of business strategy. In fact, a common rationale for centralizing the activity, such as procurement or distribution, is to reduce costs throughout the corporation. A business unit that has specialized requirements in executing its strategy typically experiences substantial conflict with the centralized activity, which is oriented towards standardization to raise efficiency. This conflict may be resolved if the unit changes its strategy to accommodate the standard policies. Corporate management must then assess whether the partial repositioning of the business unit in its market, due to using the centralized activity, produces a higher sustainable economic gain than allowing the unit to use another supplier. Thus top management, by forcing the use of standard inputs from the centralized activity, skews the portfolio of businesses towards those whose strategies are consistent with the centralized standard. Only those units with especially strong

positions in their markets and considerable contributions to corporate revenues and earnings will be able to resist this trend.

Consequently, centralization of an activity, because it is typically focused on standardizing the capabilities of that activity across all business units, implies the partial emergence of a single business strategy within the corporation. It may also imply the re-emergence of the corporation as a single business. The tradeoff between operating as one business through a functional structure, with the businesses subordinated to activities, and a multi-business structure, with the activities subordinated to the businesses, becomes evident as more activities are centralized.

This tradeoff between a single and multi-business model may be muted when centralized activities are formed as profit centers and forced to compete in external markets as well as deliver goods and services to internal customers. This shift in governance has the benefit of forcing the central unit to focus on market positioning and to invest in resources and capabilities that lead to a superior economic contribution. To the extent the activity's investments are consistent with the strategies of the internal business customers, the level of conflict surrounding the value of internal transactions should be reduced. If, however, the centralized unit positions itself in external markets in ways that are at odds with internal businesses, conflict will increase. How top management oversees centralized activities and their relationships with internal customers determines how effective the consolidation of the activity within the firm will be.

Centralizing technology development. To illustrate the issues that arise in centralizing an activity, consider the case of technology development. In general, there are three reasons for centralizing technology development in the multi-business firm:

- Scale economies in research and development
- Scope economies in research and development
- Shared process innovation

Scale economies occur when common R & D activities from separate profit centers are combined in a single centralized unit. Also, by aggregating these activities the corporation can focus its research efforts on those projects that appear the most promising from a technological perspective. Some of these projects may not have been economically feasible within the business units because their smaller size could not support the investments required.

Scope economies are realized through the lower costs of researching a range of applications from one technology platform within a common corporate unit. The lower costs are achieved through the sharing of management and research personnel, facilities, and equipment. Usually, this benefit of specialization occurs for those technologies with well-developed research methodologies, such as software engineering, gasoline engines or filtering materials. As each application is developed, it is spun off as the basis of a new business unit. This type of centralized technology development is strongly related to Hamel and Prahalad's concept of core competence, as discussed in the last chapter.

Gains from centralized process innovation arise when corporate management repeatedly directs the type and rate of process improvement in the business units (see the sidebar on GE below). Top-down initiatives are effective when they are sufficiently general in their application to be relevant to a large proportion of the profit centers and show measurable benefits at the business unit level. It is also necessary that the units adopt the innovations without exception, rejecting them only after they have been demonstrated to be uneconomical. Without uniform adoption, corporate management's role in introducing new techniques will lose legitimacy.

GE – centralized process innovation

GE is widely regarded as one of the best-managed multi-business firms in the world. The premium of its stock price over its business units valued independently is widely viewed as substantial. Yet it is remarkable in that its units share relatively few, if any, activities in their value chains. The Aircraft Engines

unit designs, produces and sells its products in a different way from Engineered Materials, which is different from NBC, which is different from Appliances, and so on. So the argument that closely related businesses are necessary for a successful multi-business firm is not supported here. Why not?

A prominent explanation is corporate leadership. Since he became Chairman and CEO in 1981, Jack Welch has initiated a series of organization-wide innovations in strategy and operations. An innovation is applied to all business units and is withdrawn only when a unit can show that it receives no benefit. Strategic initiatives had been a part of GE's top management in the 1970's under Reginald Jones and earlier, but Welch took the practice to a much higher level. In addition to a massive restructuring of the portfolio of businesses to produce a smaller set of units that were each dominant in their industry, Welch introduced a wide variety of corporate mandates. In order of their introduction over Welch's tenure, these mandates were the following:

1) Reduce bureaucratic behavior
2) Define markets globally
3) Develop managers as leaders
4) Promote sharing across business units
5) Set very aggressive goals
6) Build service businesses
7) Implement Six Sigma quality programs
8) Identify and remove underperforming managers (bottom 10%) compared to their peers
9) Force all business units to implement e-commerce strategies.

These initiatives can be separated into three categories: a) directions for growth; b) management development; and c) process innovation within and across units. Of these, perhaps the most innovative is the mechanism for sharing innovations among the businesses.

GE induces the sharing of process innovations across units by rewarding it, punishing resistance to it, and simplifying the mechanisms through which sharing occurs. GE corporate argues that all its businesses, however disparate their technologies and product markets, essentially follow a common template, shown in the figure below:

What Business Units Share:

Inputs →	Throughput →	Output
	* People	* Marketing
	* Money	* Pricing
	* Energy	* Billing
	* Space	* Quality Control
	* Supplies	* Customer Service

The elements in this template are targets for developing innovations that can be shared across the corporation. For example, one business unit may develop a highly effective system for customer service. The unit then refers its system to a central GE clearinghouse for innovation transfer. This clearinghouse assesses whether the customer service process is both valuable enough to warrant transfer and sufficiently codifiable to enable transfer. If both conditions are met, other units learn of the innovation and evaluate its appropriateness for their businesses. In general, units must have excellent reasons for not adopting an apparently superior process, usually after being induced to try it.

An example of a template that has diffused throughout GE is the Quality Matrix units use to assess their progress towards systematizing the production of very high quality outputs. The template is shown in the figure below :

Quality Matrix

	Goals			
Key Factors	1	2	3	4
Quality Leadership				
Supplier Management				
Process Operation Control and Improvement				
Quality Information Management				
Problem Solving Techniques				
People Commitment				
Customer Satisfaction				
New Product Technology/Service Introduction				
Change Capability				

Rating Scale: 1 = No Current Activity

2 = Ongoing Efforts

3 = Competent

4 = Best Practice

5 = Confirmed Best Practice

Each business unit is rated on each of the factors associated with specific goals and works towards the highest ranking - confirmed best practice - in each factor over time. Welch has stated that managers not trained in the Six Sigma quality process will be neither promoted nor ultimately employed at GE. So this quality process template is a critical managerial tool.

This kind of template can be developed for any of the other activities. Critical tasks are 1) identifying the key factors that contribute to meeting the goals that pertain to the activity and 2) describing the best practice for each factor. How the unit performs these tasks is important only to the extent it leads to a diffusible practice that is state-of-the-art.

The promotion of process innovation sharing at GE is a way of achieving economies of scope by centralizing the administration of business units whose value chains would otherwise remain dissimilar. The scale and diversity of GE's business portfolio provide an almost ideal laboratory for experimentation in those processes common to all units. GE's identification of these processes and enforcement of cross-unit technology transfer partially overcomes the disadvantage of the corporation's unrelated form of diversification.

Study Note - 2

STRATEGY DEVELOPMENT

This Study Note includes

2.1 STRATEGY DEVELOPMENT PROCESS

"How are you going to win in the period ahead?" That's the key question behind developing strategy.

To win at anything worthwhile, you need a game plan. Professional sports teams know this, and this idea applies to your organization, your department, your team – and even to yourself as an individual.

To be successful means knowing how to use your talent and resources to best advantage, and it's very difficult to "win" if you don't have this game plan in place.

Approaches to Strategy

In a for-profit company, for which competition and profitability are important, your goals will differ from those of a nonprofit or government department. Likewise, objectives for a department or team will have a different scope from objectives for your organization as a whole.

For example, and depending on scope and circumstances, you may want to develop strategies to:

- Increase profitability.
- Gain more market share.
- Increase approval ratings, or boost customer satisfaction.
- Complete a project under budget.

To determine your strategy, you must understand fully the internal and external environmental factors that affect you. With that understanding, you can identify your clear advantages and use these to be successful. From there, you can make informed choices and implement your strategy effectively.

So, strategy creation follows a three-stage process:

1. Analyzing the context in which you're operating.
2. Identifying strategic options.
3. Evaluating and selecting the best options.

We'll look at this process, and review some useful tools that can help you develop your strategy.

Stage 1: Analyzing Your Context and Environment

In this first stage, you ensure that you fully understand yourself and your environment. Do the following:

- **Analyze Your Organization**

  Firstly, examine your resources, liabilities, capabilities, strengths, and weaknesses. A SWOT Analysis is a great tool for uncovering what you do well and where you have weaknesses, providing that you use it rigorously. It's much easier to achieve your objectives when your strategy uses your strengths without exposing your weaknesses.

  Also, look at your Core Competencies. These highlight your unique strengths, and help you think about how you can set yourself apart from your competitors.

- **Analyze Your Environment**

  Now you need to examine your current operating environment to predict where things are moving. Are there exciting opportunities that you should pursue? What future scenarios are likely in your industry, and how will these impact the work that you do?

  PEST Analysis, Porter's Diamond, and Porter's Five Forces are great starting points for analyzing your environment. They show where you have a strong position within the larger environment, and where you may have issues.

  As you prepare to create your strategy, make sure that you're working in a way that's aligned with changes in your operating environment, rather than working against them. These external factors are often beyond your control, so if you pursue a strategy that requires a change in one of these elements, you may have a long, exhausting, unprofitable battle ahead of you.

  A TOWS matrix can help you with your internal and external analysis. This framework combines everything you learned in your SWOT Analysis (TOWS is SWOT in reverse), and then applies it to developing a strategy that either maximizes strengths and opportunities, or minimizes weaknesses and threats.

- **Analyze Your Customers and Stakeholders**

  Your strategy defines how you'll win, and winning is typically framed by how well you satisfy your customers. For-profit companies must keep their customers and shareholders happy. Governments, nonprofits, and project teams all have other stakeholders to satisfy as well. Strategy creation must consider these needs.

  Identify your clients and stakeholders. What do your clients want? And who are the key stakeholders in your success? A Stakeholder Analysis will help you uncover these needs and preferences.

  Also, look at your market in detail. Answer key questions such as "How is our market segmented?", "What subpopulations can we reach cost-effectively?" and "What is our optimal Marketing Mix?"

- **Analyze Your Competitors**

  In a traditional for-profit company, you must understand how your products compare with competitors' products, and what your competitors' competencies are. How easy, or difficult, is it to enter your market? What alternatives do customers have?

  Non-profits, departmental teams and projects have competitors too. Other projects and teams within the department compete for money and other resources. Therefore, you must prove that you can add value, meet objectives, and contribute to organizational success.

  Stage 2: Identifying Strategic Options

  In Stage 1, you developed an understanding of how your organization or team fits within the context of the internal and external environments. Now it's time to think about the different things that you

could do to create a clear advantage, and meet your objectives. Here are some fundamental activities that can help you make this decision.

- **Brainstorm Options**

  Use creativity tools like Brainstorming, Reverse Brainstorming and Starbursting to explore projects that you could run to develop competitive advantage. Guide your brainstorming with reference to the organization's mission statement, but, depending on your role in the organization, consider how far you should be constrained by this.

- **Examine Opportunities and Threats**

  Your SWOT Analysis identified some of the main opportunities and threats you face. Using this as a starting point, brainstorm additional ways to maximize your opportunities, minimize your threats, or perhaps even turn your threats into opportunities.

- **Solve Problems**

  A problem-solving approach can also help at this stage. If your problem is that you're not achieving your goals, ask yourself how you can ensure that you do. (If everyone in your industry finds it hard to deal with a particular problem, then you may gain a competitive edge by dealing with it.)

  For example, if you want to increase your customer satisfaction ratings in an industry plagued by poor customer relations, your starting position is "low satisfaction." Brainstorm why this is the case, and create strategic options that would increase satisfaction. Tools like Root Cause Analysis, the 5 Whys, and Appreciative Inquiry can give you some interesting new perspectives on these problems.

Stage 3: Evaluating and Selecting Strategic Options

The final stage is to evaluate strategic options in detail, and select the ones that you want to pursue.

- **Evaluate Options**

  By this stage, you've probably identified a range of good projects that you could run. You must now evaluate these to choose the best strategic options. Consider every option you've identified, but don't make a final judgment until you've completed your assessment.

  Start by evaluating each option in the light of the contextual factors you identified in Stage 1. What do these tell you about each option?

  Techniques like Risk Analysis, Failure Modes and Effects Analysis and Impact Analysis can help you spot the possible negative consequences of each option, which can be very easy to miss. Make sure that you explore these thoroughly.

  Many options will be analyzed on a financial basis. Here, techniques like Cost-Benefit Analysis, Break-Even Analysis, use of Net Present Values (NPVs) and Internal Rates of Return (IRRs), and Decision Trees are helpful.

  Grid Analysis is particularly helpful for bringing together financial and non-financial decision criteria. It helps you weight individual decision criteria, and consider subjective features - like team fit and the likelihood of team buy-in - as well as objective, tangible factors like cost and return on investment.

- **Choose the Best Way Forward**

  With your evaluation complete, you now must choose the best strategic option or strategic options, making sure that you don't choose so many options that you spread your resources too thinly.

  Check your ideas for consistency with your organization's Vision, Mission and Values, and update these if necessary. It's easy to forget about these critical elements during strategic planning, so

ensure that what you want to "win" is something that contributes towards the organization's overall purpose.

Check your assumptions using the Ladder of Inference. This helps you confirm the soundness of the reasoning process used to develop your strategy.

Strategy is more of a mindset than a document. The ultimate form and structure of a strategy needs to complement your organization, its culture and the abilities of your people. But regardless of form, the substance of a strategy need to, at a minimum, define the following:

- The overall direction of the company ---its aspirations, goals and value proposition
- Its business model to create sustainable competitive advantage
- The values, culture, and governance model
- The people and operational capabilities required for success

Strategy needs to be a dynamic, almost continuous, process - the speed of change in the competitive landscape in which we operate demands nothing less. Our facilitated approach to either reaffirming an existing strategy or creating a new one is designed to achieve these objectives, and more, by working through a defined series of interactive sessions designed to help your leadership team not only reaffirm or build a strategy, but develop critical learning capabilities in to your organization so that they can make the strategy process an ongoing and dynamic part of your business operations.

Examples of the interactive sessions and the base objectives of each of these sessions follows. The specific sessions that might be applied to your organization would depend on your specific needs.

Establishing a Common Language

- Define the meaning and critical elements of strategy for your organization
- Understand various orientations to strategy and determine where you are on this continuum
- Evaluating the current strategy of your organization and your current results against that strategy
- Agree to the reasons that you are looking at your strategy - what do you hope to accomplish
- Define the strategic design sequence you will follow in clarifying your strategy

Analyzing The Business Environment

- Review current market conditions and key competitors
- Identify key customers, key stakeholders, and their expectations
- Evaluate current market conditions affecting and influencing your organization
- Identify external factors influencing your organization
- Review the strengths and weaknesses of key known competitors

Forecasting The Future

- Identify assumptions about the future environment of the organization
- Identify your own "vital few" that will define your future
- Evaluate the impact of the "vital few" on your organization
- Identify alternative future business situations
- Conduct a SWOT analysis to determine potential ways to manage these alternatives

Creating Core Ideology

- Develop an understanding of what a core ideology is and how it impacts your organization's success
- Explore the legacy of your organization
- Define or refine your organization's mission
- Analyze the beliefs that have created your culture and crystallize your guiding principles

Defining Your Strategic Direction

- Develop a framework to define the primary questions that must be answered to establish your strategic direction
- Clarify a vision of your organization over a three to five year time-span
- Describe your future customers and how your deliverables and products or services may change to meet their needs
- Explore your organization's core capabilities and competencies and define the capabilities and competencies you will need in order to compete in the future

Defining Your Competitive Advantage

- Understand customer's perception of value as the foundation of differentiation
- Create a long-term business focus
- Identify competitive differentiators within your industry
- Do a competitor analysis against the competitive differentiators
- Select competitive anchors that distinguish you from your competitors and competitive necessities that define in which area you must keep up
- Develop a value position

Setting Goals

- Understand the importance of setting goals and tracking performance
- Develop the building blocks of goal-setting
- Identify your organization's key result areas
- Establish metrics in each of your key result areas
- Assess your current performance
- Set goals in each of your key result areas
- Evaluate your feedback system

Creating a Master Plan

- Understand the importance of an integrated, master plan for managing your organization
- Select the critical success factors for your organization
- Identify major performance initiatives to implement your ideal vision
- Develop a performance initiatives matrix showing the relationship between your critical success factors and performance initiatives
- Create a project charter to guide the implementation of each initiative
- Commission project teams for each initiative

Master Strategy of a Firm

Perhaps, conceptually, a master strategy of a firm consists of two inseparable parts : Business strategy and Corporate strategy. Each complements the other. Let us consider the following quotes :

'....The strategic aim of a business (is) to earn a return on capital [1], and if in any particular case the return in the long run is not satisfactory, then the deficiency should be corrected or the activity abandoned for a more favourable one' [2] —of Alfred P. Sloan; and

'Strategy is when you are out of ammunition [1], but keep right on firing so that the enemy won't know' [2] —Author unknown.

The part marked [1] in the above quotes represents the business strategy for a firm and the part [2], the corporate strategy of a firm.

Business Strategy

Once a firm has decided to be active in a particular business area, it must then determine how to compete in that field. Decisions of this sort involve business strategies. A firm's decision to extend its product/service line is a business strategy since it enables the firm to compete more effectively in its chosen business. To illustrate further, gaining 'market share' as one of the sources of competitive advantage is a strategy at the business level.

Corporate Strategy

On the other hand, corporate strategy defines the nature and range of businesses a firm intends to operate, for example, a tobacco company's move from cigarettes to beer and then soft drinks are -examples of corporate strategy decisions. So are the electricals company's entry and subsequent exit from the computer business. To illustrate further, adopting 'synergy' as one of the key sources of competitive advantage is a strategy at the corporate level.

At the most basic level, corporate strategy deals with the question, "what businesses should we be in?" whereas business strategy addresses the question, "How should we compete in this business?"

Master Strategy : Concept and Features

In addition to what has been sketched out in the strategic decision-making model, there are the elements of change, growth, and adaptation in the life of a firm. Master strat¬egy is a firm's basic plan for dealing with these factors.

Master strategy sets broad goals of a firm. One firm may decide to seek pre-eminence in a narrow specialty while another undertakes to be a leader in several 'niches' or perhaps in all phases of its industry. While pursuing either of them, a firm has to redefine its 'scope' in terms of desired role in society and redesign its 'activities' in respect of :

1. Services to be offered to customers.
2. Operations to be performed by it.
3. Relations to be developed and maintained with suppliers of necessary resources.
4. Product-market opportunities.

To achieve the above, managers of a firm have to decide :

- what to do first,
- how many activities can be done concurrently,
- how fast to move,
- what risks to run, and
- what to postpone.

These questions of sequence and timing must resolved to make the master strategy operational.

Master strategy involves deliberately relating to a firm's efforts to its particular future environment. Because of this dynamic aspect, frequent reappraisal of master strategy is essential. But such reappraisal should not call for sharp reversals in strategy—as a master strategy requires several years to execute. Even though drastic modification of a firm's master strategy may not be necessary, frequent incremental changes will certainly be necessary to keep abreast of the times.

Master strategy is the pivotal planning instrument for large and small enterprises.

A practical way to develop a master strategy is to :

1. Identify particular roles or 'niches' that are appropriate to a firm in view of competition and the firm's resources.
2. Develop various facets of the firm's efforts and combine them to obtain synergistic effects.
3. Set up sequences and timing of changes that reflect firm's capabilities and external conditions.
4. Provide for frequent reappraisal and adaptation to evolving opportunities in the environment, internal and external.

Key Elements to be Redefined or Redesigned

The following key elements that vitally affect the master strategy of a firm need redefinition and/or redesign :

1. New markets or services

This requires identification of, and focus on : industry-growth prospects, competition, key factors for success, and matching of a firm's strengths and weaknesses against these key success factors.

2. Predicting Future Demand

This necessitates identification of elements like desire for use or consumption, substitutes, ability to pay, and structure of markets. A local variation in demand sometimes provide opportunity for a particular firm.

3. Supply Related to Demand

This requires consideration of the probable supply of services and the conditions thereto, e.g., capacity configuration, costs and taxes, and technology changes. For an individual producer, anticipating these shifts in the industry supply situation may be a matter of prosperity or death.

4. Climate of Industry

This involves assessment of competitive conditions in the industry; size, strength and attitude of other competing firms; role of trade associations; and governmental regulations. Future government action is a significant factor in the outlook of many industries and so affects a firm's strategy.

5. Crucial Factors

This suggests review of business environment dynamics and identification of those factors that will be crucial for future success, e.g., leadership in R & D, cost leadership, product on service differentiation, customer differentiation, adaptability to markets, distinctive customer service, creative advertising, etc. All these call for a candid appraisal of a firm itself.

6. Position in Market

This involves measurement of marketing strengths of a firm. The aspects of market position—such as, a relative market share, comparative quality of product, reputation with customers, and ties with a distribution system—help define and redefine the strengths and limitations of a firm.

7. Service Abilities

This requires appraisal of a firm's relative strength in creating products and rendering services fitted to consumer needs. Redesign, if not restructuring, of distribution outlets plays a great part in this area. A firm, on this score, should identify its own strengths and see how these compare with strengths of other firms.

8. Finance and Management

Any successful venture of a firm depends on its financial strength and the character of its management.

Some strategies require large capital. A refinery and petro-chemicals company, for instance, must be prepared to invest capital in millions. Few firms could maintain cash reserves of this size and so they have to resort financial engineering instruments like bond or debentures with warrants, entitlement of shares after a certain period or iock-in-periods, etc., from existing operations that can be allocated to new venture. Qn the other hand, perhaps a strategy can be devised that calls for relatively small .cash advances, and in these fields a firm that has low financial strength will still' be able to compete with the affluent firms.

A more subtle factor in a firm is its management. The suitability of any proposed strategy is affected by the age and vitality of key executives, their ability to risk profit and capital, their urge to gain personal prestige through company growth and others.

Related to the capabilities of the key executives is the organisation structure of a firm. A decentralised structure, for instance, facilitates movement into new fields of business, whereas a functional structure with fine specialisation is better suited to expansion in closely related lines.

9. Combination of Services

This emphasises on the total service to a customer. A customer rarely buys merely a product. Other attributes of the transaction include delivery, credit terms, repair service, operating instructions, conspicuous consumption, and the like. What combination of attributes will have high synergistic value for the customers, a firm serves, becomes 'the crucial element.

10. Adding to Capabilities

This implies fuller use of existing resources. For example, the manufacture and sales of watches by a machine tools company can have synergistic effects in its sales efforts.

11. Vertical Integration

This involves expansion to obtain a resource. For example : a machine producing company, being dissatisfied with the quality and tardy delivery of its castings by a foundry firm, was looking for a new supplier. In its search, it located a nearby foundry that was breaking even. The machine producer purchased the foundry and gave a steady backlog of work plus technical know-how. This consolidated set-up that could bring in synergistic effect for betterment is a case of vertical integration. Control of a critical resource, provided that the problems of balance, flexibility, and managerial capacity are resolved, through vertical integration is often a significant part of company strategy.

12. Strategy of Sequence

Since an essential aspect of master strategy is deciding what activities to be performed first and how fast, it is necessary to make a choice of sequence. Especially in technical areas, sequences of actions may be dictated by technology. Thus, process research must precede equipment designs, product specifications must precede cost estimation and so forth. PERT analysis or normal programming may be usefully employed.

Careful thought about the sequence is of great importance in the formulation of master strategy.

13. Resource Limitations

Every firm has limits on its resources, be it human, physical or financial. The tricky issue is how to optimise the use of these limited resources to the best advantage. A master strategy needs to be devised, which is feasible within the inherent restraints.

To overcome scarce resources particularly in the supply activities, a cooperative agreement in the form of 'coalitions' or even 'mergers' or as 'supply partners' as a part of strategic alliances can be resorted to.

14. The Right Time to Act

Conditions in a firm's environment affect the 'right time' to act and to make a change. Managerial acumen and its keen sense of timing are the basic needs to incorporate environmental opportunities in a master strategy.

The preceding discussions of key elements and of sequence and timing provide no simple rules; yet they are needed to be seriously considered as the critical aspects of master strategy of a firm.

Many of our early concepts of strategy were derived from the military. The word "strategy" literally means "what generals do," referring to the mapping out of military strategy in order to create the best opportunity to win the battle. Or, in other words, strategy can be defined as, "the art of bringing forces to the battlefield in a favorable position to win."

Strategy development helps establish a framework for setting direction, and helps you determine the criteria for day-to-day decisions. It helps answer the questions: "Where are we going?" and "How are we going to get there?" When there are clear answers to these two questions, the path you take can be specific and purposeful.

The strategy must be set in current reality. Often, people try to use yesterday's solutions to cope with today's challenges. Michael E. Porter stated, "The essence of strategy is choosing what not to do."What he suggested is that the most difficult decisions in strategy development are not deciding what to do, but rather deciding what you are not going to do. Once objectives are determined, they must truly become priorities.

Your strategy builds on your understanding of the interdependence and relationship between your core values, your mission, and your vision. Everything you do should be based and identifiable in one or more of these three essentials. Strategy development then leads you into determining your objectives, setting goals, and determining what specific steps you will take to accomplish your goals. The tactics become the activities, projects, and events you determine to be the best to help you achieve the desired results.

Strategy answers the question of "How?" "How are we going to accomplish the things that we have determined need to be accomplished during the strategy period?" Strategy maps out where you are going and also outlines the specific steps you need to take to get there.

We claim that almost everything we do today is strategy; in reality, it may have nothing to do with strategy. Listed below are some of the ideas we sometimes ascribe to being strategy development, but they are not.

1. Budget Planning. A strategy needs a budget. It must have the necessary resources for successful implementation, but simply planning a budget is not strategy development.
2. Calendar Planning. Calendar planning is not strategy development. You must plan your calendar, but moving calendar dates around from one year to the next does not constitute strategy. At best, it perpetuates the past.

3. Long-Range Planning. "Long-range planning" is an old term that was used to imply that you were planning ahead for several years, usually seven to ten years. Strategy helps you position for the future. Although it has a future focus, it must help with current decisions. It becomes our decision-making guide for both now and the future. Strategy development sets the direction for the future, but does not try to plan the details beyond twelve to eighteen months.

Strategic Thinking

In order to accomplish successful strategy development, you must begin with "strategic thinking." Strategy development challenges you to think in a different way. There is nothing magical or mystical about strategic thinking. It does, however, challenge you to think in a different way. It calls for you to have the courage to risk reorganizing your problem solving and thinking patterns. Many people tend to organize data and information in linear, logical thinking order, using concrete steps to formulate answers. The tendency is to look at only one answer rather than pursuing multiple possibilities. For example, instead of looking for one answer to a problem, you need to look for a variety of alternatives, possibly five to 10 for each problem.

It is easy to get stuck in the same old ways of thinking and problem-solving patterns. And it's not uncommon to be confronted with so much data that you experience information overload. In fact, you may need to set aside time to sort through all the information before you make any decisions.

Because you may be accustomed to thinking only one way, you may place your brain on "autopilot" and make many decisions without expending a lot of mental energy. In reality, you have chosen to avoid thinking—you are just moving along the treadmill, convincing yourself that you are moving toward your desired goals. The truth is, you're just carrying the past with you. You repeat the same behaviors, the same thought processes, and the same programs. It should not be a surprise, then, when you fail to make progress and wind up in the same place year after year.

Sometimes the need for a strategic change is obvious! In the 1800's, the British army faced a new problem. For the first time, they were confronted with a crude but effective machine gun. At that time, British battle strategy was to have the soldiers—who wore brightly colored uniforms—present a united front by marching forward toward the enemy in long, straight rows. This had been effective in times past, for the approach of many rows of highly visible soldiers was intimidating to the enemy, sometimes resulting in confusion and fear for those who were unprepared for such a formidable sight.

However, with the invention of the machine gun, that kind of strategy made it easy for the enemy machine guns to mow down the British troops. In their initial confrontation with these machine guns, 500 British solders were killed or seriously injured in a matter of a few minutes.

When the British field commander saw the devastation, he sent the following communication back to headquarters: "Send me 500 more men!"

The military leader obviously needed to change his strategy! What was the wisdom of sending another 500 men to their deaths by using the same strategy that had cost others their lives? However, the commander knew only one way to fight. He was not challenged to seek a different solution to a very serious problem—even though 500 of his men had just died! Today, many people are still trying to solve tomorrow's problems with yesterday's solutions, and it's not working.

To move beyond simply perpetuating the past, you must be willing to think differently and often move outside boundaries to which you have become accustomed. Jesus also lived outside the box. This is why He was so often in trouble with the Pharisees and the other leaders. Jesus did not think like other people. He broke all the rules the Pharisees considered important, and He was constantly upsetting the status quo.

When you talk about strategic thinking and thinking outside of the box, you are not talking about positive thinking, but possibility thinking. You are not talking about dreams, but vision. You are not talking about wishful thinking, but realistic, doable actions. Your thinking becomes full of "what if's" and "why not's," instead of "we can'ts."

Remember that strategy helps you focus on objectives that provide you with maximum leverage. Strategic thinking is not trying to be creative for creativity's sake. Its design is to help you know how to capture the future and help create it, not just observe what others are doing. Strategy leads you to know how to position your resources in a way so that you are moved to new frontiers, to the front lines. Although there is a measure or risk, Jesus instructed you to take risks for the sake of the kingdom. You cannot be afraid to fail, but be afraid of failure.

The following chart suggests the basic elements of strategic thinking in contrast to maintenance thinking:

Basic Elements of Strategic Thinking vs. Maintenance Thinking

Strategic Thinking	**Maintenance Thinking**
Effective	Efficient
Success Seeker	Failure Avoider
Proactive	Reactive
Dynamic	Static
Flexible	Inflexible
Innovative	Traditional
Confronts	Avoids
Coordinated	Fragmented
Interdependent	Independent

Jesus modeled strategic thinking when He said, "For which of you, intending to build a tower, does not sit down first and count the cost. . . or what king, going to make war against another king, does not sit down first and consider whether he is able with ten thousand to meet him who comes against him with twenty thousand" (Luke 14:28-32, NKJV)? Strategy is not a buzz word; it is a powerful tool to help you become effective doers of the Word.

Strategy Process

To achieve the most success with your planning team, choose the following kinds of people:

- Involve people who care.
- Include broad-based participation.
- Enlist program or ministry leaders.
- Involve people with a passion for missions.
- Involve people who are future-oriented.

Enlisting the right people—and the right kinds of people—will help provide a solid foundation for building a relevant, contextual, strategy. Do not short-circuit this part of the process.

Too many strategy planning activities have been left on the shelf to collect dust because the people involved saw the effort as a project rather than a process. Unfortunately, many thought of strategy planning as an activity that could be completed. Once the action was completed, that was the end. Strategy development must be seen as an ongoing process, not the end result of a project.

Process implies ongoing activity. Although there may be an end to the formal part of a strategy development process, remembering that this is a process allows the strategy to stay flexible, relevant, and current to adjust and respond to emerging strategies. Strategy sets the direction by determining direction, outlining objectives, and establishing appropriate goals, but it does not go beyond twelve to eighteen months in developing action plans. Even when action plans are developed for this period

of time to accommodate calendar and budget considerations, there must be flexibility to adjust them as needed.

A variety of approaches and processes could be used. However, any effective process will answer three questions:

1. Where are we going? (This question focuses on objectives and direction. This process presupposes Vision, Core Values and Mission statements are in place.
2. What is the environment? (This question addresses contextual issues.)
3. How do we get there? (This question reminds you that strategy determines tactics.)

The strategy development process should be based on valid data that leads to solutions for the future. The deeper the inquiry, the more useful the answers will be. "The more honest the answers, the more powerful your solutions." Ask the following questions as you proceed:

- What are things really like?
- Why are things the way they are?
- How are we going to change?
- Is our plan realistic and deliverable?
- Are we really change-oriented?
- Do we sanction incompetence? (Or do we ignore the problems?)
- Have our ideas been formed into a vision?
- Do we have people on the team with ability?
- Are we prepared to see this through to the end?

After you have answered the basic questions above, four phases of strategy development can be identified and included. Somewhere in the process, however, these four phases will occur.

1. Phase I – Preparation

Before any process can begin, basic preparation must be made. This includes making a commitment to planning, enlisting appropriate personnel, gathering data, getting necessary commitments, setting aside appropriate calendar time, and determining the process to be used.

2. Phase II – Planning

During the planning phase, or the actual development phase, the strategy is formulated.

3. Phase III – Resource Development

Once the plan has been completed, necessary resources for implementation must be identified. This phase includes identifying both existing resources and new resources that must be secured, as well as determining how these resources are to be allocated. All of the resources will not be available at the beginning of implementation. These resources will include:

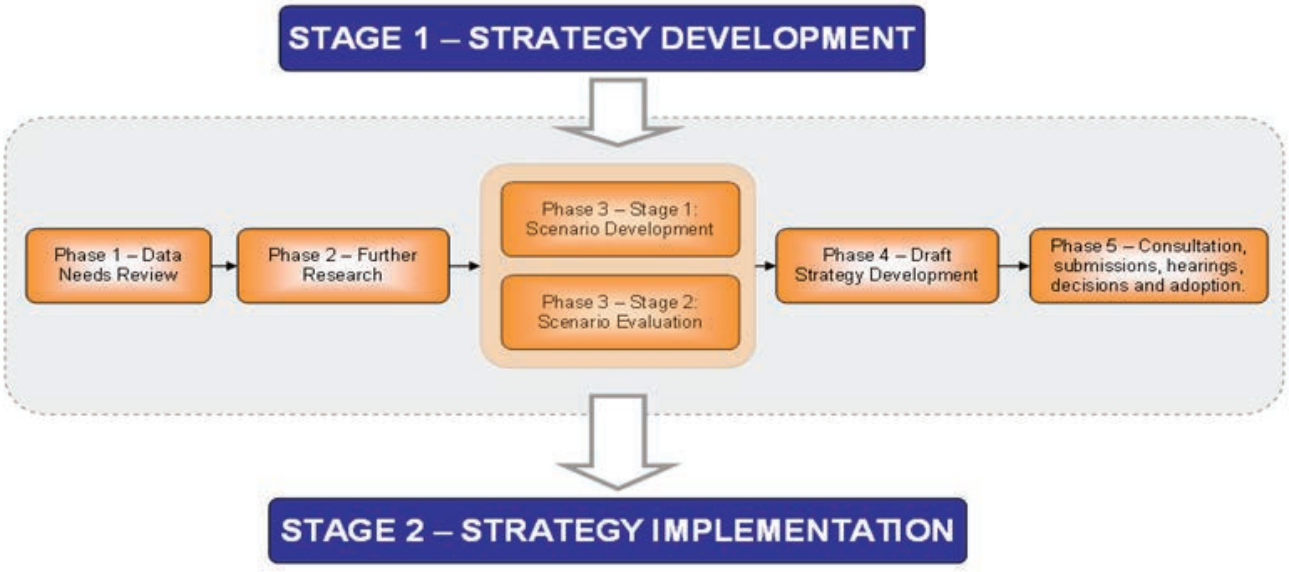
- The allocation of personnel to staff ministries, programs, activities or events planned
- The development of a budget that resources the objectives, goals and action plans
- The development of a calendar reflects the objectives, goals and action plans

4. Phase IV – Implementation

The final phase of strategy development is implementing the vision, taking action, and making it happen. One of the most frustrating experiences in life is getting to the goal line, yet failing to score. History reveals that the most common point of breakdown of strategy development is at the point of implementation.

The Implementation Phase has three primary elements:

1. Implementing the Plan. This means faithfully executing the strategy as planned. Carry out the plan! Do the work!
2. Evaluating the Plan. Evaluation is not a one-time occurrence. Ideally, you will constantly evaluate the plan. (Annual coordinated planning is a basic minimum.) Constantly evaluating your plan allows you to keep the plan fresh and relevant. It allows you to make necessary adjustments in redefining your mission and strategies in relation to your ever-changing environment. Be certain you are staying on course and not beginning to drift away from desired outcomes.



Multiple Process of Strategy Development

Imposed strategy

This strategy comes from outside the organization, it is imposed on the organization. This means that the environment can directly force the organization into a pattern in its stream of actions regardless what the central control does. The clearest case is when a external group or individual with a great influence over the organization imposes a strategy on the organization. For example, state-owned Air Canada was forced by the minister to buy a particular type of plane. The strategy was clearly deliberate but not by anyone in the organization. Given the inability to resist, the organization had to pursuit the given strategy and thus it became deliberate for the organization. Sometimes can the environment rather than individual/group that impose strategies on organizations by restricting their options. Once again Air Canada can serve as an example. Did Air Canada really choose to fly jet aeroplanes and later wide body aeroplanes? Could any world class airline decide otherwise? Again the organization has to make the external strategies, imposed on them, internal. In reality the organizations have to compromise between determinism and free choice. Environment seldom preempt all choice and just as rare the environment seldom offers unlimited choice. As most real world strategies have some umbrella strategy characteristics, so to does the environment set boundaries for most organization.

Role of Strategy in improving organisational performance

Every organization has to compete for leadership and aspires to leave competition way behind in the highly competitive environment of modern day marketplace. The complex and highly interrelated series of actions and reactions which an organization undertakes are mainly aimed at making the best use of available opportunities and nullifying the lurking threats so that corporate objectives and goals

are achieved to the maximum extent possible. The entire gamut of these actions, steps, decisions to act, react, or not to take any action at all, or be proactive before competitors can take the first mover advantage, form what is known as corporate strategy. (Ansoff, 1965)

Intended Strategy

Intended strategy is nothing but a plan or an intended course of action thought to be most suitable for achieving predetermined corporate goals. Sometimes, if the situation so desires, a ploy or a manoeuvre, tricky, cheeky or otherwise, to surmount an immediate obstacle or to browbeat a serious competitor; is also called a strategy. The basic concept of strategy is that it is pre-planned in nature and is given a proper shape after a lot of brainstorming. Strategy also determines the basic consistency in behaviour and approach of a particular firm towards the economy in general and the market in which it operates in particular. Strategy also formalises the positioning of the firm in the market. By positioning it is meant how a firm would relate with the external environment and what would be its reaction in case of a change in the parameters of such environment. Some authors are of the opinion that strategy is in a nutshell the basic prism through which an organisation perceives the entire world outside its own internal environment.

Management experts have also gone on to further classify strategy into content, process and context. (De Wit, B and Meyer, R, 1999).

Content of a strategy is basically an exposition of the current position of the company and the desired status the management would like to attain at the end of the plan period. It is nothing but a detailed brief of where it is now and the broad steps to be taken to reach where it intends to. The context part of a strategy deals in detail with the internal and expected external environment of an organisation and in effect undertakes an extensive SWOT analysis to ensure that the organisation can reach the set targets with least effort. The process part of a strategy actually lays down the timing of different actions and clearly defines who would take part in the actions directly and who would remain in indirect support thus ensuring unity of action and streamlining of efforts to prevent efforts getting wasted by working at cross purposes or overlapping and repetitive actions. But, this analysis of strategy into various components only goes on to further emphasise the basic nature of intended strategy – it is pre-planned and depends entirely on the quality of forecasts available with the management. (McGee, John; Thomas, Howard and Wilson, David, 2005)

Emergent Strategy

The real life scenario is however quite different from what is envisaged by planners as new opportunities and threats continually seem to unfold every day. A company which thinks with its feet and is quick to grab the opportunities while adroitly avoiding the threats and banana peels, is the one which leads the pack. But this is possible only if strategies keep evolving with the internal and external environment and not remain static. Strategy should be as dynamic as the real world scenario and must be adaptable to changing equations. Some authors recognised the importance of dynamism and incorporated agility in the entire system by accepting the fact that strategic corporate decisions are not taken as part of a big picture based on forecasts and predictions but are indeed taken incrementally, as it were, in tandem with changes occurring in corporate environment. Thus, these authors admitted that corporate strategy is actually a bits and pieces approach which is shaped more by external factors than what is desired by Board of Directors. (Burgelman, 1980)

Henry Mintzberg was the first expert who coined the word 'emergent' while describing the continuous evolution of corporate strategy of an organisation as it not only strived to keep pace with but also attempted to overtake the external environment to reach the pre-determined targets. The emergent strategy however, is not a brainwave of one person or a group of persons at the helm of affairs of a company. It is not a flash of individual brilliance or motivation but a learning process where the entire corporate entity absorbs facts and figures from external environment and evaluates the changes in external (and internal) environment and proceeds to formulate a proper and relevant answer in the form of a revised strategy. (Mintzberg, The Strategy Concept 1: Five Ps for Strategy, 1987) Thus the final

policy adopted by a corporate is nothing but a judicious combination of the basic framework of pre-planned strategy and an adjustment or alteration of the main flow keeping in mind the ground realities in the marketplace. So, realised strategy is nothing but the best of both worlds where the basic corporate goals and objectives are married to market realities.

Whenever the intended strategy fails to produce the desired results, an automatic introspection and a process of enquiry and learning is triggered within an organisation which evaluates and analyses the intended strategy and its applicability in the current market scenario in great detail. While accepting the inherent market dynamism and uncertainties, the emergent strategy tries to modify the intended strategy so that it fits better with the current market trend. Thus, in a sense intended strategy is the guideline and the emergent strategy is a modification of the guideline so that the realised strategy serves the company best. But some authors, Mintzberg being most notable among them, go to extent of claiming that in reality, knee jerk reactions to market happenings are rationalised as an afterthought and passed off as a properly organised plan in most companies. This is most evident when economies go through unexpected turbulences or melt downs. There is hardly any time available with companies to go through all the steps of a rigid planning procedure as it becomes a desperate exercise to stay afloat.

In fact, Burgelman had done an in-depth analysis of the circumstances under which Intel withdrew from memory chip (DRAM) market. He came to the conclusion that the corporate decision was indeed the cumulated result of many small decisions taken by middle management when they responded to market demand and started shifting resources from DRAM to microprocessors which were gradually taking over the market. This was emergent strategy at its best where the corporate intended strategy actually succeeded emergent strategy which, if stifled by corporate rigidity, would have spelt a major crisis for the company. (Burgelman R. A., 1994)

In this case, middle managers shaped the corporate strategy but does that mean lack of proper management? Most authors do not feel so. They feel it reflected a flexibility of management structure which allowed middle management to respond incrementally to changing market scenario by altering the allocation of resource towards avenues which assured better returns.

One other instance of how emergent strategy can modify the existing strategy without exhausting valuable resources of a company is when Hitachi Corporation was thinking of marketing finger-vein authentication technology which is very similar to digital fingerprint scanning. The original idea was to market this as the ultimate foolproof identification system which should be installed in entry points of all sensitive and critical installations. The makers claimed that this system cannot be compromised and no unauthorized entry in restricted areas is possible if such a device is there at the main entry point. The company was not wrong while making such claims, but it missed out on the most important market of this technology while strategising its sales plan. The most important market was the numerous ATMs which dot the entire globe. As soon as this became clear, Hitachi swiftly changed its focus and the emergent strategy contributed substantially to the bottom-line.

What is the ultimate strategy adopted by an organisation

The ultimate strategy adopted by an organisation is surely a mixture of intended and emergent strategies as these are not exclusive of one another as is evident from the discussions above. Indeed every progressive organisation actively encourages its middle and lower management to be aware of the changes that continually take place in external environment and considers the inputs provided by the middle management as a valuable learning process which is a must in an age where technology is advancing by leaps and bounds and obsolescence has become almost a daily occurrence. Though every company is not as flexible as Intel but almost each one of them is as aware as Hitachi and very rarely can one spot a company which is not awake to the possibilities of causing a market coup.

But all companies or organisations need not be as aware to emergent strategies. Government departments or mining companies need to have strategic stability for proper functioning and operational consistency. Emergent strategies would not be able to deliver desired results, indeed might cause an unprecedented chaos.

So, it can be concluded that while emergent strategies very often lead to unprecedented benefits to an organisation, it is the nature of the organisation and the environment in which the organisation operates which determine the final realised strategy which an organisation adopts.

Realized strategy – the actual strategy that is implemented – is only partly related to that which was intended (Mintzberg suggests only 10–30 percent of intended strategy is realized). The primary determinant of realized strategy is what Mintzberg terms emergent strategy – the decisions that emerge from the complex processes in which individual managers interpret the intended strategy and adapt to changing external circumstances. This model should also been seen as a process and especially if you include the variable of time. As show in the model below the realized strategy effects the intended strategy as times goes by. This is an important part of the model since it shows that current strategies will affect future strategies. There are two extreme types of organizations, the ones that have only deliberate strategies and the ones that have only emergent strategies. These two pure forms are very rare and perhaps there is no organization that has one of these pure types of processes. For a pure deliberate strategy, the organization must have pure intentions with a relative concrete level of detail. This plan has to be carried out exactly as intended. For a strategy to perfectly emergent there has to be consistency in action over time but without any intentions. Except for these two pure types of strategies that are extremely rare according to Mintzberg & Waters (1985 pp 257-258) but they argue that between those two extremes are several different type of strategies that are common in companies today.

2.2 STRATEGIC PLANNING

Strategic planning is an organizational management activity that is used to set priorities, focus energy and resources, strengthen operations, ensure that employees and other stakeholders are working toward common goals, establish agreement around intended outcomes/results, and assess and adjust the organization's direction in response to a changing environment. It is a disciplined effort that produces fundamental decisions and actions that shape and guide what an organization is, who it serves, what it does, and why it does it, with a focus on the future. Effective strategic planning articulates not only where an organization is going and the actions needed to make progress, but also how it will know if it is successful.

Strategic Planning is defined by Harvey as "long-range planning which focuses on the organization as a whole. Managers consider the organization as a total unit and ask themselves what must be done in the long-run to attain organizational goals. The most successful managers are those who are able to encourage innovative strategic thinking within their organizations."

A strategic plan is a document used to communicate with the organization the organizations goals, the actions needed to achieve those goals and all of the other critical elements developed during the planning exercise.

The natures and features of Strategic Planning are :-

(i) Strategic planning is a forward-looking exercise, which determines the future condition and attitude of the firm with special reference to its product market, profitability, size, rate of innovation etc.

(ii) It is a systematic and disciplined exercise to formulate two types of plans—operating and strategic plan. The different units in an organisation implement the operating plans.

(iii) Strategic plans are implemented through projects.

(iv) It relates to the enterprise as a whole or to particular unit.

(v) Its time span of discretion is very much longer.

(vi) The degree of uncertainty and risk involved in strategic planning are greater

Strategic planning has following advantages or usefulness:-

(i) According to different research studies, strategic planning contributes positively to the performance of enterprise and predicts better outcomes and isolates key factors of the firm.

(ii) It is concerned with the allocation of resources to product market opportunities and concerned to realise the company's profit potential through selected strategies.

(iii) It measures the strengths and weaknesses of the firm.

(iv) It selects the optimum strategy from the alternatives considering the interest of the firm, personal values of top management and social responsibility of the firm.

(v) With fast changing product market condition, technology economic condition the strategic planning is the only means by which future opportunities and problems can be anticipated by company executives.

(vi) It enables executives to provide necessary direction for the firm, to take full advantage of new opportunities and to minimise the risk.

As success of firm depends on multiple factors, so strategic planning is a necessary condition but not sufficient condition for success.

Pitfalls in Strategic Planning

The common pitfalls in strategic planning are as follows:

(i) Non-availability of correct and accurate data.

(ii) Doing strategic planning only to satisfy accredition or regulatory requirements.

(iii) Failing to communicate the plan to the people who execute the plan.

(iv) Top management making intuitive decisions that conflict with formal plan.

(v) Failing to use plans as a standard for measuring performance.

(vi) Delegating tasks to a few persons rather than involving all managers.

(vii) Failing to involve key employees in all phases of planning,

(viii) Failing to create an environment conducive of change.

(ix) Lack of flexibility and creativity.

(x) Strategic planning usually restricted to hard business concerns, leaving without proper attention for soft issues like customer, quality, labour productivity, social concerns etc.

(xi) Strategy planning sometimes becomes a routine exercise, without having proper attention to strategic issues.

(xii) The planning process is isolated from the external groups that critically affect the company like labour unions, consumer advocates, social service organizations etc.

Strategic planning is to a business what a map is to a road rally driver. It is a tool that defines the routes that when taken will lead to the most likely probability of getting from where the business is to where the owners or stakeholders want it to go. And like a road rally, strategic plans meet detours and obstacles that call for adapting and adjusting as the plan is implemented.

Strategic planning is a process that brings to life the mission and vision of the enterprise. A strategic plan, well crafted and of value, is driven from the top down; considers the internal and external environment around the business; is the work of the managers of the business; and is communicated to all the business stakeholders, both inside and outside of the company.

As a company grows and as the business environment becomes more complex the need for strategic planning becomes greater. There is a need for all people in the corporation to understand the direction and mission of the business. Companies consistently applying a disciplined approach to strategic planning are better prepared to evolve as the market changes and as different market segments require different needs for the products or services of the company.

The benefit of the discipline that develops from the process of strategic planning, leads to improved communication. It facilitates effective decision-making, better selection of tactical options and leads to a higher probability of achieving the owners' or stakeholders' goals and objectives.

Stages in Strategic Planning

The stages in strategic planning are given below:

Stage I: Strategic Option Generations

At this stage, a variety of alternatives are considered, relating to the firm's product and markets, its competitors and so forth. Examples of strategies might be:

(a) increase market share

(b) penetration into international market

(c) concentration on core competencies

(d) acquisition or expansion etc.

Stage II - Strategic Options Evaluation

Each option is then examined on its merits.

(a) does it increase existing strengths ?

(b) does it alleviate existing weaknesses ?

(c) is it suitable for the firm's existing position ?

(d) is it acceptable to stakeholders ?

Stage III - Strategic Selection

It involves choosing between the alternative strategies. This process is strongly influenced by the values of the managers in selecting the strategies.

Steps in Strategic Planning

A systematic approach to formalizing strategic plans consists of the following steps:

(i) An internal analysis that encompasses assessing company strengths and weaknesses, financial performance, people, operational limitations, corporate culture, current positioning in the market(s), the overall characterization of the condition of the company and critical issues facing by the organization.

(ii) An external analysis that focuses on analyzing competitors, assessing market opportunities and threats, evaluating changing technology that could impact the organization, analyzing regulatory or legislative concerns, changes and trends in the market(s) the company operates in and other potential outside influences on the organization.

(iii) Summarizing the current situation based on the information gathered and evaluated in steps one and two. This step is important to the process because it brings together relevant and critical data and information and allows members of the planning team to more easily get a feel for what opportunities and obstacles lie ahead.

(iv) Development of a mission, vision or purpose statement. It really does not matter what it is called, but this step is important perhaps more because of the process that the team will go through to develop it than the words that eventually end up on paper. In this step, the team is starting the process of focusing the organization and its people on what the organization is all about and what is important to the organization.

(v) Goal setting. Every organization needs goals. Again, focus is a critical element in the success of any business. This step may be the most important of all of the strategic planning steps because it establishes the framework and basis for the development of the other key elements of the plan.

(vi) Defining objectives that support the goals. Objectives are more specific in nature and are supportive of the goal. They bring into even greater focus to the goals of the organization.

(vii) Development of strategies. Strategies begin defining how the goals and objectives are going to be achieved.

(viii) While not all strategic plans include tactics, a good strategic plan will include at least the key tactics thought to be important to supporting the strategies developed in step 7. Generally tactics are more fully developed and added to the plan as time goes on. Tactics are the specific tasks associated with carrying out strategies.

Approaches in Strategic Planning

It is important to operate a planning process which will not only produce realistic and potentially rewarding plans but will also secure the support of all those involved in implementing them. There are three approaches that can be adopted to strategic planning:

(i) A top-down process, in which managers are given targets to achieve which they pass on down the line.

(ii) A bottom-up process, in which functional and line managers in conjunction with their staff submit plans, targets and budgets for approval by higher authority.

(iii) An iterative process, which involves both the top-down and bottom-up setting of targets. There is a to-and-from movement between different levels until agreement is reached. However, this agreement will have to be consistent with the overall mission, objectives and priorities and will have to be made within the context of the financial resources available to the organization. The iterative approach, which involves the maximum number of people, is the one most likely to deliver worthwhile and acceptable strategic plans.

Strategic Management and Strategic Planning : Distinction

The basic difference between Strategic management and Strategic planning are as follows:

Strategic Management	Strategic Planning
1. It is focused on producing strategic results; new markets; new products; new technologies etc.	1. It is focused on making optimal strategic decisions.
2. It is management by results.	2. It is management by plans.
3. It is an organizational action process.	3. It is an analytical process.
4. It broadens focus to include psychological, sociological and political variables.	4. It is focused on business, economic and technological variables.
5. It is about choosing things to do and also about the people who will do them.	5. It is about choosing things to do.

Corporate Planning and Long-range Planning

Corporate Planning - It is concerned with determination of objectives treating the company as a whole. It develops means to achieve the company's overall objectives. The corporate plans may relate to achieve corporate objectives for short-run and/or long-run. It is an integrated systems approach considering different functions, divisions and units of the organization. Such corporate plans are framed at the corporate level by the top management.

Long-range Planning - It is a systematic and formalized process concerned with directing and controlling future operations of an enterprise towards desired objectives for periods spreading generally over 5 or more years. It provides an opportunity to management to anticipate future problems and have got more flexibility in framing the long-range plans.

Corporate planning is not synonymous with long range planning. Corporate planning is concerned with both short periods as well as long periods. The time span depends on how far ahead a company wants to forecast, depends on nature of business and depends on commitment of resources required for it. Corporate planning in an engineering firm will involve long-term considerations but it will have short-term consideration in case of textile firm. Long range planning necessarily connotes planning with a long time horizon, generally five years or more.

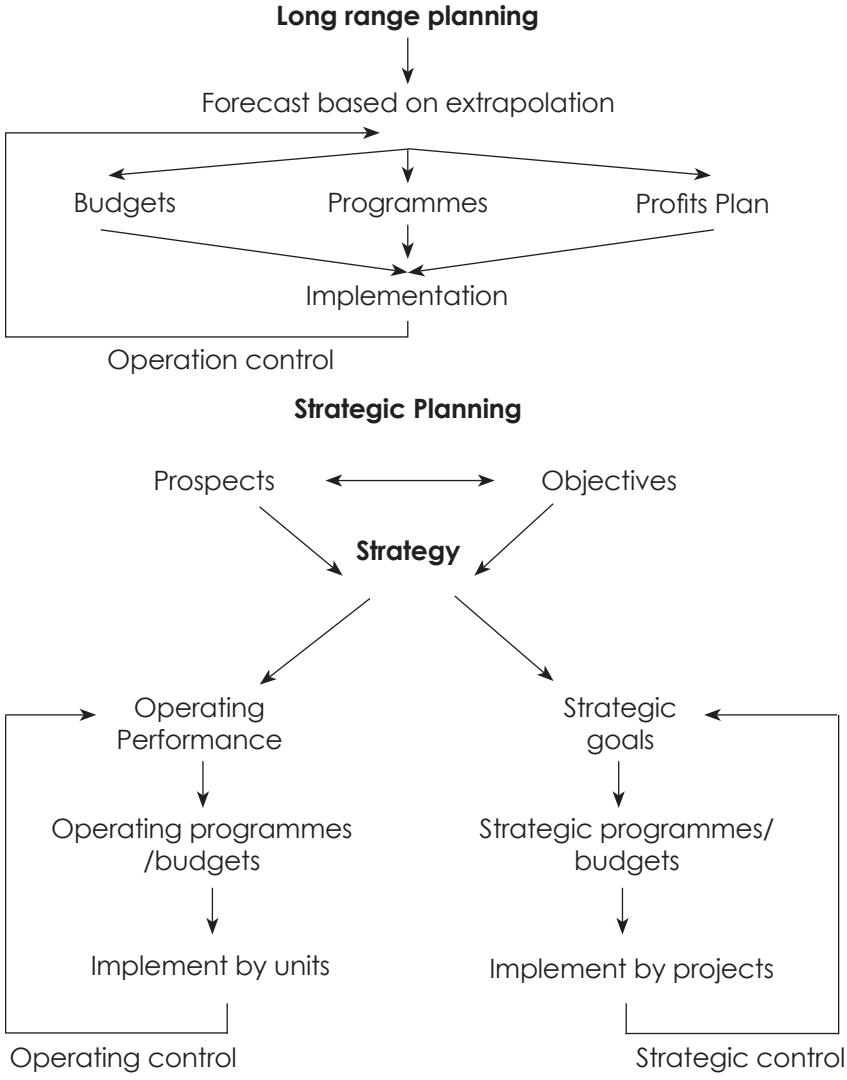
Corporate planning is associated with long range planning in labour intensive industries. Corporate planning is concerned with the existing products in existing markets as well as new products and new markets. Long-range planning takes care of only the existing products in existing markets.

Strategic Planning and Long-range Planning

The basic divergence between strategic planning and long-range planning lies in the difference in the assumption regarding the future environment of an organisation. In case of long-range planning current knowledge about future conditions is known with certainty that can be relied upon by executives. Accordingly, the course of action for achievement of organisational goals is drawn on the basis of this knowledge. In long range planning the future is forecasted through extrapolation of the historical growth.

On the contrary, strategic planning assumes that an organisation must be ready to respond to a dynamic environment and future environmental conditions are not known with perfect certainty. Thus, there is a need to emphasise and understand how the environment assumed is charging. Accordingly, the issue of developing courses of action in response to these changes will have to be taken up. Here, a number of alternatives are generated for several situations for the future. In case of strategic planning, the firm tries to identify opportunities, threats and trends based on which the future prospects are analysed.

This difference between long-range planning and strategic planning has been shown in the figure below :-



As shown in the figure above, in case of long-range planning, objectives forecasted through extrapolation are translated into budgets, programmes and profit plans. These are finally implemented. An operating control system is established and the feedback is provided which suggests a change in objectives, if required. The strategic planning leads to the setting-up of two sets of goals – operating performance goals and strategic goals. The operating performance goals are translated into operating budgets and strategic goals are translated into strategic budgets. Accordingly two types of control namely, operating control and strategic control are established.

Contingency Planning

A basic premise of good strategic management is that firms plan ways to deal with unfavorable and favorable events before they occur. Too many organizations prepare contingency plans just for unfavorable events; this is a mistake, because both minimizing threats and capitalizing on opportunities can improve a firm's competitive position.

Regardless of how carefully strategies are formulated, implemented, and evaluated, unforeseen events, such as strikes, boycotts, natural disasters, arrival of foreign competitors, and government actions, can

make a strategy obsolete. To minimize the impact of potential threats, organizations should develop contingency plans as part of their strategy-evaluation process. Contingency plans can be defined as alternative plans that can be put into effect if certain key events do not occur as expected. Only high-priority areas require the insurance of contingency plans. Strategists cannot and should not try to cover all bases by planning for all possible contingencies. But in any case, contingency plans should be as simple as possible.

Some contingency plans commonly established by firms include the following:

1. If a major competitor withdraws from particular markets as intelligence reports indicate, what actions should our firm take?
2. If our sales objectives are not reached, what actions should our firm take to avoid profit losses?
3. If demand for our new product exceeds plans, what actions should our firm take to meet the higher demand?
4. If certain disasters occur—such as loss of computer capabilities; a hostile takeover attempt; loss of patent protection; or destruction of manufacturing facilities because of earthquakes, tornadoes, or hurricanes —what actions should our firm take?
5. If a new technological advancement makes our new product obsolete sooner than expected, what actions should our firm take?

Too many organizations discard alternative strategies not selected for implementation although the work devoted to analyzing these options would render valuable information. Alternative strategies not selected for implementation can serve as contingency plans in case the strategy or strategies selected do not work. U.S. companies and governments are increasingly considering nuclear-generated electricity as the most efficient means of power generation. Many contingency plans certainly call for nuclear power rather than for coal- and gas-derived electricity.

When strategy-evaluation activities reveal the need for a major change quickly, an appropriate contingency plan can be executed in a timely way. Contingency plans can promote a strategist's ability to respond quickly to key changes in the internal and external bases of an organization's current strategy. For example, if underlying assumptions about the economy turn out to be wrong and contingency plans are ready, then managers can make appropriate changes promptly.

In some cases, external or internal conditions present unexpected opportunities. When such opportunities occur, contingency plans could allow an organization to quickly capitalize on them. Linneman and Chandran reported that contingency planning gave users, such as DuPont, Dow Chemical, Consolidated Foods, and Emerson Electric, three major benefits:

(i) It permitted quick response to change,

(ii) It prevented panic in crisis situations, and

(iii) it made managers more adaptable by encouraging them to appreciate just how variable the future can be.

Steps in Contingency Planning

Robert Linnemam and Rajan Chandran have suggested that a seven step process as follows:

Step 1 - Identify the beneficial and unfavourable events that could possibly derail the strategy or strategies.

Step 2 - Specify trigger points. Calculate about when contingent events are likely to occur.

Step 3 - Assess the impact of each contingent event. Estimate the potential benefit or harm of each contingent event.

Step 4 - Develop contingency plans. Be sure that contingency plans are compatible with current strategy and are economically feasible.

Step 5 - Assess the counter impact of each contingency plan. That is, estimate how much each contingency plan will capitalize on or cancel out its associated contingent event. Doing this will quantify the potential value of each contingency plan.

Step 6 - Determine early warning signals for key contingency event. Monitor the early warning signals.

Step 7 - For contingent event with reliable early warning signals, develop advance action plans to take advantage of the available lead time.

Benefits of Contingency Planning

(i) It will make the future through their proactive planning and advanced preparation.

(ii) It will introduce original action by removing present difficulties.

(iii) It enables to anticipate future problems.

(iv) It will change the goals to suit internal and external changes.

(v) It experiments with creative ideas and take initiative.

(vi) It will attempt to shape the future and create a more desirable environment.

(vii) It permits quick response to change,

(viii) It prevents panic in crisis situations.

(ix) It makes managers more adaptable to unforeseen changes.

2.3 STRATEGIC LEADERSHIP

Strategic leadership refers to a manager's potential to express a strategic vision for the organization, or a part of the organization, and to motivate and persuade others to acquire that vision. Strategic leadership can also be defined as utilizing strategy in the management of employees. It is the potential to influence organizational members and to execute organizational change. Strategic leaders create organizational structure, allocate resources and express strategic vision. Strategic leaders work in an ambiguous environment on very difficult issues that influence and are influenced by occasions and organizations external to their own.

The main objective of strategic leadership is strategic productivity. Another aim of strategic leadership is to develop an environment in which employees forecast the organization's needs in context of their own job. Strategic leaders encourage the employees in an organization to follow their own ideas. Strategic leaders make greater use of reward and incentive system for encouraging productive and quality employees to show much better performance for their organization. Functional strategic leadership is about inventiveness, perception, and planning to assist an individual in realizing his objectives and goals.

Strategic leadership requires the potential to foresee and comprehend the work environment. It requires objectivity and potential to look at the broader picture.

A few main traits / characteristics / features / qualities of effective strategic leaders that do lead to superior performance are as follows:

- Loyalty- Powerful and effective leaders demonstrate their loyalty to their vision by their words and actions.
- Keeping them updated- Efficient and effective leaders keep themselves updated about what is happening within their organization. They have various formal and informal sources of information in the organization.

- Judicious use of power- Strategic leaders makes a very wise use of their power. They must play the power game skillfully and try to develop consent for their ideas rather than forcing their ideas upon others. They must push their ideas gradually.
- Have wider perspective/outlook- Strategic leaders just don't have skills in their narrow specialty but they have a little knowledge about a lot of things.
- Motivation- Strategic leaders must have a zeal for work that goes beyond money and power and also they should have an inclination to achieve goals with energy and determination.
- Compassion- Strategic leaders must understand the views and feelings of their subordinates, and make decisions after considering them.
- Self-control- Strategic leaders must have the potential to control distracting/disturbing moods and desires, i.e., they must think before acting.
- Social skills- Strategic leaders must be friendly and social.
- Self-awareness- Strategic leaders must have the potential to understand their own moods and emotions, as well as their impact on others.
- Readiness to delegate and authorize- Effective leaders are proficient at delegation. They are well aware of the fact that delegation will avoid overloading of responsibilities on the leaders. They also recognize the fact that authorizing the subordinates to make decisions will motivate them a lot.
- Articulacy- Strong leaders are articulate enough to communicate the vision(vision of where the organization should head) to the organizational members in terms that boost those members.
- Constancy/ Reliability- Strategic leaders constantly convey their vision until it becomes a component of organizational culture.

To conclude, Strategic leaders can create vision, express vision, passionately possess vision and persistently drive it to accomplishment.

Strategic leadership has many characteristics in common with leadership at lower levels, but it also has some that are distinctive. There are six characteristics that we think will be particularly relevant to strategic leaders in the future: intellectual openness, nuance, intellectual agility, integration, teamwork, and ethics. Because the scope of opinion on strategic leadership is diverse, leaders must be open to different points of view.

Intellectual openness. Because the scope of strategic leadership is so wide and the range of opinions on strategic issues is so diverse, leaders must be open to different points of view. Indeed, they should encourage subordinates, peers, and others to express their views as directly as possible—from those in the corridors of power and the public at large to allies and friends abroad. No one has a monopoly on relevant experience and practical wisdom about the complex issues.

Nuance. The problems that occupy the inboxes of strategic leaders involve ambiguity and complexity. If they were unambiguous and simple, they would be solved at lower levels. Strategic leaders must be able to recognize and deal with this ambiguity and complexity and the shades of nuance that they present. This requires effective skills in managing cognitive dissonance, for evidence and argumentation usually send conflicting signals. Denial is not one of those skills. Leaders may be able to deny that they perceive cognitive dissonance, but cannot make the conflicting signals disappear by denying them. A well-developed appreciation for nuance would generally reject an either/or approach, which in itself denies ambiguity and complexity. For military leaders in particular, this means that tactics, techniques, and procedures—though important, even necessary—may not always be up to the task at hand, which leads to consideration of another quality.

Intellectual agility. Strategic leaders do not have single-issue inboxes nor do they fully control their agendas. Strategic leaders must be able to transition with little or no warning, and at times turn on a dime, from one problem to another. It is the policy equivalent of the so-called three-block war. In practicing intellectual agility, strategic leaders must be informed and guided by doctrine and past experiences but not become slaves to them. Too often, professional officers rigidly apply doctrine to situations that may be significantly different from those the doctrine writers envisioned.

Strategic leaders must be adaptable and able to "call an audible" when an unanticipated situation is thrust upon them, or in an anticipated crisis that differs in important ways from the planning scenario, thus rendering the "on-the-shelf" plan not fully appropriate and useful. Since "no war plan survives contact with the enemy," strategic leaders must also be able to adapt in the middle of a war or crisis, rather than holding on stubbornly to the plan or policy they began with, even when it no longer seems to be achieving the objectives, or is doing so at unacceptably high costs.

Integration. The problems confronting strategic leaders are rarely unidimensional. Almost by definition, strategic problems are multidimensional, involving military, political, economic, cultural, social, religious, and historical factors and forces that are often difficult to disentangle from each other. Thus, successfully addressing strategic problems involves several instruments of national power, sometimes all of them. Strategic leaders must master the instruments of their own departments or agencies, but must also be able to help integrate and coordinate them with those of other departments and agencies. Strategic leadership requires the skills of an orchestra conductor, not of a soloist, no matter how talented.

Teamwork. Government operations on the strategic level require teamwork. Strategic leaders must build an effective team within their own agencies that includes career officials (both civilian and military) and political appointees. The former are nonpartisan experts, and the latter, who also include experts, make administration policy. Strategic leaders must also build effective interagency teams to integrate and apply various instruments that the given problem demands. Increasingly in the 21st century, strategic leaders must also build effective teams with coalition and alliance partners, whose cultural backgrounds and modes of operation frequently will be greatly different from their own.

Relationships are critical in building effective teamwork on all levels. Organizations do not cooperate or integrate; people do. Building relationships takes time, and new administrations sometimes do not have that luxury because real-world concerns will suddenly intrude. Thus, forming and molding relationships must start on day one. The key to strong and effective relationships is trust. It must be built and earned; it cannot simply be declared. It must be multidirectional, not unidirectional. For trust to take hold in organizations, leaders on all levels must be both trustworthy and trusting. Both are necessary; neither by itself is sufficient.

Ethics is always important, but especially given the challenges that the Nation confronts today. Strategic leaders must personally set and periodically recalibrate their own moral compasses. Doing so begins with one's own moral values and principles, those inherited from family (and, for many, from religion) and nurtured in school. Professionals are guided by an ethos that defines and regulates their profession—military, public service, the law. All citizens, but especially public servants, must also incorporate national values and principles. In an era when the world is shrinking, news is driven by a 24-hour cycle, and coalitions have become the norm, ethics also involve what the Founders called "a decent respect to the opinions of mankind."

Ethics must involve both ethical ends and ethical means, especially for strategic leaders who wrestle with the problems of today. Ethical ends can justify some means, but even the most ethical ends cannot justify any and all means. Leaders will be judged—by themselves and by others—not only by the goals they set, but by the means they use in trying to achieve those goals.

In every organization, regardless of size, the leaders set the tone, including the ethical tone. Within military organizations, command climate starts at the top. It is reflected in what strategic leaders say and in what they do, and those who serve in their organizations, as well as those people outside who come into contact with them, pay attention to both words and deeds.

The Nine Roles of Senior Strategic Leadership

Contrasted with operational leaders, whose primary role is to manage day-to-day business operations, leaders who transit from operational to strategic leadership must assume a variety of key roles to achieve longer term strategic business results in pursuit of profitable sales growth, increased market share, implementation of change, and the strategic alliances that will help achieve these goals.

Quite often, one of the biggest barriers to success in making the transition to strategic leadership is a lack of insight into the roles that leaders need to assume at the senior strategic level. A taxonomy is needed that defines and helps to clarify the nature of these roles and the transition leaders must make to perform well in these roles. This in turn will help better prepare leaders to be successful, and to provide a framework for their development and deployment.

While strategic leaders are not typically engaged in all nine roles "all the time," they will often be involved in situations related to more than one role at any given time. The relative importance placed on each role is dependent upon the business situation in which the leader is engaged. Thus, in one situation a strategic leader may initially be focused on developing a long range course of action or set of goals to align with the organization's vision (the "Strategist" role). The focus might then subsequently shift to building passion and commitment toward those goals among the people who need to take ownership of the strategy or vision (the "Captivator" role). The nine roles have general applicability across all senior leadership positions, and are not unique to any particular job; however, the particular focus on any given role at a point in time will be determined by the business issues being addressed at that time. Ideally, an executive team would collectively represent capabilities across the full spectrum of these roles.

Role 1 : NAVIGATOR—Clearly and quickly works through the complexity of key issues, problems and opportunities to affect actions (e.g., leverage opportunities and resolve issues). Navigators analyze large amounts of sometimes conflicting information. They understand why things happen and identify possible courses of action to affect events. They know which factors really matter in the overall scheme of things.

Illustrations

- Identifies root causes quickly.
- Displays a keen sense of priority, relevance, and significance.
- Integrates information from a variety of sources and detects trends, associations, and cause-effect relationships.
- Creates relevant options for addressing problems and opportunities and achieving desired outcomes.

- Translates complex situations into simple, meaningful explanations that others can grasp.
- Provides others with relevant context for work.
- Overcomes personal and organizational biases in looking at data; avoids "not the way we do it here" thinking.

Role 2 : STRATEGIST—Develops a long-range course of action or set of goals to align with the organization's vision. Strategists focus on creating a plan for the future. Part of this plan might involve capitalizing on current opportunities and future trends (Entrepreneur) and understanding complex information related to future events (Navigator). Strategists make decisions that drive the organization toward its vision.

Illustrations

- Continuously looks beyond the current year.
- Perceives what drives the business.
- Uses financial data for a successful business.
- Grasps big-picture, enterprise-wide issues across boundaries.
- Recognizes risks and pursues actions that have acceptable levels of risk.
- Links the organization's vision and values to the business strategy.

Role 3 : ENTREPRENEUR—Identifies and exploits opportunities for new products, services, and markets. Entrepreneurs are always alert for creative, novel ideas. They might generate the ideas themselves or take existing opportunities or proposals down a new path. Entrepreneurs are able to look at events from a unique perspective and develop ideas that have never been thought of.

Illustrations

- Takes calculated risks to capitalize on emerging trends.
- Looks beyond the boundaries of the organization for new growth opportunities (partnerships, new technologies, applications).
- Turns threats (from competitors, government policies, and new technologies) into business opportunities.

Role 4 : MOBILIZER—Proactively builds and aligns stakeholders, capabilities, and resources for getting things done quickly and achieving complex objectives. Mobilizers gain the support and resources they need to accomplish goals.

Illustrations

- Leverages and integrates the capabilities of resources across all levels of the organization to accomplish complex, multiple-level objectives.
- Anticipates and diffuses roadblocks to desired goals.
- Uses necessary and appropriate lobbying techniques to gain support for actions from decision-makers.
- Utilizes creative networking approaches to identify contacts who can help in attaining goals.
- Develops alternative/contingency plans.
- Empowers others relative to achieving the strategy.

Role 5 : TALENT ADVOCATE—Attracts, develops, and retains talent to ensure that people with the right skills and motivations to meet business needs are in the right place at the right time. Talent Advocates ensure that the organization has people with potential to meet present and future organizational needs. Talent Advocates are less concerned with filling specific positions than with attracting and retaining talented individuals.

Illustrations

- Relentlessly identifies and secures high-potential talent.
- Identifies the best people (internal and external), gets to know them, and stays in touch with them.
- Links development assignments to current and future needs of the organization (as determined by the business strategies).
- Increases readiness of high-potential talent by providing developmental opportunities.
- Minimizes barriers to achievement; maximizes the individual's likelihood for success.
- Builds and facilitates a culture that embraces development.
- Promotes employee retention by analyzing and understanding its drivers.

Role 6 : CAPTIVATOR—Builds passion and commitment toward a common goal. Captivators build upon an established foundation of trust to instill people with feelings of excitement and belonging. Captivators transfer the energy of their message in such a compelling way that people take ownership of the strategy or vision and are empowered to carry it out.

Illustrations

- Conveys a simple, vivid picture of the organization's vision and goals.
- Moves people from compliance to commitment.
- Instills others with a strong sense of belonging (they understand how they will benefit).
- Generates energy and enthusiasm through personal passion and conviction.
- Keeps the message alive and ongoing.

Role 7 : GLOBAL THINKER—Integrates information from all sources to develop a well informed, diverse perspective that can be used to optimize organizational performance. Global Thinkers understand and accept international and cultural differences and behave in a way that accommodates people's varying perspectives. They also discern differences in individual styles and adapt their approaches accordingly.

Illustrations

- Considers the implications of issues, decisions, and opportunities beyond the boundaries of own country/culture.
- Understands the different perspectives and approaches in order to effectively handle cross-cultural challenges/individual differences.
- Identifies opportunities for global leverage (for example, opportunities to develop R&D strategy from a global point of view).

Role 8 : CHANGE DRIVER—Creates an environment that embraces change; makes change happen—even if the change is radical— and helps others to accept new ideas. Change Drivers focus on continuous improvement. Always challenging the status quo and breaking paradigms, they identify ideas for change and become the force driving the change home.

Illustrations

- Sees the possibility for change.
- Recognizes the need for change before it becomes critical.
- Sells ideas for change.
- Funds and supports the implementation of change and rewards behavior that supports change.

Role 9 : ENTERPRISE GUARDIAN—Ensures shareholder value through courageous decision-making that supports enterpriser unit-wide interests. Enterprise Guardians rise above the parochial nature of the job and make decisions that are good for the shareholder, even if the decisions cause pain to individuals or to the organization.

Illustrations

- Refuses to trade long-term for short-term gain.
- Possesses the courage to make difficult decisions in times of success.
- Objectively upholds the interest of the enterprise by putting aside emotions and personal relationships.
- Takes responsibility for unpopular decisions and their aftermath.

Strategic Skills and Abilities

- Leaders at all levels require skills and abilities in three broad areas:
- Technical knowledge and skills required in the position, especially about executive information systems.
- Interpersonal/communication knowledge and skills.
- Conceptual skills which allow the strategic leader to make decisions and cope with the level of complexity associated with a particular position.

Specific leadership tasks to be performed differ from level to level in organizations. More importantly, the balance between technical, interpersonal/communication, and conceptual changes across levels.

Technical Skills

Technical skills are required at all levels. However, at the lower levels, technical skills consist of using or operating a system; at upper levels, technical skills are more about employing systems within systems in order to create synergy. For example, at the lower levels, automation-technical skills might consist of what is required to install and maintain a network of computer systems. At the strategic level, they might be what is required to achieve the integration of an extensive automation system, e.g., WWMCS, into a multiservice command and control architecture.

At the direct level, technical focus is on solving well-defined problems, and performing specific tasks and missions. At the strategic level, the focus is on solving ill-defined problems-dealing with intangibles and indirect effects that can impact on the organization. Many of the technical decisions facing these senior leaders require the assessment of organizational capabilities and an understanding of the intricacies of resourcing the total organization.

Structuring and re-structuring includes responsibility to develop new kinds of systems and organizations to provide future operational capability. These strategic decisions require major resource commitments that cannot easily be reversed (e.g., the decision to build an aircraft carrier). They also require calculation of the tradeoffs between opportunity and risk, with the knowledge that if decisions are wrong, the defense posture may be weakened.

New organizations may be developed in response to changing threat capabilities, technological enhancements, or resource changes. However, such decisions carry substantial opportunity costs.

Interpersonal Skills

Because the relationships at the strategic level are much more lateral and without clear subordination than at lower levels, the interpersonal skills involved in persuasion, negotiation, and collaboration are more crucial. These processes operate on a base of effective reasoning and logic. Strategic leaders -- especially when consequential decisions are being made -- must be able to build the perception that their ideas are rational and deserve support. This demands that a consensus be built among contemporaries of equal rank and tenure, who might have competing interests and ideas of their own. To a very great extent, the capacity to build consensus depends as much on interpersonal skills as on political and conceptual skills.

The CEO must be able to lead subordinates who disagree with each other, and with him, while he retains his own convictions about the desirable direction for the corporation. This conviction may be tested over several years by the skepticism and dissent of other senior officers. But if the CEO and those who agree with his ideas for new direction are persistent, and if they are correct in their decisions so that improved results become apparent to others, then gradually they can rebuild a consensus about the "rightness" of the new ideas, and these will be incorporated into management's beliefs.

Conceptual and Decision Skills

Environmental Scanning. Scanning is purposeful search in the environment for relevant information. The skill lies in knowing what may be important, where to look, who to ask, and what to ask, to obtain needed information. Not all environmental scanning is done by strategic leaders. In today's environment, the task has such enormous scope that whole departments, branches, or organizations maintain environmental scans. For example, environmental scanning is one of the most central missions of the CIA.

In any organization the leader's unique capacity to commit the resources of his/her organization, opens many doors. One way a leader may add value is by using this "source mobility" to scan, interpret, and understand what is going on elsewhere that may have future relevance to his/her organization. Because many strategic courses of action require huge investments, they may unfold over substantial time frames. Therefore, to the extent early sensing of important events might allow timely action to gain a competitive advantage, the value of strategic scanning may be enormous.

Decision Making. In most strategic decision making where **options** are consequential, situations may not have clear cause-and-effect outcomes. Also, plausible courses of action may not yet have been developed or identified. In such cases, decision makers must isolate and identify key issues, visualize and predict potential problems, and formulate least-risk solutions. Additionally, at the strategic level, some problems may be so poorly structured that even one clearly workable course of action is not apparent. The complexity may be too great, and the consequences of possible courses of action too uncertain. For these complex and ill-structured problems, most organizations make use of an **executive team**, composed of the leader and his/her advisors. The assembled wisdom of the team members enables a broader scope to be considered, and permits a more careful analysis of the information relevant to the issue.

Reducing Complexity. The complexity and uncertainty of the strategic environment exceeds that which can be tolerated at the lower levels. Decision makers at these levels- nominally the mid-levels-develop concrete plans for allocating resources to operations. However, this kind of resource allocation cannot be done intelligently without concept guidance from higher levels. The strategic role is to comprehend the complexity and uncertainty in the strategic environment, and then to set understandable azimuths for the mid-levels of the organization that can be used as a rational basis for resource allocation to operational units.

Systems Understanding. This is a capacity to visualize the interactive dynamics of large systems, including interdependencies, so that decisions taken in one area will not have adverse impact in another. Strategic decisions must balance conflicting expectations, requirements and values, over time. Systems-by virtue of strategic leadership-must deal with current requirements, conceive future requirements, and balance these requirements with current and future resources.

Understanding Indirect Effects. A strategic leader's frame of reference and vision must be broad enough to predict the indirect-second-, third-, and fourth-order effects of decisions. Without this capacity, changes in policy, regulation, or action may produce effects neither anticipated nor desired.

Future Focus and Vision. Strategic leaders must not only be future oriented, but must have a "sense of time" to envision long-term system-wide programs and schedules for their implementation. The importance of vision at this level is that it provides the umbrella for defining specific and detailed programs at the organizational.

Proactive Reasoning. Although strategic leaders must react to immediate, near-term events, they reduce the surprise factor by maintaining a "proactive stance." Being proactive is more than just seeing the future relevance of present-day events. In this proactive process, strategic leaders use their frames of reference as a tool to:

- Assess current position.
- Envision desired future capabilities.
- Determine the difference and define steps to close the difference.
- Initiate the future program.
- Monitor progress.

Example of Strategic Leadership – Ratan Tata

Ratan Tata was chairman of Tata Group of companies which is a conglomerate of around 114 companies and whose revenues in 2009-2010 were $67.4 Billion. The group has operations in more than 80 countries and has interests in chemicals, steel, automobiles, information technology, communication, power, beverages, and hospitality.

He became chairman of Tata Group in 1991 when the decision was widely criticized. Two decades later, the revenues increased by 40 times, and the net profit increased by 4 times. Although we will discuss his leadership traits that caused this tremendous growth, the environment also became conducive in the 90s. India's economic liberalization started in 90s when the government under the leadership of prime minister P.V.Narasimha Rao and finance minister Manmohan Singh determined to transform the economic system from socialism to capitalism. The new neo-liberal policies included opening for international trade and investment, deregulation, initiation of privatization, tax reforms, and inflation-controlling measures .

Ratan Tata has won several accolades for his leadership. He possesses the qualities of a level 5 leader as described by Jim Collins in his book "Good to Great". He definitely has the mindsets required by a 21st century leader such as Boundary less thinker, network builder, diplomat, interpreter. Some of the skill sets have been highlighted below.

The acquisitions by Tata group have grown over the years. In 1995-2003, the group made an acquisition every year on average. It rose to 6 in 2004 and to 20 in 2005-06. One of the acquisitions Tetley, was twice the size of Tata Tea. JLR which had reportedly recorded combined losses of an estimated $10 Billion over a 19-year period under former owner made its profit of $59 million in '09 under Tata's leadership. These results are due to the strengths of leadership which includes qualities such as :

- being able to search, understand and utilize synergies
- knowledge of own value and uniqueness
- ability to recognize others' value and uniqueness

- ability to relate, communicate and negotiate
- solid knowledge of business and marketplace
- big picture perspective

Tata also conceptualized and motivated the company to manufacture a $2,500 car, called Tata Nano. This enormous challenge was met by introducing innovative processes. Several partnerships were formed to improve the supply chain. This remarkable achievement demonstrates some qualities such as :

- Openness to ideas
- Innovation
- Willingness to look beyond oneself for capabilities and resources
- Relationship mindset

These are some of the examples that clearly indicate the leadership practices of Tata. Analyzing the leadership using the lifecycle-culture matrix, Tata's leadership falls in the realm of "Administrator". New products are constantly being developed (be it in automobiles – new models, innovations in telecommunications – Tata Photon, lemon flavored tea bags or Tion, a new cold drink) and the brands constantly evolve themselves to attract the newer generation, increase relevance to the local market and to increase competitiveness in the market. New customer segments are constantly sought (JLR acquisition is a simple example which helped them capture the high end segment and at the same time Tata Nano helps to capture the low segment) to maintain the growth and leadership of the organization. This quality of Tata's leadership is visible in many other decisions that deal with wide spectrum of the market. While he led the group to acquire luxurious Pierre Hotel in New York, he also drove the launch of budget Ginger hotels in India. A latest example from TCS is a cloud service application targeted at small business in India . Various product variations and extensions are not only seen in the automobile company, but also in steel, chemical and software services companies. New geographic markets are constantly being entered either by expansion or by acquisition. Tata remains competitive in the advent of new entrants to the market, reinventing itself and driving innovations in technologies and processes. As mentioned before, Tata also is very successful in growing inorganically through meaningful acquisitions and turnarounds. Thus, the business lifecycle can be said to be focusing on the customers but at the same time a sense of urgency and strategic intent can be seen.

The growth of the company, given the size, has definitely not reduced thanks to the innovation and a strong strategic direction. At the same time, there are enough evidences that in some organizations, life cycle has seen a maturity. The focus on innovation and the leadership effectiveness is not similar in all organizations, one example being a failure in the passport project. This raises concerns of a pending crisis in some organizations. The employee satisfaction in some of the organizations, for example Tata Consultancy Services (TCS), is not comparative to the industry standards. TCS is among the top 4 IT services companies in India comprising of around 200K employees and generating around $7B revenues. At one point, it experienced lowest attrition rate in the industry, however its reputation decreased over the time with employees criticizing the human resource policies in public forums. In addition, brand trust report study lists TCS way below its competitors (Infosys, Wipro). These are the signs of some organizations moving towards bureaucracy rather than maintain the competitive edge by focusing on strategic growth.

Finally, a word about the capabilities of the Tata group. Tata group as such has been technological leader in many industries. In addition as the acquisitions and the new products show, Tata group is also mature in demonstrating its strategic capability. The operational capability is not similar among all companies, although under Tata's reign the profit margins have increased multifold. The profit margins in TCS is strong while the same can not be said about Tata Steel. While there are many factors in play for the challenges faced by different industries, it can be ruled out that the reputation and quality of services and products are not of similar stature across Tata's companies (for example Tata Docomo, a telecom provider has not demonstrated industry leadership in its services).

Challenges for tomorrow:

Tata's vision and personality helped group's big transformations, restructuring and focus on frugal innovation. An example of his personality and the respect that the group commands can be seen in the fact that Corus deal met with little opposition as compared to the furore against Mittal Steel's bid for Arcelor. The trust that Tata commands in the global finance markets can be witnesses when 75% of the deals were financed by foreign funds. *It is a challenging legacy to inherit.*

What Tata particularly excelled was in having a vision, demonstrated abilities of thinking big, potential to grasp the opportunities shaped due to change in policies, economic climate and an unwavering execution. He rushed in the doors opened by the economic liberalization of the 90s, jumped on to the IT/telecom bandwagon, and recently focused on renewable energies such as geothermal energy. His ability to sense the synergies and strengths of his own organizations made his acquisitions a success. The next leader is desired to reflect some of these qualities and also should act in a sense of urgency not only to further focus on growing industries but also to divest interests in the not so growing industries as explained below.

Another significant challenge is a re-think on the current diversification. More than 90 companies in various industries from salt to software may not be the order of the day. Tata, soon after becoming chairman, was wise enough to exit from the industries which were not attractive. Perhaps a similar strategy needs to be adopted to keep the group growing at a healthy pace and not face the risk of a decline.

Given the challenges of 21st century and the impact of Tata leadership not only on the group of companies but on the entire Indian businesses, Tata group needs to put greater emphasis on the sustainability practices. In recent years, Tata Steel's joint venture with Larsen & Toubro to construct a port at Dhamra, Orissa, has come under the scanner for its proximity to two protected areas, one of which is the world's largest nesting site for the endangered Olive Ridley Turtle and the other India's second-largest mangrove forest. A soda ash extraction plant in Tanzania also came under fire because of the threat it poses to a nearby lake and its flamingo population. In the wake of increased awareness of social responsibility among the customers and internet communication, similar oppositions will be exaggerated in a way that could be damaging to the brand. Moreover, considering the leadership Tata enjoys among Indian businesses, every action of Tata will be scrutinized and/or followed by others.

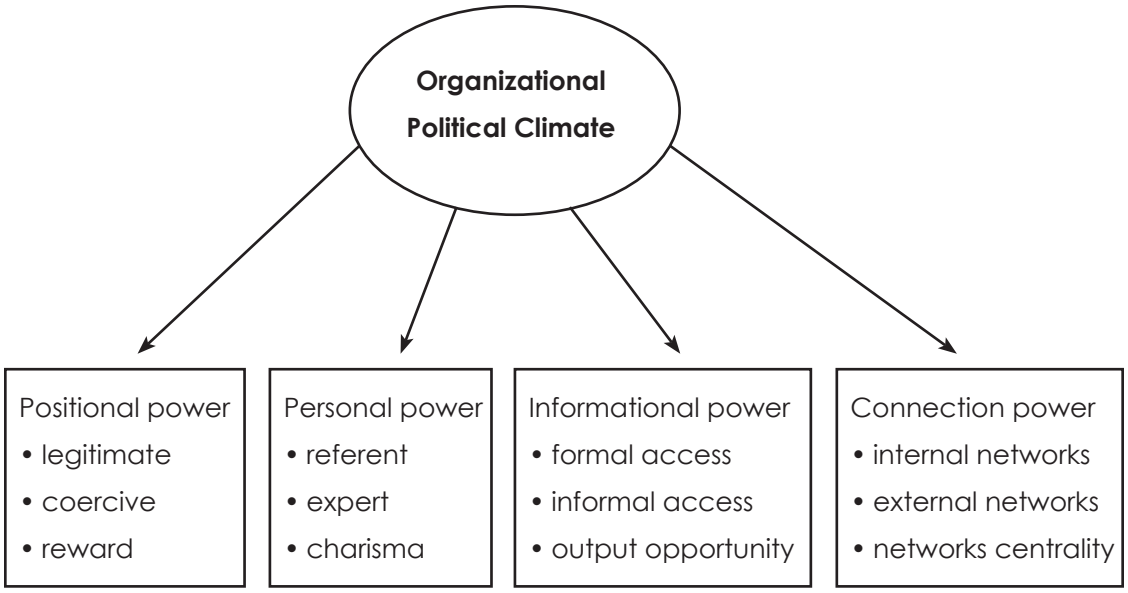
There are already some efforts taken by many of the companies under the Tata group umbrellas, but they have a greater opportunity to form a consolidated sustainability that is forward looking. A centralized support that is financially independent (supported by profit making companies) can promote transparency and enable monitoring and maintaining consistent business practices across the conglomerate. Given the global operations of the organization, there are significant challenges to such a consolidation approach; however the effort will have its impact on clarity to shareholders. This sustainability leadership will be a model for other conglomerates to follow and can achieve greater objectives by being sensitive to local needs of the global organization.

2.4 ORGANIZATIONAL POLITICS

All organisations are subject to conflict and competition between the desires and interests of different departments, teams and individuals. Organisational politics refers to the processes through which these rival interests are played out and eventually reconciled. While in an ideal organisation it may be hoped that decisions are made on a rational basis, politics is inherently non-rational and subject to power interactions between diverse interests. Members of an organisation are at the same time cooperating to achieve a common goal and competing for rewards, and at times their personal interests may be at odds with the organisation's objectives.

It is through the political system of an organisation that rival interests are resolved. This system represents how power is applied and distributed in the organisation. Understanding the political system of an organisation is necessary for a leader to operate effectively and reach their goals. A leader, exercising

power, is able to have a strong influence on the political climate of an organisation through their decisions, their way of handling conflict and providing recognition, support and inspiration to their teams.



Negative organisational politics may be very destructive for an organisation. This has been identified as one of the major sources of stress within modern businesses. Negative politics includes the use of subversive methods to promote a personal agenda which may undermine organisational objectives, distract energy away from organisational goals and compromise the interests, cooperation and fulfilment of other employees. Such tactics may include filtering or distortion of information, non-cooperation, allocating blame, reprisals, dishonesty, obstructionism and threats.

Impression management is another aspect of organisational politics that it is important to maintain an awareness of. The term refers to techniques of self-presentation where a person may purposefully control the information they put forward about themselves or their ideas to create a favourable impression. For the leader this implies that everything may not always be as it appears. Studies have indicated that people using impression management may be more favourably rated by their supervisors than others. On the other hand, being aware of the impression you are creating should be considered in building support for your own goals. The extent to which impression management is applied is an ethical question that relates to a leaders credibility and integrity.

Often, political behaviour and manoeuvring within an organisation is caused by uncertainty, such as unclear objectives, poorly defined decisions, competition and change. A leader's influence may be used to smother a political climate that promotes such negative politics.

By promoting a positive culture that values integrity, respect and fairness within their team, the leader is able to channel people's interests and energy away from negative political interplay and towards an alignment with organisation objectives. Allowing team members to express their interests and demonstrating a commitment to support individual needs integrates their fulfillment into the work organisation and promotes the positive resolution of political conflicts.

Pfeffer (1992, p.30) defined politics as the processes, the actions, the behaviors through which potential power is utilized and realized. Another author defined organizational politics as informal approaches to gaining power through means other than merit or luck. It could be argued that politics are used primarily to achieve power, either directly or indirectly, e.g., by being promoted, receiving a larger budget or other resources, or gaining desirable assignments.

Many people regard organizational politics as something negative (e.g., pursuing self-interests at the expense of others) and something to be minimized. Consequently, although most people know that organizational politics are common, they avoid saying so when it concerns one's own behavior. It is more common to talk about politics when complaining about a loss to a friend than it is in the context of one's own political maneuvering. When we win on an issue, we call it leadership; when we lose, we call it politics. In many organizations, politics is a taboo subject, which makes it difficult for individuals to deal with this crucially important aspect of organizational reality.

A leader must skillfully use organizational politics to acquire and retain power and to accomplish major goals. Therefore, it would be a mistake to pretend that politics does not exist or to fantasize that a leader can be effective without appropriate (and ethical) use of politics. As Pericles wrote over 2500 years ago, "Just because you do not take an interest in politics doesn't mean politics won't take an interest in you." Organizational politics is neither good nor bad, per se, although it is important for us to distinguish between ethical and unethical political behavior.

Factors Contributing to Political behaviour in Organizations

It is useful to remember that in its original meaning, the idea of politics stems from the view that, where interests are divergent, society should provide a means of allowing individuals to reconcile their differences through consultation and negotiation. In ancient Greece, Aristotle advocated politics as a means of reconciling the need for unity in the Greek polis (city-state) with the fact that the polis was an "aggregate of many members." Politics, for him, provided a means of creating order out of diversity while avoiding forms of totalitarian rule. Political science and many systems of government have built on this basic idea, advocating politics, and the recognition and interplay of competing interests that politics implies, as a means of creating a non-coercive form of social order.

Organizational politics are a natural result of the fact that people think differently and want to act differently. This diversity creates a tension that must be resolved through political means. There are many ways in which this can be done, for example: autocratically ("We'll do it this way"); bureaucratically ("We're supposed to do it this way"); technocratically ("It's best to do it this way"); or democratically ("How shall we do it?"). In each case the choice between alternative paths of action usually hinges on the power relations between the actors involved.

An organization's politics is most clearly manifest in the conflicts and power plays that sometimes occupy center stage, and in the countless interpersonal intrigues that provide diversions in the flow of organizational activity. Politics occurs on an ongoing basis, often in a way that is invisible to all but those directly involved.

As Scottish sociologist Tom Burns has pointed out, most modern organizations promote various kinds of political behavior because they are designed as systems of simultaneous competition and collaboration. People must collaborate in pursuit of a common task, yet are often pitted against each other in competition for limited resources, status, and career advancement. These conflicting dimensions of organization are most clearly symbolized in the hierarchical organization chart, which is both a system of cooperation, in that it reflects a rational subdivision of tasks, and a career ladder up which people are motivated to climb. The fact that there are more jobs at the bottom than at the top means that competition for the top places is likely to be keen, and that in any career race there are likely to be far fewer winners than losers. Along with the fact that different individuals and groups are mandated to exercise authority and influence over others, the hierarchy more or less ensures the kinds of competitive struggle on which organizational politics thrives.

One does not have to be consciously cunning or deviously political to end up playing organizational politics. Political behavior is a fairly natural response to the tensions created between individuals and their organizations. The setting of budgets and work standards, the day-to-day supervision and control of work, as well as the pursuit of opportunity and career, are often characterized by sophisticated forms of gamesmanship. Take, for example, the situations that reveal the guile with which factory workers are able to control their pace of work and level of earnings, even when under the close eye of their

supervisors or of efficiency experts trying to find ways of increasing productivity. The workers know that to maintain their positions they have to find ways of beating the system, and do so with great skill and ingenuity. Individuals who systematically wheel and deal their way through organizational affairs merely illustrate the most extreme and fully developed form of a latent tendency present in most aspects of organizational life.

The potential complexity of organizational politics is mindboggling, even before we take account of the personalities and personality clashes that usually bring roles and their conflicts to life. Sometimes the conflicts generated will be quite explicit and open for all to see, while at other times they will lie beneath the surface of day-to-day events. For example, relations in meetings may be governed by various hidden agendas of which even the participants are unaware. In some organizations disputes may have a long history, decisions and actions in the present being shaped by conflicts, grudges, or differences that others believe long forgotten or settled. The manager of a production department may align with the marketing manager to block a proposal from the production engineer not because he disagrees with the basic ideas, but because of resentments associated with the fact that he and the production engineer have never gotten along. Though such resentments may seem petty, they are often powerful forces in organizational life.

A number of individual and organizational factors contribute to political behavior

1. **Pyramid-shaped organization structure:**

   A pyramid concentrates power at the top. Only so much power is therefore available to distribute among the many people who would like more of it.

2. **Subjective standards of performance:**

   People often resort to organizational politics because they do not believe that the organization has an objective and fair way of judging their performance and suitability for promotion.

3. **Environmental uncertainty and turbulence:**

   When people operate in an unstable and unpredictable environment, they tend to behave politically. They rely on organizational politics to create a favorable impression because uncertainty makes it difficult to determine what they should really be accomplishing.

4. **Emotional insecurity:**

   Some people resort to political maneuvers to ingratiate themselves with superiors because they lack confidence in their talents and skills.

5. **Manipulative tendencies:**

   Some people engage in political behavior because they want to manipulate others, sometimes for their own personal advantage.

6. **Disagreements that prevent rational decision making:**

   Many executives attempt to use rational criteria when making major decisions, but rational decision making is constrained by major disagreements over what the organization should be doing.

Political Strategies and Tactics

To make effective use of organizational politics, leaders must be able to make appropriate use of specific political strategies and tactics. Remember that ethical behavior is regarded as an important requirement for effective leadership.

As one of many guidelines, The Center for Business Ethics at Bentley College has developed six questions to help evaluate the ethics of a specific decision. Before engaging in a particular influence act or political tactic, they recommend that a person seek answers to the following questions;

* Is it right? (based on absolute principles of moral rights)
* Is it fair? (based on absolute principles of justice)

* Who gets hurt? (the fewer the better)
* Would you be comfortable if the details of your decision or actions were made public in the media or through electronic mail? (based on the principle of disclosure)
* What would you tell your child, sibling, or young relative to do? (based on the principle of reversibility)
* How does it smell? (based on common sense and intuition)

Let's look at a representative group of political tactics and strategies, categorized in the following two sections as ethical or unethical, although many of the strategies and tactics could fall into either category, depending on motivations and methods of implementing them. Used with tact, diplomacy, and good intent, ethical influence tactics can be quite effective. Sequencing of tactics is another important consideration. In general, it is best to begin with the most positive, or least abrasive, tactic. If you do not gain the advantage you seek, proceed to a stronger tactic. Also, begin with low-cost, low-risk tactics.

Essentially Ethical Political Strategies and Tactics

This section describes a sampling of ethical political behaviors, divided into three related and overlapping groups: strategies and tactics aimed at (a) directly gaining power, (b) building relationships with superiors and coworkers, and (c) avoiding political blunders. All of these approaches help a leader gain or retain power. They also help the leader cope with the fact that organizations are not entirely rational.

Strategies and Tactics Aimed Directly at Gaining Power. It could be argued that all political tactics are aimed at acquiring and maintaining power, if we consider power in a broad scope. Tom Peters says that, although power can often be abused, it can also be used to benefit many people, "and as a career building tool, the slow and steady (and subtle) amassing of power is the surest road to success."

1. Develop Power Contracts & Relationships. One way to develop these contacts is to be more social, for example, throwing parties and inviting powerful people, although they may not be available.
2. Once a person has impressed management with his or her ability to solve an important problem, that person can look forward to working on problems that will bring greater power.
3. Keep Informed. It is politically important to keep informed. Successful leaders develop a network to help them keep abreast, or ahead, of developments within the firm. For this reason, a politically astute individual befriends key staff members and executive administrative assistants, for example.
4. The vital information they control is knowledge of whom to contact to shorten some of the complicated procedures in getting government contracts approved.
5. Control Lines of Communication. Related to controlling information is controlling lines of communication, particularly access to key people. Administrative assistants and staff assistants frequently control an executive's calendar. Both insiders and outsiders must curry favor with the conduit in order to see an important executive.

Strategies and Tactics Aimed at Building Relationships. Much of organizational politics involves building positive relationships with network members who can be helpful now or later. This network includes superiors, subordinates, other lower-ranking people, coworkers, external customers, and suppliers. The following are several representative strategies and tactics:

1. Provide Favors and Develop Ingratiation. A skillful leader always has a positive balance of favors given, and can draw on that balance when something is needed in return.
2. Display Loyalty. A loyal worker is valued because organizations prosper more with loyal than with disloyal employees. Blind loyalty--the belief that the organization cannot make a mistake--is not called for; most rational organizations welcome constructive criticism. An obvious form of loyalty to the organization is longevity, although its value varies.

3. Develop a Reputation as a Subject Matter Expert. Expertise is one of the major sources of power. Others come to and ask help from an expert.

4. Rational Persuasion. Using this form of influence helps create an impression that you are reasonable and fair, and also avoids creating resentment that can result from heavy-handed influence tactics.

5. Manage Impressions of You. Impression management includes behaviors directed at enhancing one's image by drawing positive attention to oneself. Although this can deal with clothing and grooming, it also deals with deeper aspects of behavior, such as speaking well and presenting one's ideas coherently. Another part of impression management is to tell people about your success or imply that you are an "insider."

6. Bring in Outside Experts for Support. To help legitimate their positions, executives will often hire a consultant to conduct a study or cast an opinion. One possible problem to avoid is that, consciously or unconsciously, some consultants may slant things to support the executive's position. This tactic would be considered unethical if the executive is intentionally seeking a non-objective opinion.

7. Consult With and Ask Advice of Others. Consulting with others, even when not required, helps build support for a decision or action. Consulting and asking advice on work-related topics builds relationships with other employees. Asking another person for advice--someone whose job does not require giving it--will usually be perceived as a compliment, and asking advice transmits a message of trust in the other person's judgment.

8. Ask Satisfied Customers to Contact your Boss. A favorable comment by a customer receives considerable weight because customer satisfaction is a top corporate priority. If a customer says something nice, the comment will carry more weight than one from a coworker or subordinate.

9. Be Courteous, Pleasant, and Positive. It has been argued that courteous, pleasant, and positive people are the first to be hired and the last to be fired (assuming they also have other important qualifications).

10. Send Thank-you Notes to Large Numbers of People. One of the most basic political tactics, sending thank-you notes profusely, is simply an application of sound human relations. Many successful people take the time to send handwritten notes to employees and customers to help create a bond with those people.

11. Flatter Others Sensibly. Flattery in the form of sincere, specific praise can be an effective relationship builder. By being generous in your positive feedback and comments, you can build relationships with work associates and make them more receptive to your ideas.

12. Develop Coalitions. Sometimes coalitions are initiated by less powerful actors who seek the support of others. At other times they may be developed by the powerful to consolidate their power. Whether formal or informal, confined to the organization or extended to include key interests outside, coalitions and interest groups often provide important means of securing desired ends.

Avoiding Political Blunders. A strategy for retaining power is to refrain from making power-eroding blunders. Committing such politically insensitive acts can also prevent one from attaining power. Several leading blunders to avoid are described next.

1. Embarrassing or criticizing the boss in a public forum. One of the oldest saws in human relations is to "praise in public and criticize in private." Yet, in a moment of anger or stupidity, we may blurt out something that can be costly.

2. Surprising the boss. Surprises, particularly negative ones, are not appreciated.

3. Bypassing the boss. Protocol is still highly valued in a hierarchical organization. Going around the boss to resolve a problem is therefore hazardous. You might be able to accomplish the bypass, but your career could be damaged and your recourses limited.

4. Declining an offer from top management. Turning down top management, especially more than once, is a political blunder. You thus have to balance your other interests against the blunder of refusing a request from someone powerful in the organization. An increasing number of managers and professionals today decline opportunities for promotion when the new job requires geographic relocation. For these individuals, family and lifestyle preferences are more important than gaining political advantage on the job.

Potentially Unethical Political Strategies and Tactics

Any technique of gaining power can be unethical if practiced in the extreme and with negative intentions. For example, a person who supports a boss by feeding him or her insider information that could affect the price of company stock is being unethical. Some approaches are almost unequivocally unethical, such as those described next. In the long run they can erode a leader's effectiveness by lowering his or her credibility.

1. **Back Stabbing**. The ubiquitous back stab requires that you pretend to be nice, but all the while plan someone's demise. A frequent form of back stabbing is to initiate a conversation with a rival about the weaknesses of a common boss, encouraging negative commentary and making careful mental notes of what the person says. When these comments are passed along to the boss, the rival appears disloyal and foolish. Email has become a medium for back stabbing. The sender of the message documents a mistake made by another individual and includes key people on the distribution list. A sample message sent by one manager to a rival began as follows, "Hi, Sam. I'm sorry you couldn't make our important meeting. I guess you had some other important priorities. But we need your input on the following major agenda item we tackled . . . ."

2. **Purge All But Loyalists**. The ancient strategy of purge those you have conquered suggests that you remove from the organization rivals who suffered past hurts through your efforts; otherwise the wounded rivals might retaliate at a vulnerable moment. This kind of strategy is common after a hostile takeover or even a merger of equals, e.g., the purge of former Chrysler Corporation executives by the former Daimler-Benz executives after the merger to form DaimlerChrysler.

3. **Set a Person Up for Failure**. The object of a setup is to place a person in a position where he or she will either fail outright or look ineffective. For example, an executive whom the CEO dislikes might be given responsibility for a troubled division whose market is rapidly collapsing. The newly assigned division president cannot stop the decline and is then fired for poor performance.

4. **Exert Undue Pressure**. Even if you have the power to do this, it would be unethical if used to further your interests at the expense of others. In any case, it may have longer-term repercussions.

5. **Divide and Conquor**. An ancient military and governmental strategy, this tactic is also used in business. The object is to have peers struggle among themselves, therefore yielding the balance of power to another person. If team members are not aligned with one another, there is an improved chance that they will align with a common superior. One way of getting subordinates to fight with one another is to place them in intense competition for resources.

6. **Play Territorial Games**. Also referred to as turf wars, territorial games involve protecting and hoarding resources that give one power, such as information, relationships, and decision-making authority. A relationship is "hoarded" in such ways as not encouraging others to visit a key customer, or blocking a high performer from getting a promotion or transfer. Other examples of territorial games include monopolizing time with clients, scheduling meetings so someone cannot attend, and shutting out coworkers from joining you on an important assignment.

Effects of politics on organization and employees:

1. **Decrease in overall productivity**
   - Politics lowers the output of an individual and eventually affects the productivity of the organization.
   - Common observation says that individuals who play politics at the workplace pay less attention to their work.
   - They are more interested in leg pulling and back biting. They spend most of their times criticizing their fellow workers.
   - As a result of politics at the workplace, employees fail to achieve targets within the stipulated time frame. Work gets delayed in such an organization.
2. **Affects Concentration**
   - Individuals find it difficult to concentrate on their work. They are more interested in spoiling the other person's image in front of the superiors.
   - An individual involved in politics is bound to make more mistakes as his focus is somewhere else.
3. **Spoils the Ambience**
   - Politics leads to a negative environment at the workplace.
   - It spoils the relationships amongst individuals. An individual playing politics at the organization is disliked by all.
4. **Changes the Attitude of employees**
   - Politics changes the attitude of the employees.
   - Even the serious employees lose interest in work and attend office just for the sake of it.
   - Internal politics do not allow employees to give their hundred percent at work.
   - No matter how much hard work an employee puts in, it goes unnoticed in a politically driven organization.
5. **Demotivated employees**
   - A non performer can be the apple of his boss's eye simply due to politics, thus demotivating the performers.
   - Discussions are essential at the workplace to extract the best out of employees. Evaluating the pros and cons of an idea always helps in the long run. Employees playing politics always look for an opportunity to tarnish the image of the fellow workers.
   - Employees feel demotivated when they are not rewarded suitably or someone who has not worked hard gets the benefits due to mere politics.
6. **Increases Stress**
   - It is rightly said that problems evaporate if discussed. Individuals find it difficult to confide in any of their fellow workers due to the fear of secrets getting leaked.
   - Politics increases the stress level of the employees. Individuals are not machines who can work continuously for 8-9 hours without talking to others. It is important to have friends at the workplace who help you when needed.
   - Individuals fail to trust each other.
7. **Wrong Information**
   - Employees indulged in politics manipulate information and it is never passed on in its desired form.
   - Superiors get a wrong picture of what is actually happening in the organization.
   - A wrong person walks away with the credit in an organization where employees are indulged in politics.

2.5 LOGICAL INCREMENTALISM

Logical incrementalism is the evolution of strategy as a result of experimentation and consensus (Johnson, Whittington & Scholes, 2011). Logical Incrementalism allows strategy to be synthesised and coordinated into a single coherent direction by using as many known multi-dimensional inputs as possible in the conceptualisation process to shape the overarching goals (Kippenberger, 1998). This means incrementalism is relevant in a market that has a high degree of dynamism and where financial and other resources are neither rich nor abundant. It allows leaders to shape overarching goals that encourage creativity in their execution. This decision making style allows for the most informed decision possible, whilst not locking the decision in until the last practicable moment. The immediacy of the decision to the execution allows the strategist to anticipate the uncertain, the known unknowns rather than trying to guess at the unknown unknowns (Rumsfeld, 2002).

The focus on including as many variables as possible being generated and analysed by the stakeholders means it incorporates and underpins elements of a risk management approach to strategy creation. This is achieved by experimentation until the best possible options are found, which allows early identification of possible issues. It creates awareness and encourages convergent behaviour within the organisation because the stake holders understand the possible benefits and consequences. The small step of incrementalism gives time for behavioural adaptation and avoids the alienation created by the culture destruction of comprehensive changes. The consultative style required creates stakeholder engagement with the emergent strategy. This means it has a built in understanding which allows adaptive adjustment after any internal or external shocks.

The elements through which intended strategy can be developed include strategic leadership. This involves an individual or small team creating the strategy. There is a balance between organisational adaptability, flexibility and providing overarching direction in the chaos and inhibiting individual motivation, creativity and engagement (Johnson, Whittington & Scholes, 2011). Strategic planning systems are another element and are the structured procedures used to create strategy. This is suitable for an organisation with centralised power in a stable environment. It requires decisions to be made on unknowns because it looks at longer time frames (3-5 years) and relies on managers "knowing all" (Obeng & Ugboro, 2008). The final way strategies are materialised is an externally imposed strategy. This is when an exogenous entity, such as governments, parent companies, receivers or venture capitalists forces their own agenda on the company's strategy (Johnson, Whittington & Scholes, 2011).

Whilst Incrementalism is underpinned by the learning aspect of the strategy development framework the political process for strategy development considers the determinates of successful engagement and manipulation of the process by diverse human agendas. It acknowledges that factional tension within the organisation will be a powerful driver of the overall strategy development. Depending on the dominance of the stakeholders these power plays will be an amalgam of compromises. They will be generated by personal experience, competition for resources, relative influence and access to information. Strategy informed by prior decisions identifies that all strategy development emerges and is influenced by the constraints from which it was created. No organisation creates strategy in a bubble; it is collective collaboration of people and resources. The history, richness and synergy of the people and resources will create path dependencies and a culture that will adapt and be adapted by the development of strategy. The last option is the organisational system for the creation of strategy. This identifies that strategy can be created within the organisation surrounded by a local context. It will be created from a combination of culture and environment at a grass roots level. This approach has a strong focus on endogenous and localised issues which will be seen from within the paradigm of the creator: for example marketing, sales, finance, human resources, etc. This means the creator may not have considered the integration implications for the whole organisation. This may have unexpected ramifications and consequences. In turn this may alienate stakeholders that have had no influence on the strategies creation (Johnson, Whittington & Scholes, 2011).

The capacity of an organisation to achieve continuity of its strategy is contingent on many factors. This is referred to in literature as its ambidexterity. It identifies the organisations capacity to tolerate the ambiguity of the "dual searches for certainty and flexibility". This contradiction will be displayed by the organisations aptitude at efficiently exploiting its current resources whilst having the flexibility to explore new opportunities (Bodwell & Chermack, 2010). This could manifest itself in the organisational structure by running different structures in different aspects of the organisation. It will be tightly controlled and hierarchical whilst trying to exploit its current resources and flexible and flat in the exploratory areas such as taskforces and teams. Within each team the acceptance and encouragement of diversity allows well managed cognitive dissonance to become a force for creativity. The implications for leadership include the required capacity to tolerate and encourage a diversity of opinions and the aptitude to make the balance between the two systems and champion the learning created. These capabilities ensure the stability and progress of the strategies of the organisation.

Underpinning Google's strategy development is a combination of strategic leadership and incrementalism. This strategy is rooted in their history and been allowed to continue because of their high profitability. It has been developed by creating a two tier structure where the directors are removed from the shareholders. This allowed the directors a degree of creative freedom that gave rise to a flatter more autonomous, team based structure than American shareholders would normally have been comfortable with (Johnson, Whittington & Scholes, 2011). This creates a cultural platform that attracts the best American people which drives the strategy creation process. The managers are then given broad overarching goals (organise the world's information) and the space is then allowed for strategy to emerge (Bodwell & Chermack, 2010). The strategies created need to be embraced collectively so they are peer reviewed before they are accepted. The computing focus within the company means the peer review will be assisted by artificial intelligence and include data analysis (Claburn, 2006). There are many projects created and released in a 'buggy' beta form, 'fixed' from consumer input and 'killed' if there is not enough end user interest or uptake (Techcrunch, 2010). While the strategies seem to be a very lightly controlled incrementalist attitude toward strategy development this just means the company has focused on other aspects of the business to retain control. Therefore many of the backend systems are 'formulaic and rigid'. For example: they have maximum teams of six, deadlines are extremely short and every aspect of the organisation possible is measured and systemised. The company's strategic

development style has come at a cost. The overall strategic direction and accountability can get lost within the organisation. At this stage it has only had bizarre consequences such as the patent for the name Google not being renewed in Germany. In the longer term as the company moves into other aspects of computing it may have more dire outcomes? The high failure rate of projects within the organisation sometimes forces the company to create expensive patches, for example buying You Tube ($1.65 billion) to overcome the failure of Google Video. Also by sticking with strongly American cultural norms the company has upset the Chinese government and potentially alienated large potential markets such as China. Whilst the current approach has many weaknesses it allows for an inbuilt risk management attitude. It ensures that the failures are only a small percentage of the business and allows for the organisation to retain its ambidexterity. The deep level of knowledge and learning created by the incrementalism strategy has allowed the company to exploit it resources very effectively. This creates rising quarterly profit and earnings per share. While effected by many things the success and potential of the strategy is reflected in the share price. The initial public offering for Google was $US85, Google is currently trading at $US 598.67 (Google, 2011).

Quinn (1978) studied strategic management process of a range of companies and found that strategies of most of the companies do not come to existence by following a long term plan or merely a positioning approach or follow just environment led or resource based approach. Quinn (1978) coined the term **'Logical Incrementalism'** to explain how the strategies of companies come in existence in real world.

Logical Incrementalism approach towards strategic management is that strategies are not formed and come in existence as some long term plans which are made once a while and then whole organization starts working on them. Rather strategies emerge over time in an incremental way. However, this incremental way is not random but logical as top managers make changes and take strategic decision as they learn by implementing small steps of strategies. There is constant critical evaluation of all the decisions that are taken to come to a realized strategy for businesses.

Strategies are made over a period of time and strategists formulate strategies by searching, experimenting, learning and not being tied to any one course of action. Process of strategic management is scattered, small steps and unstructured approach. Realized strategies of companies, according to Quinn (1978) are partly random and partly logical.

This approach helps companies to reduce risk in strategic decisions though managers may focus more on taking short term decisions. Companies also take investment decisions more prudently for strategic decision as they learn from their past decisions. Managers are expected to take decisions proactively as they come in terms with results of internal decisions and change in environment. In this approach towards developing strategies, managers are continuously negotiating with stakeholders to make a consensus for strategic decisions and a 'muddling through' approach in a logical manner is followed.

INDITEX - a very good example of the "logical incrementalism

Within the organization, a host of behavioural, social, and political factors influence the strategy making process. Instead of being a comprehensive, planned, and rational process, strategy making can sometimes be disjointed and incremental. Quinn (1980) used the term logical incrementalism to describe such processes. Logical incrementalism acknowledges that organizational goals are complex, changing, and unclear. It involves artfully blending formal analysis, behavioral techniques, and power politics to move organizations toward broadly conceived goals. In this process, strategy formulation and implementation are not separate; rather, they are integrated into a single-decision making process.

The famous clothes firm INDITEX is a very good example of the "logical incrementalism" in the global economy.

Logical incrementalism explains strategy as a process that is clarified and defined incrementally with the unfolding of events. In this strategy process paradigm, managers strategize effectively by curbing or avoiding irreversible commitments at the outset, treating newly formed problem resolutions as tentative, and making intentions concrete and tying them to particular details gradually. Such a process gives them time to improve the quality of information used in their decisions and manage the practical realities

associated with their strategic goals. This theory of logical incrementalism is an extension of Lindblom's suggestion (1952) that policy makers "muddle through" their decisions, relying upon the recognition of feasible constraints, the restriction of their attention to relatively few items among numerous alternatives, and the initiation of small decision steps to find a workable solution to complex policy issues. Within the logic of Quinn's logical incrementalism, strategy is as a process that is more fluid and evolving than a formal plan, but, nevertheless, a process that has clear priorities and intentions. Conceptions of emergent and incrementalist strategies present together a management paradigm that emphasizes the bounded rationality of decision makers and how decision makers cope with uncertainty and complexity while remaining committed to their strategic objectives.

According to Quinn the logical incrementalism managed of correct form, it allows the director to combine the contributions of the rational and systematic analysis with the concepts on the organizational behaviour. Also it allows managers to obtain connexion and identity with new courses, so as to face relations of being able and to necessities of individual conduct. The logical incrementalism makes possible the use of the best reconnaissance datas and analytical, and therefore the main decisions in the company.

The ideas of Mintzberg complement the ideas of Quinn. But a difference exists that deserves to be considered. Whereas both agree in the strategic process like an instance of evolution of learning, Quinn tends to give more importance to the paper of the main executive, and the CEO, considering the main strategy. On the other hand Mintzberg tends to attribute greater importance to other elements that can introduce the hierarchy in the strategic decision making. In effect, for Mintzberg the organizations can have general managers that they down raise their visions of the strategy from the top managers to medium managers, and at the same time that the creative personnel send strategies in inverse sense.

STRATEGIC DECISION MAKING IN THE MARKET

Development of Strategies

In order to be able to develop an agreed strategy to the necessities of an organization, it is fundamental to take into account some variables and factors that determine the functionality and the efficiency of these strategies with base in the structure of the company. The quantitative, qualitative, organizational factors and the relative ones to the power and the behavior are due to take into account, that are those that often determines the success of a strategy in a specific situation.

These elements have improved the understanding of which they are the multiple structures of organization goals, the policy of the strategic decisions, the executive processes of negotiation and commitments, the satisfaction in the decision making, the paper of the coalitions in the administration strategic and the practice "to confuse" in the public sphere.

In this one sense, important findings exist:

- Neither the paradigm of "being able and behavior" nor the one of the "formal systems" of planning characterize in suitable form the way in which the successful strategic processes work.
- The effective strategies tend to arise from a series of "strategic subsystems", each one of which approaches a specific class of strategic tasks, of disciplined way, but which they are condensed and they increased opportunely in a coherent pattern who transforms itself into the strategy of the company.
- The logic that it sustains to each "subsystem" is so strong that, to a certain extent, it can serve like normative approach for the formulation of key elements of the strategy in great companies.
- Due to cognitive and procedural limits to each other they have to be directed and to be related by a designated approach "logical incrementalism".
- This incrementalism is not "confusion". It is a propositive, effective and proactive approach administrative that tends as much to the improvement and the integration of the analytical aspects of the formulation of the strategies.

The critical aspects strategic to consider are the following ones:

- Global organizational structure or its basic administrative style
- Relations with the government or other groups of external interest
- Practices of acquisition, reincorporation or of divisional control
- International relations and positions
- Capacities of innovation or personal motivations affected by the growth
- Relations of workers and professionals reflecting changing expectations and social values and
- Advance technological environment

Often external or internal events, on which the administration essentially does not have control some, precipitate urgent, fragmented and temporary decisions that without remedy, conform the future strategic position of the company.

The companies require a incremental process to handle the crucial psychological changes and of power that the global direction of the program and its consequences determine. These processes contribute to unify the analytical aspects of the diversification decisions. They generate a wide consensus, the attitudes of acceptance of risks, the flexibility of the organization and the resources, and the adaptive dynamism conceptual that determine, as much the sequence as the direction of the diversification strategies.

Most important of these processes are:

- The generation of a genuine psychological commitment and the highest level with the diversification.
- The conscious preparation to act according to the opportunity.
- To establish a factor of comfort when assuming risks.
- To develop new customs.

Each one of the processes interacts to each other, and among them they affect the sequences of action, the passed time, and the final results, always of unexpected way.

As far as the system of reorganization on great scale, the great organizations changes are integral part of the strategy. Sometimes, those changes constitute a strategy in themselves; in others, they precede or they precipitate the sprouting of a strategy, and other times they allow to the implementation of a strategy. Nevertheless, like it happens with many other strategic decisions, the macro organizations changes happen in incremental form and outside a formal process of planning.

The formal planning in all corporative strategy must provide a discipline that forces the administrators to visualize periodically and carefully towards ahead, to demand rigorous communications about the strategic goals, aspects and allocations of resources, to stimulate analysis of greater terms of those than they would be made in other circumstances, to produce bases to evaluate and to integrate the short term plans, to extend the time horizons and to protect the long term investments, such as the investigation and the development, as well as to generate a psychological heap and an informative frame of reference about the future with which the managers can decide in the short term.

As far as the decision making, programs of reduction of costs are due to sharpen the annual commitments, to formalize and of helping to implant strategic changes, since the planning occurs from the general position of the organization.

The strategy has to do with the stranger, more than with the uncertain thing. It implies so numerous forces and strengths that cannot be predicted the events. The logic experimentally imposes the behaviour of flexible way and, the general concepts towards the specific commitments, making specific them more soon possible with the purpose of diminishing the uncertainty margin, as well as to benefit to us from the best information than can be obtained. This process is called "logical incrementalism".

The incrementalism is a conscious, propositive form and proactive of the good management. Managed on the right way, it allows the executive to combine the contributions of the rational and systematic analyses, political theories and being able, and concepts on the organizational behaviour. It allows the executive to obtain connection and identity with new courses. It allows him to fight with relations of being able and individual necessities, and to use the best data, analytical news and, and thus to choose his main attachment lines.

In order to be able to know an organization we must know its systems and the connections that exist between the thought and the action, to obtain a good strategy. The notion of which the strategy is something that must happen in high levels, very far from the details of the daily activity of an organization, is one of the greatest deceits of the conventional strategic administration. That explains great part of the failures in the business.

In this one sense, the effective strategies can arise in the strangest places and be developed by average more unforeseen expenses. An optimal method does not exist to develop a strategy.

Some strategies feel roots in several places anywhere or in where people are able to learn. These strategies happen in organizations when they become collective, when its proliferation is translated in guide of the behaviour of the organization as a whole.

In a company, it must have change. The change must be continuous and the organization must be in constant adaptation. This must not to that formality at the moment does not exist for implementing a strategy, but to that the market and the industry they change constantly and like company, we must ourselves adapt to the changes that they indicate to us, or of national or international way.

What it does not manage to include the conventional vision is the knowledge how and when to promote the change. A fundamental dilemma of the development of the strategies is located in the necessity to conciliate the change and stability forces, to focus the efforts and to increase the operative efficiency on the one hand, and at the same time to adapt, and to stay to as much of an external and changing atmosphere.

What the quantitative theory suggests is that the new strategies, are conserved in revision in some corner of the organization until a strategic revolution becomes necessary. As the old established strategy is disintegrated, the seeds of the new one begin to open themselves.

In more creative organizations we see a pattern somewhat different from change and stability, a pattern more balancing. Or by means of quantitative revolutions or by cycles of convergence and divergence, the organizations seem to have will separate the time the basic forces of the change and the stability, having conciliated them by means of a subsequent attention to each one of them. Multiple strategic failures are attributable or to the mixture of these forces, or to the obsession by one of these forces to expenses of the other.

To govern a strategy is then to conform a pattern of thought and action, control and learning, as well as stability and change. The administrators must be dedicated, to count on experience, mutual understanding with the material, to have a personal touch, dominion of details and a sense of harmony and group integration. They must be sensible to his surroundings and to recognize other factors that help him in the elaboration of new strategies.

The strategic planning has to be recognized reason why it is: means, do not stop to generate strategies, but to program a created strategy previously, to determine its implications of formal way. In essence, it is of analytical nature, one is based on the decomposition: whereas the strategy creation is, in essence a synthesis process. For that reason it is that the attempt to generate strategies by means of the formal planning takes almost always to the extrapolation of the existing strategies or to the copy of those of the competition.

The administration in this context implies the creation of a climate in which grows the strategies. In more complex organizations, this means the construction of flexible structures, the creative hiring of personnel, the definition of ample strategies and the observation of emergent patterns.

The essential logic of the integral administration consists of that the administration of high level creates a vision or a dream, and the administration of the medium level creates and implants concrete concepts to solve and to surpass the contradictions that emanate of emptiness between which it exists at the moment and what the administration hopes to generate. The administration of high level creates a global theory, whereas the administration of medium level creates a theory to medium term and it on approval puts under it of empirical form in all the organizational structure.

The administration of the center upwards and downwards, is a type of information generation that concerns to the totality of the organization. He is able to give body to the essence of an organization, which survives, of spontaneous way, in the incessant generation of changes that take place in the scope of the businesses.

In the development of a strategy different variables take part that do not have to be followed like a general rule since each organization counts on a structure and a system different from others. All the elements that conform to a company handle of different way in their respective circles, from their organizational culture, the behaviour of the employees, the systems which they use, etc.

It is for that reason that before developing a strategy we must know well our organization from the roots and start off of proposing strategies there, raising objectives, and to cause that she is really successful.

PRACTICAL CASE

The beginning

Galicia is a region of Spain not used to the enterprise successes. It is not necessary more to throw a glance to the daily press to be convinced that those products that present/display certain competitive advantages for the companies of the region specially have been flagellated by most recent of the fatalities. For that reason, when a native company acquires remarkable dimensions in the outside, it does not let cause a certain perplexity between his natural ones. This is the case of the group (Inditex), more known by its more important branch Zara, that has also surprised academic analysts and by its fast positioning in the international market. Selling domestic preparation in the local market during the Sixties, it has happened to design, to produce and to distribute all type of articles to dress and complements for the consumption masses in more than 30 countries three —in three continent—, competing advantageously with leaders, like the American Gap or the Swedish Hennes & Mauritz, and surpassing to which until not long ago they were located between most excellent.

In fact, this has turned it the first regional company/signature in terms of consolidated net benefits, very in front of our greater company in invoicing like Citroen.

The origins of the group it is necessary to name the figure of his president, who, in the strictest American tradition, was a perfect stranger. Without no familiar precedent in the business of the textile, Amancio Ortega Gaona parked in him of a very circumstantial way, something that remembers the biographies of the company men which they recreated the factories of Hollywood: by the end of the 50 —he was a simple sales assistant— of some of the first stores of preparation, like Gallic Shirt shop, the Foam or the emblematic establishment the Smart one. In this surpassed platform it acquired a valuable professional experience, from the contact with the tendencies of the recent fashion of masses until the direct access to the manufacturers of weaves and the networks of distribution. There it learned to know first hand the preferences of the consumers and to value what meant its fast satisfaction in opportunity terms. It thus had some of the keys of the success that in the future would mark the character of their activities, but also, of the indispensable formation in all businessman.

His first attempts as entrepreneur began of very modest way, first in the familiar house —with the only aid of his wage—, arranging the work for others with the own one; soon in the rented commercial premises, experiencing in designs of dressing gowns and lingerie. Their contacts with Catalan and Valencian weave manufacturers gave access him to prices of wholesaler. To obtain a perfect advantage of those fabrics on which the thousand of times patterns re-design themselves to optimize their use eliminating

remnant, to make them and to distribute them without intermediation between their old clients they allowed him to sell to prices without competition.

With the benefits of the familiar activity, Ortega gave the jump in 1963 to a production of greater scale and thinking about the consumption of masses. He started with about 125 employees until reaching the 380, and it commercialized lingerie and feminine clothes of his seal between retailers, wholesalers, power stations of purchase, some of foreign them, and more ahead between the great distribution centers as Simago, Carrefour, Auchan that at that time they began to emerge in the Spanish market. Its business already integrated the activities of design and preparation (the societies Goa and Noite for lingerie and Samlor for other feminine articles), whereas the weave supplying and the distribution depended basically on outer operators. The development of a primitive vertical integration data of 1975, after the creation of the first Zara store in A Coruña to commercialize articles of woman, man and boy, a segment of the market that covered an emergent demand of clothes with acceptable design and quality to reasonable prices. One was a segment that already satisfied Gap and The Limited in America and C&A in Germany. This way the distribution to the productive cycle was gotten up. It was the first time that was made something similar in the sector of the fashion.

The establishments of Ortega, nevertheless, had reunited in a single company/signature both functions, reason why it had margins greater than his competitors and could, therefore, sell to lower prices. The initial advantage with which it concurred allowed Ortega to establish the Goasam society the following year, in Arteixo (A Coruña), like proprietor of Zara, that already conformed a small commercial chain in the city. Great part of the success achieved about its stores in the regional market derived from an suitable election of the location place: since it did not emit publicity by saving of costs, they had to be located in centric places, very concurred by the type of public to whom it went directed the product, and to have the reclamation of and obtained attractive, very conceptual powerful a showcase of with means economy.

But it was not tried so single to approach the supply the consumers, but also to know its preferences and, mainly, to give a fast answer them in form of the wished merchandise. And next to this, stock zero. Ortega was well-known, by the contact and the experience acquired with its old businessmen, the disadvantage who supposed the not selled ones in terms of immobilization of operating capital: or the warehouse was eliminated quickly or had left the condemned for always. This way, most of the elements that were going to define the future character of their societies was already in embryonic form in the management of Goasam: on the one hand, the procedure just in Time that made possible the fast satisfaction of the preferences of the consumers, a Japanese invention that Ortega had discovered of intuitive way; on the other hand, the vertical integration of the design processes, production and distribution.

With this powerful armament, the local and regional market appeared already small to the height of the first eighty. It was, then, necessary to initiate the expansion in the Spanish market, for which it counted on the collaboration of a first group of managers (partly, coming from the staff of the School of Enterprise Studies of A Coruña). This aid was fundamental, because in the jump of the familiar company/signature to the one of greater scale it was where many tannings failed businessmen. Ortega, however, knew to make it of reasonable way, delegating functions in those activities that did not dominate.

In order to give cover to this transition it arose in 1985 Inditex, that happened to be the first society and supposed a flexion point. It for the first time increased his capacity productive of excellent way, something in which had much to do the reformulation of the own design, that had held fast and purified of progressive way, and the deflection from the production, and dislocation towards particular factories and the cooperative premises, created to the margin of holding. But also it was the moment at which Zara expanded by the peninsular territory in search of a market of masses, installing points of sale in the main capitals of province. In 1985 the group already had seven companies of preparation, almost 1,100 employees and 41 establishments in all Spain. This domestic expansion demanded of an investing effort for which rarely outer resources looked for, reason why it was come from one double way. On the one hand, one gave up to distribute dividends, something that was not complicated since the number of

its shareholders agreed the familiar nucleus. The other base of the financing came from the high level of liquidity that reported the numerous points of sale of Zara and which they allowed, together with the part of the benefit non distributed between the shareholders, to finance its growth in the Spanish market.

Expansion

At the end of the Eighties, the vertical concentration of the companies of Ortega advanced with safe and determined step and included own design, preparation, commercialization and distribution. Nevertheless, the increasing saturation and maturity of the Spanish market induced to modify the growth strategy. The group already was prepared to initiate his first outer expansion with Zara Holding B.V. with seat in Holland by tributary reasons was created from its natural exit, Portugal (1988), and shortly after the U.S.A. and France (1989). Nevertheless, the necessity to supply to an increasing number of points of sale in all Spain, as well as the first attempts to arrive at the international market had created some strangling in the productive chain, that were solved with the incorporation of several sequences of robots which they made flexible in greater measurement the manufacture processes. The system, that had been designed by the engineers of one Japanese factory of Toyota, added sensible innovations to the classic chain, created in the change of century for the factory of Henry Ford. To the servants of Toyota it was demanded to them to work of foot, which can seem tired, but turned out basic to develop a multifunctional activity. In fact all of them rotated in their positions and finished dominating the set of the cycle, without always conducting the same operation, something that in the classic chain caused serious personal pathologies. Instead of fomenting the competition, the system stimulated the cooperation and the creativity between the workers, reinforcing the equipment spirit, so that they replaced to others when it was pronounced necessary. And of the sector of the automobile for which they were created, Toyota adapted to other activities, among them the textile preparation. In 1991 they were incorporated to the production of Inditex, although only in some of the phases of the process, the cut of fabrics previously designed and the assembly of determined articles that demanded a greater rapidity from access to the market.

The rest of the most intensive operations in use were made, by independent societies and cooperatives, that little by little expanded by Galicia and north of Portugal. The incorporation of robots allowed to eliminate the stranglings in the cycle and to apply in greater degree the procedure of the JIT, but also to increase the scale of the production. That way, the expansion of the group in the outside was started again with force. In 1992 the first stores in Mexico were opened; in 1993 in Greece; in 1994 in Belgium and Sweden; in 1995 in Malta; in 1996 in Cyprus; in 1997 in Norway, Turkey, Japan and Israel; in 1998 in Argentina, United Kingdom, Venezuela, Lebanon, Dubai, Kuwait and China; in 1999 in Holland, Germany, Poland, Saudi Arabia, Bahrein, Canada, Brazil, Chile and Uruguay and, finally, in 2000 in Austria Denmark, Andorra and Qatar, until entering something more than 1,000 establishments to end of year. Inditex operates in three continent countries and has managed to penetrate in 4 of the European markets nails: France, Germany and United Kingdom. This year also did it in Italy, an area of highest barriers of entrance.

The complexity of the distribution system arrived at such levels of answer that was precise to create a logistic center totally computerized (1995), and a system of telecommunications integrated, to unite the central seat of Inditex in Arteixo with the supply centers, production and sale anywhere in the world. The costs of the international expansion of first half of the 90 were remarkable and they were pronounced in a greater indebtedness and a smaller growth of the benefits between 1992 and 1995. In order to free itself of the dependency of the short term credit to that they had resorted, it was able to contract credits multidescries in the long term with JP Morgan. With regards to the benefits before taxes, they managed to go back as of 1996 by the route of the greater invoicing than it provided the international expansion to him. The competitive advantages a modest business arisen in the Sixties in a small capital of province without hardly textile tradition has managed to reach to the multinationals that lead the sector of the preparation in a global economy.

Conclusions

Up to here one is a history that has precedents. Nevertheless, its endurance and growth in which they seem to be the beginnings of a recession cycle, that has lowered to some of its competitors and fact to

back down to many others, are what surprises academic analysts and who ask themselves for the keys of this situation. In synthesis, these keys can be detected as much from the supply as from the demand. It is clear that a flexible production, when assuring at every moment the exact finished product, provision, amount and variety that the market demand, avoiding the storage cost and obsolescence that in the textile is unbearable, constitutes one of the factors of its success. Nevertheless, it is also a practice that uses their competitors. The advantage of Inditex resides here in the high levels of flexibility that can reach, which obtains by means of a multiple strategy. In the first place, through the vertical integration of its companies, that include the production processes, but single partly, the one that supplies to the more dynamic commercial operator (Zara). Secondly, the introduction of the procedure JIT, that allows to modify "Just in Time" the own production based on the changes observed in the behaviour of the consumers.

The creation of a computerized logistic center, that communicates with each the points of sale in the world, conforms a third element that makes flexible the production makes possible to replace the consumed product, colours, patterns, the modifications are introduced in factory that each specific market dictates and it is known, in addition, in real time the invoicing of each one point.

Finally, Inditex has the advantage that to him the decentralization provides and autonomy of each one of its commercial seals to which the economies generated by the centralization of common services are added. The perfect knowledge of the preferences of the consumers constitutes the first competitive advantage. To know that Inditex had to add a very well-taken care of study of the peculiarities of the markets (that vary with the age, sex, culture or buying capacity, etc), based on which the different commercial seals have been designed. The fidelity of the consumers, obtained from a heterodox marketing research and of low cost, without hardly apparent publicity, finishes drawing the picture of the competitive advantages.

2.6 LEARNING ORGANIZATION

A **learning organization** is the term given to a company that facilitates the learning of its members and continuously transforms itself. Learning organizations develop as a result of the pressures facing by modern organizations and enables them to remain competitive in the business environment.

Three definitions of a learning organization

Learning organizations [are] organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together. (Senge 1990: 3)

The Learning Company is a vision of what might be possible. It is not brought about simply by training individuals; it can only happen as a result of learning at the whole organization level. A Learning Company is an organization that facilitates the learning of all its members and continuously transforms itself. (Pedler et. al. 1991: 1)

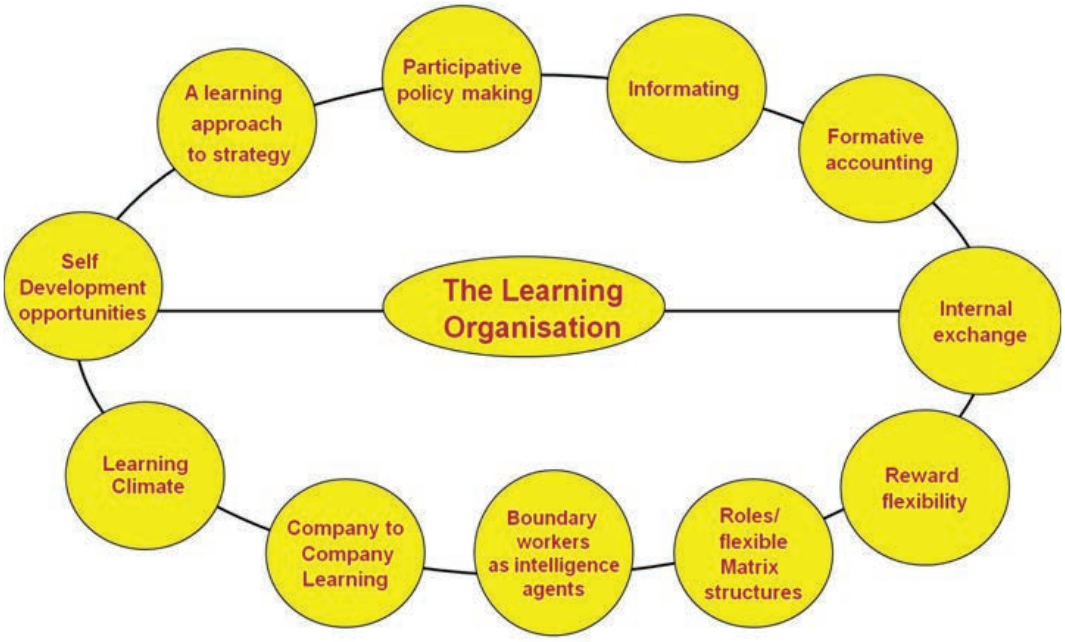
Learning organizations are characterized by total employee involvement in a process of collaboratively conducted, collectively accountable change directed towards shared values or principles. (Watkins and Marsick 1992: 118)

According to Sandra Kerka (1995) most conceptualizations of the learning organizations seem to work on the assumption that 'learning is valuable, continuous, and most effective when shared and that every experience is an opportunity to learn' (Kerka 1995). The following characteristics appear in some form in the more popular conceptions. Learning organizations:

- Provide continuous learning opportunities.
- Use learning to reach their goals.
- Link individual performance with organizational performance.

- Foster inquiry and dialogue, making it safe for people to share openly and take risks.
- Embrace creative tension as a source of energy and renewal.
- Are continuously aware of and interact with their environment. (Kerka 1995)

Organizations do not organically develop into learning organizations; there are factors prompting their change. As organizations grow, they lose their capacity to learn as company structures and individual thinking becomes rigid. When problems arise, the proposed solutions often turn out to be only short term (single loop learning) and re-emerge in the future. To remain competitive, many organizations have restructured, with fewer people in the company. This means those who remain need to work more effectively. To create a competitive advantage, companies need to learn faster than their competitors and to develop a customer responsive culture. Argyris identified that organizations need to maintain knowledge about new products and processes, understand what is happening in the outside environment and produce creative solutions using the knowledge and skills of all within the organization. This requires co-operation between individuals and groups, free and reliable communication, and a culture of trust.



Characteristics

There is a multitude of definitions of a learning organization as well as their typologies. According to Peter Senge, a learning organization exhibits five main characteristics: systems thinking, personal mastery, mental models, a shared vision, and team learning.

Systems thinking. The idea of the learning organization developed from a body of work called systems thinking. This is a conceptual framework that allows people to study businesses as bounded objects. Learning organizations use this method of thinking when assessing their company and have information systems that measure the performance of the organization as a whole and of its various components. Systems thinking states that all the characteristics must be apparent at once in an organization for it to be a learning organization. If some of these characteristics are missing then the organization will fall short of its goal. However O'Keeffe believes that the characteristics of a learning organization are factors that are gradually acquired, rather than developed simultaneously.

Personal mastery. The commitment by an individual to the process of learning is known as personal mastery. There is a competitive advantage for an organization whose workforce can learn more

quickly than the workforce of other organizations. Individual learning is acquired through staff training and development, however learning cannot be forced upon an individual who is not receptive to learning. Research shows that most learning in the workplace is incidental, rather than the product of formal training, therefore it is important to develop a culture where personal mastery is practiced in daily life. A learning organization has been described as the sum of individual learning, but there must be mechanisms for individual learning to be transferred into organizational learning.

Mental models. The assumptions held by individuals and organizations are called mental models. To become a learning organization, these models must be challenged. Individuals tend to espouse theories, which are what they intend to follow, and theories-in-use, which are what they actually do. Similarly, organizations tend to have 'memories' which preserve certain behaviours, norms and values. In creating a learning environment it is important to replace confrontational attitudes with an open culture that promotes inquiry and trust. To achieve this, the learning organization needs mechanisms for locating and assessing organizational theories of action. Unwanted values need to be discarded in a process called 'unlearning'. Wang and Ahmed refer to this as 'triple loop learning.'

Shared vision. The development of a shared vision is important in motivating the staff to learn, as it creates a common identity that provides focus and energy for learning. The most successful visions build on the individual visions of the employees at all levels of the organization, thus the creation of a shared vision can be hindered by traditional structures where the company vision is imposed from above. Therefore, learning organizations tend to have flat, decentralized organizational structures. The shared vision is often to succeed against a competitor, however Senge states that these are transitory goals and suggests that there should also be long term goals that are intrinsic within the company.

Team learning. The accumulation of individual learning constitutes Team learning. The benefit of team or shared learning is that staff grow more quickly and the problem solving capacity of the organization is improved through better access to knowledge and expertise. Learning organizations have structures that facilitate team learning with features such as boundary crossing and openness. Team learning requires individuals to engage in dialogue and discussion; therefore team members must develop open communication, shared meaning, and shared understanding. Learning organizations typically have excellent knowledge management structures, allowing creation, acquisition, dissemination, and implementation of this knowledge in the organization.

Benefits

The main benefits are;

- Maintaining levels of innovation and remaining competitive.
- Being better placed to respond to external pressures.
- Having the knowledge to better link resources to customer needs.
- Improving quality of outputs at all levels.
- Improving Corporate image by becoming more people oriented.
- Increasing the pace of change within the organization.

Barriers

Even within or without learning organization, problems can stall the process of learning or cause it to regress. Most of them arise from an organization not fully embracing all the necessary facets. Once these problems can be identified, work can begin on improving them.

Some organizations find it hard to embrace personal mastery because as a concept it is intangible and the benefits cannot be quantified; personal mastery can even be seen as a threat to the organisation. This threat can be real, as Senge points out, that "to empower people in an unaligned organisation can be counterproductive". In other words, if individuals do not engage with a shared vision, personal mastery could be used to advance their own personal visions. In some organisations a lack of a learning culture can be a barrier to learning. An environment must be created where individuals can share

learning without it being devalued and ignored, so more people can benefit from their knowledge and the individuals becomes empowered. A learning organization needs to fully accept the removal of traditional hierarchical structures.

Resistance to learning can occur within a learning organization if there is not sufficient buy-in at an individual level. This is often encountered with people who feel threatened by change or believe that they have the most to lose. They are likely to have closed mind sets, and are not willing to engage with mental models. Unless implemented coherently across the organization, learning can be viewed as elitist and restricted to senior levels. In that case, learning will not be viewed as a shared vision. If training and development is compulsory, it can be viewed as a form of control, rather than as personal development. Learning and the pursuit of personal mastery needs to be an individual choice, therefore enforced take-up will not work.

In addition, organizational size may become the barrier to internal knowledge sharing. When the number of employees exceeds 150, internal knowledge sharing dramatically decreases because of higher complexity in the formal organizational structure, weaker inter-employee relationships, lower trust, reduced connective efficacy, and less effective communication. As such, as the size of an organizational unit increases, the effectiveness of internal knowledge flows dramatically diminishes and the degree of intra-organizational knowledge sharing decreases.

Challenges in the transformation to a Learning Organization

The book The Dance of Change states there are many reasons why an organization may have trouble in transforming itself into a learning organization. The first is that an organization does not have enough time. Employees and management may have other issues that take priority over trying to change the culture of their organization. The team may not be able to commit the time an institution does not have the appropriate help or training. For an organization to be able to change, it needs to know the steps necessary to solve the problems it faces. As a solution, a mentor or coach who is well versed in the learning organization concept may be necessary.

Also, the change may not be relevant to the organization's needs. Time should be spent on the actual issues of the organization and its daily issues. To combat this challenge, a strategy must be built. The organization should determine what its problems are before entering into the transformation. Training should remain linked to business results so that it is easier for employees to connect the training with everyday issues.

Emergence of Learning Organisations

The new species of organisations is called a learning organisation, and it possesses the capability to:

- Anticipate and adapt more readily to environmental impacts.
- Accelerate the development of new products, processes, and services.
- Become more proficient at learning from competitors and collaborators
- Expedite the transfer of knowledge from one part of the organisation to another.
- Learn more effectively from its mistakes
- Make greater organisational use of employees at all levels of the organisation.
- Shorten the time required to implement strategic changes.
- Stimulate continuous improvement in all areas of the organisation.

Organisations that learn faster will be able to adapt quicker and thereby achieve significant strategic advantages.

The Systems-Lined Organisation Model

A systematically define **learning organisation** is an organisation which learns powerfully and collectively and is continually transforming itself to better collect, manage, and use knowledge for corporate success.

It empowers people within and outside the company to learn as they work.

Organisational learning refers to how organisational learning occurs, the skills and processes of building and utilising knowledge.

There are a number of dimensions of a learning organisation:

- Learning is accomplished by the organisational system as a whole.
- Organisational members recognise the importance of ongoing organisationwide learning.
- Learning is a continuous, strategically used process – integrated with and running parallel to work.
- There is a focus on creativity and generative learning.
- Systems thinking is fundamental
- People have continuous access to information and data resources.
- A corporate climate exists that encourages, rewards, and accelerates individual and group learning
- Workers network inside and outside the organisation.
- Change is embraced, and surprises and even failures are viewed as opportunities to learn.
- It is agile and flexible.
- Everyone is driven by a desire for quality and continuous improvement.
- Activities are characterised by aspiration, reflection, and conceptualisation.
- There are well-developed core competencies that serve as a taking-off point for new products and services.
- It possesses the ability to continuously adapt, renew, and revitalise itself in response to the changing environment.

The systems-linked learning organisation model is made up of five closely interrelated subsystems:

learning, organisation, people, knowledge, and technology. If any subsystem is weak or absent, the effectiveness of the other subsystems is significantly weakened. Marquardt discusses each of the subsystems in their own chapters so I won't go into the details here.

Building Dynamic Learning through the Organisation

The learning subsystem is composed of three complementary dimensions:

1. Levels of learning (individual, group and organisational)
2. Types of learning (adaptive learning, anticipatory learning, deutero learning and active learning)
3. Critical organisational learning skills (systems thinking, mental models, personal mastery, team learning, shared vision, and dialogue)

Learning, ultimately, is a social phenomenon – our ability to learn and the quality and openness of our relationships determine what we can know. Our mental models of the world and of ourselves grow out of our relationships with others.

Levels

Learning in organisations can occur at three levels. **Individual learning** is needed since individuals form the units of groups and organisations, or as Senge asserts "organisations learn only through individuals who learn". The factors that can contribute to individual learning in the organization include:

- Individual and collective accountability for learning
- Locus and focus of individual learning (learning should have immediate application to the job.)

- Accelerated learning techniques.
- Personal development plan (people recognise that employers cannot guarantee them lifelong employment but that they can assist them in achieving lifelong employability. There should be a partnership between the organisation and the employee to assist in the long-term career development.)
- Abundant opportunities available for professional development
- Individual learning linked to organisational learning in an explicit and structured way.

Group/team learning means that work teams must be able to think and create and learn as an entity. They must learn how to better create and capture learning (learning to learn). A successful team learning system ensures that teams share their experiences with other groups in the organisation. Team learning will occur more fully if teams are rewarded for the learning they contribute to the organisation. Marquardt uses Watkins and Marsick's team learning model that shows the learning organisation as the union of individuals and organisation. The key is the overlap, which is where teams function.

Organisation learning occur through the shared insights, knowledge, and mental models of members of the organisation builds on past knowledge and experience which depends on institutional mechanisms (policies, strategies, explicit models...) used to retain knowledge. Though organisations learn through individuals and groups, the process of learning is influenced by a much broader set of variables (for example symphony's performance is more than the sum of individuals' knowledge and skills but the result of the know-how embedded in the whole group working in unison.

Types

There are four types in which organisations learn:

1. **Adaptive learning** occurs when an individual or organisation learns from experience and reflection: action ? outcome ? results date ? reflection. Adaptive learning may be either single-loop (focused on gaining information to stabilise and maintain existing systems) or double loop (questioning the system itself and why the errors or successes occurred in the first place).
2. **Anticipatory learning** arises when an organisation learns from expecting the future: vision ? reflection ? action approach.
3. **Deutero learning** occurs when the organisation learns from critically reflecting upon its taken-for-granted assumptions.
4. **Active learning** involves (a group/team) working on real problems, focusing on the learning acquired, and actually implementing solutions.

Skills

Marquardt has added Dialogue to the five critical organisational learning skills identified by Peter Senge:

1. **Systems thinking:** "A framework for seeing interrelationships rather than linear cause-effect chains, for seeing underlying structures rather than events, for seeing patterns of change rather than snapshots." Changes in one part of the organisation can affect other parts with surprising consequences.
2. **Mental models:** An image or perspective of an event, situation, activity or concept
3. **Personal mastery:** A special level of proficiency that is committed to continually improve and perfect skills, a discipline of continually clarifying and deepening one's personal vision, energies, and patience.
4. **Team learning:** The process of aligning and developing the capacity of a team to create the learning and results that its members seek. The team involved must learn to tap the potential of many minds to become more intelligent than one mind.

5. **Shared vision:** Provides a focus, direction and energy for the members of an organisation. And learning is a way of striving to accomplish that vision.
6. **Dialogue:** promotes collecting thinking and communication.

Empowering and Enabling People

People are the pivotal part of learning organisations because only people, in fact, learn. The people subsystem includes employees, managers/leaders, customers, business partners, and the community itself. Each of these groups is valuable to the learning organisation, and all need to empowered and enabled to learn.

There are several principles to consider in the empowerment and enblement of **employees**:

- Treat employees as mature, capable workers and learners
- Encourage employee freedom, energy, and enthusiasm
- Maximise the delegation of authority and responsibility (too many organisations have made employees accountable but have not empowered them.)
- Involve employees in developing strategies and planning (empowered workers are able to make decisions as good as, if not better than, the decisions made by managers because the workers, in fact, possess the best information).
- Strike a balance between individual and organisation needs (Better organisational results are built upon happy, productive individuals. Learning organisations are also conscious of the pressures on workers to meet both family and work obligations.)

Managers/leaders need to move from controlling to empowering, from being a commander to being a steward, from acting as a transitional manager to acting as a transformational leader. The new leadership roles and skills required include:

- Instructor, coach, and mentor
- Knowledge manager
- Colearner and model for learning
- Architect and designer (of the learning organisation)
- Co-ordinator
- Advocate and champion for learning processes and projects.
- Building a shared vision
- Co-ordinating multiple, task-focused teams
- Surfacing and testing mental models
- Engaging in systems thinking (they must help people see the big picture, with the underlying trends, forces and potential surprises)
- Encouraging creativity, innovation, and willingness to risk.
- Conceptualising and inspiring learning and action.

Conversations and information gathering from **customers** provide new knowledge for customers, after all, have expertise in what they do or buy.

Business partners are to be included because company's success is dependent to a large extent to the success of its entire business network.

Involving the **community** as a part of the learning process brings many benefits, it may, for example prepare potential future workforce and enhance the company's image.

The top strategies for people empowerment and enablement in learning organisations:

1. Institute personnel policies that reward learners.
2. Create self-managed work teams
3. Empower employees to learn and produce (informate workers with knowledge about financial, technical, and other data so that they can make wiser decisions)4
4. Encourage leaders to model and demonstrate learning
5. Invite leaders to champion learning processes and projects
6. Balance learning and development needs of the individual and organisation
7. Encourage and enhance customer participation in organisation learning
8. Provide education opportunities for community
9. Build long-term learning partnerships with vendors and suppliers
10. Maximise learning from alliances and joint ventures

Knowledge Management in Learning Organisations

Knowledge has become more important for organisations than financial resources, market position, technology, or any other company asset. Individuals may come and go, but valuable knowledge cannot be lost or the company starves to death. The knowledge subsystem refers to the management of acquired and generated knowledge or the organisation. It includes the acquisition, creation, storage, transfer, and utilisation of knowledge.

Acquisition: Organisations acquire knowledge from both external and internal sources. Companies can acquire information from the external environment through various methods, for example conferences, consultants, benchmarking other organisations, hiring new staff and collaborating with other organisations. Internal collection of knowledge means learning from what other parts of the organisation are doing.

It should be noted that information acquired is subject to perceptual filters that influence what information the organisation listens to and accepts. In addition, acquiring knowledge is not always intentional.

Creation of knowledge is generative. Marquardt refers to Nonaka and Takeuchi's four patterns of creative knowledge production that happen at the transformations of tacit and explicit and individual and shared knowledge. The other mentioned knowledge creation approaches are action learning, systematic problem solving (current situation and problems), experimentation (opportunities and possibilities) and learning from past experiences (including failures).

Storage and retrieval: In order to store knowledge, on organisation must first determine what is important to retain and then how best to retain it. Knowledge storage involves technical (records, databases, etc.) and human processes (collective and individual memory, consensus). The knowledge stored should be:

- Structured and stored so the system can find and deliver it quickly and correctly. (information will be retrieved by different groups of people in different manners)
- Divided into categories such as facts, policies, or procedures on a learning-need basis
- Organised so that it can be delivered in a clear and concise way to the user
- Accurate, timely, and available to those who need it.

The retrieval of knowledge may be either controlled (users trigger retrieval) or automatic (situations trigger retrieval).

Knowledge **transfer** and **utilisation** involves the mechanical, electronic and interpersonal movement of information and knowledge both intentionally (memos, reports, training, briefings, tours, mentoring, etc.) and unintentionally (job rotation, stories, task forces, informal networks etc.).

Four factors may limit the transfer: cost, cognitive capacity of receiving unit, message delay due to priorities of sending knowledge, and message modification or distortion of meaning either intentionally or unintentionally.

Adding Technological Power to Organisational Learning

The technology subsystem is the supporting, integrated technological networks and information tools that allow access to and exchange of information and learning. It includes technical processes, systems, and structure for collaboration, coaching, co-ordination, and other knowledge skills. The three major components are information technology, technology-based learning, and electronic performance support systems.

Information technology is the computer-based technology used to gather code, process, store, transfer, and apply data between machines, people, and organisations. Information technology enhances knowledge transfer in organisations:

- It can improve the ability of people to communicate with one another, because it blurs the boundaries of the company and increases the range of possible relationships beyond hierarchies.
- It makes it easier for people to communicate directly with one another across time and space.
- It reduces the number of management levels needed; yet at the same time provides and enhanced potential for span of control.
- It contributes to flexibility, with mobile workstations, relational databases, and the storage of knowledge in open databases rather than in the minds of individuals.

Technology-based learning refers to the video, audio and computer-based multimedia training for the deliver and sharing of knowledge and skills away from the job site. The future learning environment will be modular (single skills), multisensory, portable, transferable (across languages and cultures) and interruptible. Technology-based learning will be under the control of the employee, because most jobs are becoming ever more complex and require higher levels of skills.

In addition, the skill and knowledge mix required will be in a state of flux.

Steps in Becoming a Learning Organisation

It is important to remember that one never fully is a learning organisation. Change always continues, as well as learning. The chapter presents the 16 steps taken by various organisations in order to become learning organisations:

1. Commit to becoming a learning organisation.
2. Connect learning with business operations (direct connections between learning and improved business operations makes it easier to persuade people).
3. Assess the organisation's capability on each subsystem of the systems learning model.
4. Communicate the vision of a learning organisation (the most sophisticated vision is of no use unless it can be clearly understood by others).
5. Recognise the importance of systems thinking and action (a company cannot become a learning organisation by focusing on just one subsystem or on one part of the organisation).
6. Leaders demonstrate and model commitment to learning.
7. Transform the organisational culture to one of continuous learning and improvement.
8. Establish corporatewide strategies of learning (encourage experimentation, recognise and praise learners, reward learning, spread the word about new learnings, apply the new learnings).
9. Cut bureaucracy and streamline the structure.

10. Empower (to possess the necessary freedom, trust, influence, opportunity, recognition, and authority) and enable (to possess the necessary skills, knowledge, values, and ability) employees. Significant resources of time, money, and people are allocated to increase employees' skills not only in present job but also for future, unforeseen challenges.
11. Extend organisational learning to the entire business chain.
12. Capture learnings and release knowledge (quickly throughout the organisation).
13. Acquire and apply best of technology to the best of learning.
14. Encourage, expect, and enhance learning at individual, group, and organisation levels.
15. Learn more about learning organisations.
16. Continuous adaptation, improvement, and learning.

Building, Maintaining, and Sustaining the Learning Organisation

Building a learning organisation may be difficult, but so is maintaining and sustaining it when it is operating. Many an excellent, even learning company has dropped from its high perch.

It is preferable to begin building a learning organisation at the very top – to get top leadership committed. But it is possible to begin in any part that has the potential to affect the others. Start where the energy is! Things to consider include:

- Work with the directors, managers, union and human resources department
- Begin with a diagnosis
- Raise consciousness and start with a company conference
- Start with one department and Focus on one of the key business issues.

Keys to a successful transformation into a learning organisation:

- Establish a strong sense of urgency about becoming a learning organisation. The idea is to make the status quo seem more dangerous than the unknown.
- Form a powerful coalition pushing for the learning organisation
- Create a vision of the learning organisation. Without a vision, the effort can dissolve into a list of confusing and incompatible projects. Communicate and practice the vision. Remove obstacles (bureaucracy, competitiveness of individuals rather than collaboration, control. Poor communications, poor leaders, rigid hierarchy) that prevent others from acting on the new vision of a learning organisation.
- Create short-term wins. Most people won't stay on the long march unless the journey has some short-term successes.
- Consolidate progress achieved and push for continued movement. Declaring the war won can be catastrophic until changes sink deeply into the culture.

Ten facilitating factors that support and sustain the learning organisation:

1. Scanning imperative. Learning cannot continue without a solid awareness of the environment
2. Performance gap. Performance shortfalls are opportunities for learning.
3. Concern for measurement. Discourse over metrics is a learning activity.
4. Experimental mindset. Support the practice of trying new things and being curious about how things work.
5. Climate of openness. Debate and conflict remain acceptable ways of solving problems.

6. Continuous education. One is never finished learning and practising.
7. Operational variety. There is more ways than one to accomplish business objectives and work goals.
8. Multiple advocates or champions.
9. Involved leadership. Creating vision is not enough. Leadership at any organisational level must engage in hands-on implementation of the vision.
10. Systems perspective.

2.7 STRATEGIC DRIFT

The greatest challenge for ensuring a successful business strategy has traditionally been within its "execution" rather than "planning." The reason is simple: unexpected challenges always and constantly arise. As an outcome of these uncertainties leaders field countless requests and participate in many debates over whether or not to change the direction of their strategy to mitigate the newly arisen risks. This often leaves everyone questioning.... " **should we stay the course or abandon and redirect our focus elsewhere?"** Learning to navigate these issues will support you in an ever-changing environment.

The Inability to Discriminate Between the Urgent and the Important

First of All - NOT every surprise is in EQUAL consequence and thus requiring patience rather than adjustments. Executives must be able to discern the difference and be thoughtful and thorough before requiring teams to shift focus. Without this discernment, executives can be tempted to make unnecessary adjustments to their original strategy too often or too soon. This often results in the phenomenon known as **strategic drift**.

Strategic Drift is defined as:

A subtle and unnecessary shift from an intended course or direction to another one – one that is usually undesirable, at least in a long-term perspective.

Of course we recognize that in some situations shifting may be necessary, but over time and with too many shifts, companies naturally lose focus and become more reactionary, negatively impacting long-term success.

The real problem in veering into a strategic drift becomes apparent when you observe senior executives that start to believe minor turbulence is equal to a major change in the market place. For example:

- A temporary loss of market share, but the market is showing there is no long-term cause for alarm.
- A slower than expected growth at the launch of a new product or the entrance of new competitor, but revenue is still growing.

You MUST have the CERTAINTY to know when you should and should NOT make adjustments and these decisions should be made ONLY after the data shows the change is critical. If not, you too may fall victim to strategic drift.

What Call of Action Do You Take?

1. Justifiability, a **NECESSARY** call to change should be invoked when your go-to-market strategy is in danger or compromised from actions outside of your control which can be measured as catastrophic.
2. On the other hand, it will be crucial **NOT** to abandon your entire go-to-market strategy, unless those decisions made with the right evidence or data to support the adjustments in people, money and technology resources.

The Negative Operational Effects of Strategic Drift are Apparent

Strategic drift causes a loss of momentum, escalates unnecessary costs, diverts focus and sacrifices competitive advantage. Impacts are:

- Employee morale is damaged due to psychological repercussions from the constant shifting and changing of long-term impact to the organization, often resulting in creating a reactionary state of mind, and making team members numb to a constant state of alert.
- Change is no longer seen as strategic but rather 'change for change sake.'
- Executives become skeptical as the only certainty are the forthcoming uncertainties. This state of mind is arguably justified. Why invest resources and time for one concerted plan when the chance of drifting is the only thing that is definite? The motive to argue and actually fight for staying in one direction is diminished over time. These actions start to develop a culture of chaos and fire fighting.

What Can an Organization do to Prevent Strategic Drift?

1. First, start with creating a culture that is not only openly tolerant of feedback (both positive and negative) but welcomes it.
2. Make sure the organization can both
   a. Embrace change when necessary, and
   b. NOT hesitate to question it when is seems unnecessary.
3. Clarify C-suite leadership responsibilities and execute within a formal senior decision-making model. Many unwanted surprises are nothing more than tactical or operational challenges that should be handled within individual business functions and cross-functional leadership team.
4. Senior executives who align their individual ROI with the long-term success of the organization will be able to quickly identify the nature of the incoming challenge as well as create contingencies to combat it when and if it occurs. This way, the organization continues along its intended direction without unnecessarily deviating.
5. Finally, the best way to combat strategic drift is to have a Grand Strategy. A comprehensive set of corporate strategies that are designed to be durable and flexible, tailored to the strengths of the senior decision-makers and organization.

Case Study – Embracing Change – AEGON (UK)

Introduction

With the changing expectations of customers, organisations constantly need to adapt to remain competitive. When faced with such pressures for change, managers may look for situations which are familiar to them. This may involve improving the ways in which they operate, but only little by little. This is called incremental change. The danger is that improving little by little might not be enough. They need to adapt to all of the bigger changes in the environment of that business as well. If they don't, what happens is strategic drift.

When an organisation experiences strategic drift, it does not make strong and radical decisions to deal adequately with all of the changes in its business environment. To avoid strategic drift, managers within organisations have to embrace change fully. This means building a responsive organisation.

AEGON UK

This case study focuses upon AEGON in the UK, part of the AEGON Group, one of the world's largest life insurance and pensions companies. AEGON owns pensions, life insurance, asset management and adviser businesses in the UK. The case study illustrates the success that embracing and pursuing change has brought to AEGON in the UK. It is helping AEGON move towards its goal of becoming 'the best long-term savings and protection business within the UK'.

The AEGON Group has 27,000 employees and over 25 million customers worldwide. Its major markets are in the USA and Netherlands. Since 1994, the UK has become another major and increasingly important market. In 1994 AEGON bought a large stake in Scottish Equitable. Scottish Equitable was a strong brand with a heritage that went back to the 1830s. Since then AEGON's UK business has grown both organically and by acquiring other businesses.

As most of the acquired companies kept their existing identities, awareness of AEGON in the UK remained relatively low. AEGON realised that such low levels of awareness could impact on its ability to achieve its ambitions. Therefore, it needed to combine the global strength of its parent with the experience and reputation of the domestic company brands, like Scottish Equitable, that made up AEGON in the UK.

External factors influencing change

One of the main challenges for decision-makers is to understand the environment in which they are operating. They can then identify key issues which they need to respond to. Understanding these key issues improves decision-taking and reduces uncertainty. Few industries have experienced as many changes in their external environment in recent years as financial services.

Thinking ahead and saving for retirement is a concept that is sometimes difficult for people to understand. In the UK, life expectancy has risen in recent years so people can expect to be retired for longer. In many instances, individuals have not planned properly for retirement and there may be a shortfall in the amount of money available. There is also a drive by the government to reduce dependency on the State in old age. Added to this many companies have introduced new, less expensive pension schemes or insisted on employee pension contributions where they did not in the past.

These factors mean people have to make decisions to invest properly at an earlier stage of their working lives. Investing in the future helps people to prepare in advance for old age. The benefits of such an investment are only realised years later.

The industry

The life insurance and pensions industry, in which AEGON operates, has had a poor reputation in recent years. Some organisations have been accused of 'mis-selling' by not providing consumers with the best product for their needs. To prevent similar situations arising in the future, the Financial Services Authority (FSA) has put significant amounts of regulation on the industry.

Financial services products are often difficult to understand. People do not always feel equipped to choose between the range of financial products and services and are not sure where to seek support and advice. In addition, falling values on the Stock Exchange have affected the investment return on some products, such as mortgage endowments. For some people this means that the product they bought has not delivered the financial return they expected. All this has created uncertainty in the financial services industry.

The industry has also been characterised by intense competition. AEGON is in competition with organisations which sell directly to consumers and which are better known in the UK. AEGON distributes its products and services to customers mainly through financial advisers. AEGON, as a reputable company, has had to address and overcome these industry-wide problems to remain competitive.

Reasons for change

AEGON had historically been successful but government-imposed price controls had reduced profitability. Compared to its competitors, AEGON was not well known by consumers. It had developed good products and services and had a good reputation with distributors, particularly in the area of pensions which were a key strength of Scottish Equitable.

However, it was not as well recognised in areas other than pensions. Often these other areas, such as offshore investment products, were more profitable. If consumers are to invest in a product long term, they need to know more about the organisation they are dealing with. They need to recognise the brand and understand more about the brand values that it represents. As AEGON traded under a number

of brand names it was not always easy for financial advisers and consumers to recognise the breadth and depth of the company in the UK.

How to move forward?

With a new Chief Executive (CEO) in place, AEGON underwent a discovery phase. The purpose of this was to find out what it had to do to meet the CEO's goal. This goal was to build 'the best long-term savings and protection business in the UK'. This time of discovery focused on three key questions:

1. What do we stand for in the UK?
2. What do we want to stand for in the UK?
3. What should we be doing about it?

Brand audit

To answer these questions AEGON undertook a brand audit. This audit looked at two aspects:

- the company internally
- how the organisation was positioned externally.

The purpose of the audit was to find out more information about the organisation. This helped AEGON to provide a more informed approach to the decisions that were needed to start the process of change.

The audit showed that AEGON was solidly placed within the market. Its staff were known for their considerable expertise, innovation and clarity of communication.

The external audit also helped to discover where AEGON was positioned in relation to its competitors. People who were aware of AEGON saw it as being a refreshing and different organisation. However, there was evidence that people were confused about the breadth of what AEGON did because it traded under a number of different company brands.

Creating a new culture is a key part of the change process

Culture refers to the personality and attitude of an organisation. It also includes the shared beliefs, values and behaviour of the employees. These determine the ways in which the organisation and its people make decisions and solve problems.

The goal of AEGON's CEO helped to provide a vision for change. Financial objectives were important as the path for future developments depended upon these. It was also important to create more clarity about who AEGON was. With limited awareness of AEGON in the UK, it was important to explain what it had to offer, how big the organisation was within the UK and how strong it was globally.

At the heart of this strategy was the need to:

a) simplify financial services and provide more customer focus. It was important that consumers understood more precisely what they were buying, as well as the benefits and services they received

b) develop the workforce. The objective was to develop the skills needed within the business to help it change. AEGON also created opportunities for progression from one job to another in a way that provided individuals with a coherent career path.

c) create a more distinct presence within the marketplace. This involved refreshing the AEGON brand in a way that made it more distinctive from its competitors and more attractive to customers.

A behaviour framework

In order to help embed this culture, AEGON developed a behaviour framework to support its brand values. This was designed to influence how people at all levels within the organisation could work and make decisions. These behaviours emphasise the values of the organisation. They have helped to build

AEGON's culture and have also influenced its performance. AEGON also introduced a Management Development Programme, supported by a leading Management College.

The eight behaviours are:

- Think customer
- Embrace change
- Encourage excellence
- Act with integrity
- Decisive action
- Work together
- Learn and grow
- Relate and communicate.

'Think customer' is about 'ensuring that the customer's needs are at the heart of our business, informing actions, decisions and behaviours'.

For senior managers this means keeping the customer's experience at the heart of what AEGON does. Other managers and professionals are encouraged to 'innovate with your customers in mind'. All staff are encouraged to keep to commitments made to customers by doing 'what you say you will, when you say you will'.

Implementing the change

Before the change consumers were confused about who AEGON was, what it did and how it fitted together. The audit had shown that global scale was important but so was local expertise.

In the past, the AEGON brand had not been heavily promoted alongside Scottish Equitable or the other brands that it traded under. The brand strategy helped to reposition the brand within the industry.

Now the association with AEGON is much stronger. For example, Scottish Equitable is now AEGON Scottish Equitable – reflecting both local knowledge and global power. All the brands now carry a new common look which is refreshing and different. This, along with the values and behaviours, is helping to make the brand 'refreshingly different'.

Impacts of the change

The changes affected the organisation both internally and externally. Within the organisation, they influenced not only how people behaved but also how they communicated. The organisation has become more focused on the customer. The emphasis is on making information clearer for the customer to understand and the company easier to do business with.

To help embed the values and behaviours, AEGON established a new relationship with Shirley Robertson, the famous yachtswoman and the only British female athlete to have won gold medals at consecutive Olympic Games. By associating AEGON with an individual who embodies similar values, it was able to bring the values and behaviours to life for staff.

However, AEGON had to develop the brand and its reputation. It did this is a number of ways:

- External promotional campaigns emphasised the relationship between Scottish Equitable and AEGON. This helped to reinforce the local knowledge and the global power of AEGON in the UK.
- The CEO talked to the media about the need for change. The refreshing of the brand internally and externally resulted in strong positive feedback.

- AEGON has launched new and innovative products. For example, the 5 for Life annuity has helped to change the way in which consumers can look at their retirement income. It provides more certainty about levels of income for the consumer, with AEGON providing the levels of return promised and being responsible for any risks associated with doing so.

Today the AEGON brand has a position from which it is influencing the financial services industry. It has posted record results with significant growth in underlying earnings. It has also increased its new business across a mix of profitable products and services, reflecting its continued strength.

Conclusion

Change is continuous. The process of change is a journey. External factors will always be there to influence business organisations.

AEGON responded to these factors by simplifying, clarifying and strengthening its brand in the UK.

As organisations change, their patterns of behaviour and business culture develop. For AEGON, this is a cycle in which the business uses its knowledge to learn from its experiences.

This has helped AEGON as an organisation to move positively towards achieving its full potential and to remain competitive in an increasingly difficult market.

2.8 STRATEGY UNDER UNCERTAINTY

At the heart of the traditional approach to strategy lies the assumption that executives, by applying a set of powerful analytic tools, can predict the future of any business accurately enough to choose a clear strategic direction for it. The process often involves underestimating uncertainty in order to lay out a vision of future events sufficiently precise to be captured in a discounted-cash-flow (DCF) analysis. When the future is truly uncertain, this approach is at best marginally helpful and at worst downright dangerous: underestimating uncertainty can lead to strategies that neither defend a company against the threats nor take advantage of the opportunities that higher levels of uncertainty provide. Another danger lies at the other extreme: if managers can't find a strategy that works under traditional analysis, they may abandon the analytical rigor of their planning process altogether and base their decisions on gut instinct.

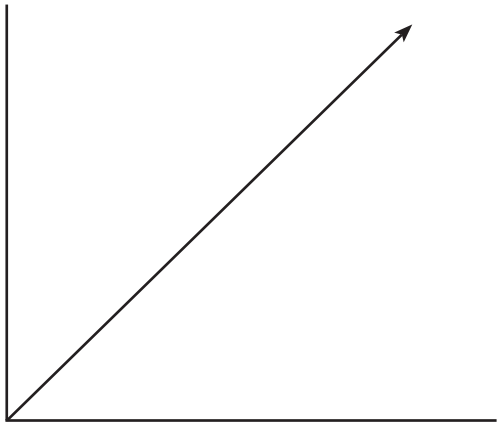
Making systematically sound strategic decisions under uncertainty requires an approach that avoids this dangerous binary view. Rarely do managers know absolutely nothing of strategic importance, even in the most uncertain environments. What follows is a framework for determining the level of uncertainty surrounding strategic decisions and for tailoring strategy to that uncertainty.

Four levels of uncertainty

Available strategically relevant information tends to fall into two categories. First, it is often possible to identify clear trends, such as market demographics, that can help define potential demand for a company's future products or services. Second, if the right analyses are performed, many factors that are currently unknown to a company's management are in fact knowable—for instance, performance attributes for current technologies, the elasticity of demand for certain stable categories of products, and competitors' plans to expand capacity.

The uncertainty that remains after the best possible analysis has been undertaken is what we call residual uncertainty—for example, the outcome of an ongoing regulatory debate or the performance attributes of a technology still in development. But quite a bit can often be known despite this. In practice, we have found that the residual uncertainty facing most strategic-decision makers falls into one of four broad levels.

Level 1: a clear enough future



Single view of the future

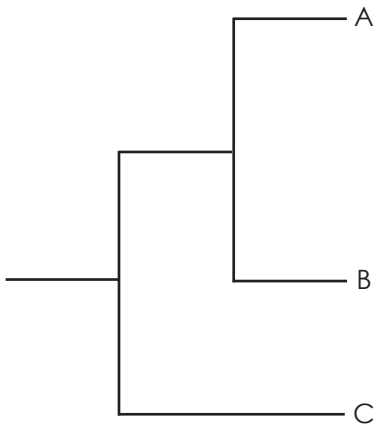
Decision-makers face Level 1 uncertainty when the range of possible outcomes is narrow enough that this uncertainty does not matter for the decision at hand. This does not imply that the future is perfectly predictable, but rather that the future is predictable enough to identify a dominant strategy choice that is best across the range of potential outcomes. As you might guess, decision-makers in well-established markets that are not prone to external shocks or internal upheaval are the most likely to face Level 1 uncertainty.

McDonald's, for example, generally faces Level 1 uncertainty when it makes its US restaurant location decisions. It can study potential customer demographics, traffic patterns, supply logistics, and the extent of competition in a given location and come up with a reasonably precise forecast of future restaurant earnings. And while such forecasts will be far from perfect, they will tend to be predictable enough to make a dominant yes-no decision on any potential US restaurant location. For example, McDonald's will not be able to predict a variable like traffic patterns with complete certainty, but it will be able to conclude – say with 95 percent confidence –that the traffic pattern either will or will not support a restaurant in any particular location.

Since uncertainty is so low, and dominant strategy choices can be identified, scenarios provide limited insight in Level 1 situations. In such cases, simple simulations and sensitivity analyses are preferred to more time-and expenses consuming scenario planning efforts.

McDonald's, for example, might vary its traffic pattern parameters within the range of possible outcomes to determine the impact of alternative assumptions on the expected earnings of a new franchise location. Such analyses would help quantify pay-off uncertainty (the ultimate pay-off to the decision is uncertain) even where there is no strategic uncertainty (the pay-off uncertainty is narrow enough that it does not matter for the decision at hand). Sensitivity analyses are easy to automate using standard spreadsheet programs and thus are almost costless to implement, yet still provide useful information for financial planning purposes. Sensitivity analyses are a more cost-effective alternative to scenario planning techniques in such relatively predictable, Level 1 situations.

Level 2: alternate futures



Limited set of possible future outcomes, one of which will occur

Decision-makers face Level 2 uncertainty when they can define a limited set of possible future outcomes, one of which will occur, and when the best strategy to follow depends on which outcome ultimately occurs. For example, investors in the US stock market faced Level 2 uncertainty in trying to determine the identity of the next president of the USA throughout the fall of 2000. There was a well-defined set of possible outcomes, one of which would occur – the next president would be either George W. Bush or Al Gore. However, on election day, and even weeks later, no one could say for sure who had won. This uncertainty mattered to investors since the candidates proposed policies that might have divergent effects on the share prices of companies in certain industries. It was widely thought, for instance, that health insurance companies would benefit from a Bush victory.

Organizations that face Level 2 uncertainty can define a mutually exclusive, collectively exhaustive (MECE) set of possible outcomes. One, and only one, of these outcomes will actually occur. Potential regulatory, legislative, or judicial changes are often sources of Level 2 uncertainty. Will a proposed environmental legislation be passed? Will new regulations be imposed? Will the merger pass antitrust review or not? Similarly, unpredictable competitor moves and countermoves often create Level 2 uncertainty for business strategists. Will a competitor build a new plant? Enter a new market? The potential answers to all of these questions usually define a clear, MECE set of possibilities.

Scenario planning exercises under Level 2 uncertainty must define in great detail the MECE set of possible outcomes, and specify the implications each outcome has for the decision at hand. For example, what are the implications for the cost structure of a proposed new chemical plant if a pending environmental regulation is approved or if the regulation is rejected? What does this imply for the decision to build the new plant or not? Scenario builders in this case should also attempt to determine the relative probabilities of these different outcomes, and to specify the dynamic path to each scenario. Will change come quickly, say, following a regulatory decision? Or will it be a gradual evolution, as in the establishment of a new technological standard? This is important information in Level 2 situations since it determines which market variables should be monitored most closely. As events unfold and the perceived probabilities of alternative scenarios change, it is likely that one's view of the ''best'' strategy will change. For example, as the chemical company receives more information on whether or not the environmental regulatory ruling is likely to favor new plant construction, it might choose to either accelerate, decelerate, or shut down its construction plans altogether.

Once scenarios and their probabilities (or at least a range of probabilities) have been defined, and strategies have been properly evaluated across each scenario, it is time to make decisions. By definition, in Level 2 situations you will not find a strategy that is dominant (has the highest pay-off) across all scenarios (dominant strategies are a feature of Level 1 situations, not Level 2). The strategist must choose between strategic options with different risk-return profiles across the different scenarios.

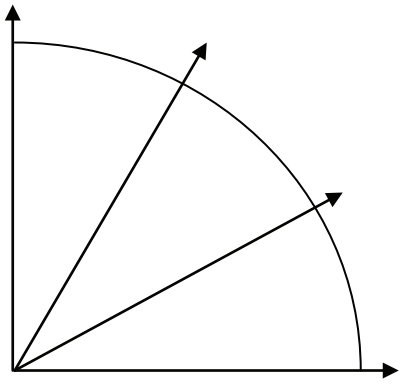
Decision analysis tools can be used to facilitate decision-making when there is no dominant strategy. Given your objectives – in particular, your willingness to accept risk – decision analysis techniques allow you to value strategic options that show different pay-off profiles across a set of scenarios. If you are risk neutral, for example, the strategy with the highest expected value across scenarios should be chosen. Risk-averse decision-makers, on the other hand, will prefer strategies with the most stable pay-offs, choosing to avoid strategies with high pay-off variances across the different scenarios.

In any event, keep in mind that the probabilities of different scenarios can be highly dependent on a company's strategy choices. For example, if you face Level 2 uncertainty over whether or not a competitor will enter a new market, you must take into account the fact that the probability of either scenario may be influenced by your company's own decision to enter the market or not. Therefore, when evaluating the pay-off to different strategies across scenarios, you must focus on two questions:

1. What is the pay-off to this strategy in each scenario?

2. How does this strategy change the relative probabilities of each scenario?

Level 3: a range of futures



Range of possible future outcomes

In some respects, Level 3 uncertainty is like Level 2 uncertainty: one can identify the range of possible future outcomes, but no obvious point forecast emerges. In both cases, this range is wide enough to matter for the decision at hand, but there is a very important difference: strategists facing Level 3 uncertainty can only bound the range of future outcomes – they cannot identify a limited MECE set of outcomes, one of which will occur. For example, they might be able to conclude that the five-year market penetration rate of a new consumer electronics product will fall somewhere between 5 percent and 40 percent, but they will not be able to conclude that the rate will be either 5 percent, 20 percent, 30 percent, or 40 percent. Any other rate between 5 percent and 40 percent is also a possibility in this case. Customer demand for new products and services, and new technology performance and adoption rates, are both common sources of Level 3 uncertainty. Airbus, for example, faced Level 3 uncertainty when deciding whether or not to build its new A380 super-jumbo jet. Estimates of the size of the super-jumbo jet market ranged from 350 to 1,500 planes, and Airbus knew that it must sell approximately 500 planes to break even on the A380 investment.

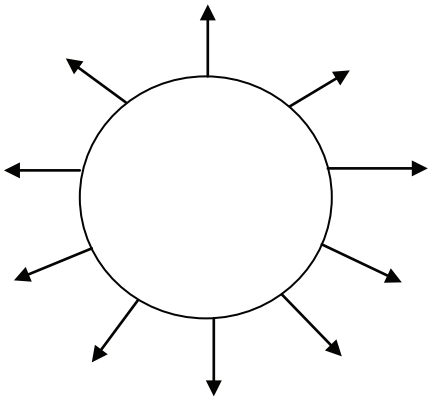
To illustrate the preferred decision-driven approach in Level 3 situation return to the A380 super-jumbo example. Market research indicates that the demand for super-jumbo jets will fall somewhere between 350 and 1,500 planes. Does this imply that one must develop different scenarios for every market size between 350 and 1,500 planes, determining the implications each would have for Airbus' product launch and promotion strategies? Or should one instead merely choose a limited set of plausible, representative outcomes between 350 and 1,500 planes to fully develop into scenarios? And if one chooses this route, how does one choose which outcomes to build scenarios around?

There are no simple answers to these questions, but there are a few general rules to follow. First, develop only a limited number of representative scenarios; the complexity of juggling more than four or five alternatives tends to hinder rather than facilitate sound decision-making. Second, avoid developing redundant scenarios that have no unique implications for strategic decision-making. Make sure each scenario offers a distinct picture of the future. Third, develop a set of scenarios that collectively accounts for at least the probable, if not possible, range of outcomes. Some companies prefer to develop "best" and "worst" case scenarios at the extreme ends of the spectrum of possible outcomes, while others develop "best" and "worst" case scenarios that span a tighter range of more probable outcomes. Either approach can work well so long as the "extreme" scenarios are not so extreme that they lose credibility within the organization, and the "probable" scenarios are not so closely tied to the status quo that they provide a false sense of future stability and predictability.

As with Level 2 situations, once scenarios are defined, the next step is to identify potential dynamic paths to each outcome, and to evaluate each strategic option across each scenario. However, assigning probabilities to different scenarios does not make sense in Level 3 situations. When assigning probabilities you are implicitly assuming that you have identified a collectively exhaustive set of scenarios, one that includes all possible outcomes. But in Level 3 situations, in contrast to Level 2, your scenarios will only represent a subset of possible outcomes.

Since probabilities cannot be defined, it is impossible to calculate the expected value, standard deviation, and other key statistics that summarize the risk-return characteristics of a given strategic option. Nonetheless, the logic for evaluating strategic options is very similar in Level 2 and Level 3 situations. In either case, evaluating each option against each scenario allows managers to determine how robust different strategies are, and to assess the overall risk-return characteristics of these strategies. And in either case, companies can assess which scenarios become more and less likely based on their own strategy choices. The only difference is that in Level 3 situations, absent scenario probabilities, these evaluations cannot be reduced to the simple decision-making metrics such as expected values and other key statistics that are so useful to Level 2 decision makers. This implies that while the same, rigorous decision analysis logic applies to both Level 2 and Level 3 situations, qualitative ''business judgment'' factors will inevitably play a more prominent role under Level 3 uncertainty.

Level 4: true ambiguity



Not even a range of possible future outcomes

Future outcomes for Level 4 uncertainties are both unknown and unknowable. Analysis cannot even identify the range of possible future outcomes with certainty, or the most likely scenarios within that range.

Level 4 situations are rare, and they tend to degrade over time to lower levels of uncertainty. They are most likely to occur in markets during and immediately after major technological, economic or social

discontinuities, as well as in markets that are just beginning to form. For example, a manager attempting to formulate United Airlines' security strategy on 12 September 2001 faced Level 4 uncertainty. In the immediate aftermath of the horrific terrorist attacks that occurred on 11 September, even the most prescient security experts could not confidently bound the range of future terrorist activity.

Under conditions of Level 2 and 3 uncertainty, strategists analyze the situation to bound the range of possible future outcomes, and then develop scenarios that describe alternative outcomes within that range. Since this is impossible in Level 4 situations, the alternative is to work backward from potential strategic options to define "what you would have to believe" about a future scenario to support this option. For example, a manager was unable to bound the range of demand estimates for a new gene therapy, but he was able to "back out" what demand levels would be necessary to support the proposed research and development investment he was considering. Likewise, the United Airlines' security manager could work backwards to identify which set of assumptions about future terrorist threats would make it worthwhile to arm pilots or train all flight attendants in the martial arts.

In Level 4 situations, a "scenario" is then an integrated set of assumptions about the future that supports a given strategic option. There is no analysis that you can do to determine conclusively whether any such scenario is likely or not; that is the definition of Level 4 uncertainty. However, analogies and references cases can be useful in testing the logic, likelihood and internal consistency of Level 4 scenarios. If a proposed strategy requires faster consumer adoption rates than those observed for any analogous product launch, for example, it will probably make sense to reject this strategy in favor of another.

Given how different scenario planning exercises are in Level 4 situations, it should come as no surprise that the decision-making model is also unique. The decision analysis techniques favored in Level 2 and Level 3 situations are impossible to implement since the range of outcomes cannot be bounded. Instead, a qualitative, yet systematic checklist of key considerations should drive decision-making:

(1) Which sets of integrated assumptions (i.e. scenarios) about the future seem credible given what can be learned from analogous situations and executive team experiences?

(2) Of these credible scenarios, which support options that have the lowest downside risk? Highest upside reward? Which are most consistent with our organizational capabilities and long-term strategic goals?

(3) Are there likely to be real first-mover advantages, or can commitments be staged over time? Which options allow for such staging, and which require upfront "big bets?"

In the end, strategic decision making under Level 4 uncertainty should involve "getting comfortable" with the logic, likelihood and internal consistency of the future scenario, or set of scenarios, that support your chosen strategy.

2.9 STRATEGIC MANAGEMENT IN COMPLEX CONDITIONS

Strategic management and its predicament

Strategic management is combination of science and arts which increases an organization's chances of success as it involves detailed planning of each and every variable of the organization that can help in the achievement of goals and objectives. Dr. Jagdish Sheth, a respected authority on marketing and strategic planning, provides the following framework for understanding strategic management: continually asking the question, "Are we doing the right thing?" It entails attention to the "big picture" and the willingness to adapt to changing circumstances, and consists of the following three elements: formulation of the organization's future mission in light of changing external factors such as regulation, competition, technology, and customers development of a competitive strategy to achieve the mission creation of an organizational structure which will deploy resources to successfully carry out its competitive strategy. Strategic management is adaptive and keeps an organization relevant. In these dynamic times it is more likely to succeed than the traditional approach of "if it ain't broke, don't fix it."Rationality has a deeprooted tradition in enterprise management.

From Adam Smith, economics saw people as rational animal. The appearance of the rational people influenced the subsequent management even more deeply. The strategic management has showed itself in the rational way from its forming. From the design and plan school in the 60s to the dominant position of location school in the 80s, until the rising of core school in the 90s, all emphasized the rational character of strategic management. The thought of rational strategic management supposes the environment of the enterprise facing is simple, small changes and expectant, so, the enterprise can be expectant for the market and the future. But today, the environment of the enterprise facing is not only complex, but also less and less expectant. If the enterprise emphasizes the rational way, it may concern with management efficiency and stylization of forming strategic management excessively, which will create a kind of inertia of strategic management. After the 1970s, the operation and management of Japanese enterprises shocked the United States. Compare with the management differences of the United States and Japanese, we can find that the United States frustrated in the competition of operation and management with Japanese, which showed the predicament of rationalism in modern enterprise management. Strategic management entails allocating the right amount of resources to the different parts of your business so that those assigned to particular goals have what they need to meet their objectives. This ranges from providing your workers with the right supplies to enacting systems by which employees receive the necessary training, all work processes are tested, and all information and data generated is documented. To effectively manage your business strategically, every inch of your company must have its needs met in these ways, so all parts can work together as a seamless, highly functioning whole.

A critical but often overlooked aspect of strategic management is the need for it to be both planned and unplanned. Company leaders must take the initiative in setting out how the company should function and operate, but they must also be dynamic in responding to needs and requirements as they arise. Strategic management is not a static process that can be limited to a linear process. Often, unforeseen results ensue (which can be both positive and negative) and strategic managers must be able to respond to occurrences that cannot be predicted.

Irrational Strategic Management on the rise

People often see the irrational factor as the opposition of rationality, and think it is not rational, loss of rationality, and negative rationality. In fact, irrationality means the spirit property of no conscious, tuition, emotion and belief which not belongs to the rational factor and corresponding with rationality, it is a natural part of human nature. Irrationality is cognition, thinking, talking or acting without inclusion of rationality. The term is used, usually pejoratively, to describe thinking and actions that are, or appear to be, less useful or more illogical than other more rational alternatives. Management today combines creative, business, organizational, analytical and other skills to produce effective goal-oriented results! Some of the key functions in management includes learning to delegate, planning and organizing, communicating clearly, controlling situations, motivating employees, adapting to change, constantly innovating and thinking of new ideas, building a good team and delivering results which are not just figure -bound but results that also focus on overall growth and development. Irrational strategic management means that in the complex strategic management activity, the manager except playing the role of rational strategic management through necessary data analysis, predict and logical reasoning, should change the concept of efficiency supremacy, and should be people-centered, take sentiment as main line, pay attention to play the role of irrational factors, such as faith, sentiment, will, mind-set, intuition and so on, which can be used to excavate staff's potential and enthusiasm, attract as faith, entiment, will, mind-set, intuition and so on, which can be used to excavate staff's potential and enthusiasm, attract consumer's attention and support, create the environment of the three (manager, staff and consumer) common recognition, form the group's values and cohesion, and achieve the harmonious management of the aim of strategic management. The core of irrational strategic management is people-centered, attach importance to people's emotional factors, respect people, depend on people and develop people.

In 1924, the results of Hawthorne experiment carried out by Mayo shows that people is not only economic people, but also the society people who have irrational factors, such as desire, demand, emotion and so on. Members who have common feeling, attitude and value in the work constitute the informal

organization, which influences members' action with stable authority form and irrational emotional logic. Now, the birth of the theory of knowledge management, building a learning organization promotes the symbiotic integration of rational and irrational management. On the one hand, it promotes rationality as the role of achieving irrational tool by making full use of scientific method and means which can make knowledge doing identification, processing and dissemination. On the other hand, it pays attention to playing the role of irrational factors, such as people's desire, emotion, interests, will and so on in management, encourages innovation, promotes learning and exchanges, enhances the ability of facing changes, and makes the irrational factors in the framework of rationality play the active role of cohering popular feeling, management innovation under the guidance of scientific way.

The function of irrational factors in strategic management

Irrational factor, as a kind of spirit composition and existence way, mainly concludes the needs, emotion, feeling, will, faith, belief, unconsciousness, intuition, inspiration and so on. Irrational factors play an important way in the whole process of strategic management, mainly in the following aspects:

Irrational factors guide the strategy manager to get information

Essentially, strategic management is a manager's idea of future development of the enterprise, which has uncertainty character. What the information the manager faces before he making decision is complex and difficult to get by data analysis and logical reasoning. The most important information for strategic planning may beside the manager's hand, or may lose evanescently. It needs manager to find and grasp information by rich experience and exceptional insight.

The three-year-old daughter of Lande, the leader of Polaroid asked him, why she could not see her photos at once. Less than one hour, this scientist formed a strategic thought of image camera, which took a turn for the better for his company. From this example we can see that this strategic thought comes from the sudden comprehension for his daughter's question and his broad technical knowledge.

Irrational factors support strategy manager to carry out information analysis

When a new environment comes quietly, or an enterprise faces crisis or the strategy turning point, people cannot make data analysis at this time, and cannot forecast the future. To be brief, rational analysis mode cannot provide an accurate answer at this time. People must analyze and make decision by their own intuition and sense and insight under situation of uncompleted information, unsure circumstance and unclear state.

Irrational strategic mode may be the only choice at this time. It is the manifestation of the two situations that the strategies choose of the company of Intel from the number one company of memory production to microprocessor market. In accordance with traditional analysis, this decision is simply inconceivable, unconscionable. At that time, memory service is the company's absolutely leading service, and the sales volume of microprocessor is small among the 2000 kinds of products. For this, the former president of Intel Andy Grove has a wonderful experience summary, "Sometimes, the experience tells you that some factor is very weak now, and is insignificant in data analysis, but it has great development potential, and you will change your management rule in the future. In other words, in the process of treating the impact of budding trend, you should go out of the rigid data analysis, and depend more on perception and knowledge to decide."

Irrational factors help improve the efficiency and quality of decision making

Decision makers do not only depend on rational judgment when they choose programs among lots of options. Simon affirmed that it was exist intuitive thinking during the process of program design and selection. He thought that intuition is a kind of thinking pattern. Depending on intuitive thinking can breakthrough the restrictions of logical thinking on the basis of logical thinking results in the past, and can save time of reasoning. In the practice of strategy decision making, people who doing the choice of decision making program by using intuition are mainly experienced experts and senior managers in the organization. They do not do it by using logical thinking, but making decision as soon as possible under the analysis of intuitive thinking and some rational analysis. When the company of Volvo in Sweden sold

their cars to American market, all the analysis get the result that Volvo has no competition and it cannot succeed in American market. But Benguela insisted on his own intuitive judgment, he thought that the car will surely succeed in the largest market in the world through all kinds of methods. The result proves his intuitive judgment. Just as the former CEO of this company said, "intuitive feeling really

significantly impact on strategic actions, though strategic decision, such as large scale investment will be naturally influenced by economic analysis and forecast, strategy is dominated by feeling and intuition to a certain extent, because the future profit is difficult to estimate. This is a complex thing, and you cannot forecast forever, must be feeling right."

Irrational factors promote the smooth implementation of strategic decision

Good strategic decision needs executor to implement. If strategy has not been smoothly implemented, it will fail in the end. Therefore, the coordination and communication between decision maker and executor are very important. The essence of communication is emotional communication. Emotion promotes effective interaction between manager and executor.

Emotion, as an irrational factor, can promote all staff's ambition and struggling spirit, and stimulate activity through conveying goal to the staff to make them identical direction . For example, the Japanese leaders pay attention to the role of emotional factor in strategic management. Komatsu proposes the slogan of "surround Caterpillar". Canon Corporation wants "to attack Xerox Corporation", Honda Corporation takes "to try its best to become the automobile industry pioneer like Ford" as the power of going forward. They will stimulate staff's enthusiasm through slogan or strategic intention, and achieve the company's final goal at last. Concerning the unique role of emotion in the process of strategic management, Phillips, the famous learner, summarized exactly, he said, "strategy has no value in itself, and it only has significance for people who participate enthusiastically." From this aspect, good strategy is to stimulate staff's participation enthusiasm.

Management goes beyond the organization's internal operations to include the industry and the general environment. The key emphasis is on issues related to environmental scanning and industry analysis, appraisal of current and future competitors, assessment of core competencies, strategic control and the effective allocation of organizational resources. Irrational factor is a doubleedged sword. Due to the non-logical and non-critical features of irrational factors, they inevitably have negative role which can not be neglected in management activity.

Irrational factors easily lead to misleading information and decision errors. During the process of information collection, one-sidedness of irrational factors may limit the scope of attention. The desire of diversity will not make attention focus on a particular goal. The speed and accuracy of information gathering and processing will be affected if the emotion and feeling are more than or less than a certain level of intensity. Irrational factors, such as intuition and inspiration, are short of rigidity and reliability, or even are illusion.

Abusing them will lead to major mistakes in decision making. Negative emotion will also make leaders become inconstancy, bring hindrance for the communication, and lower management efficiency and the effectiveness of organization activity and individual action, and effect the achieving of organization goal at last.

Role of Irrational factors in strategic management - Paying attention to and cultivating irrational factors, promoting rationality and irrationality harmonious development

The aim of learning and thought of strategic manager is not only mastering methods and rules, being able to use conventional methods of strategic management to making strategic analysis and decision, but also stimulating thought, improving creativity and innovational ability. During the management training, managers should pay attention to emotional shape, will training and correct beliefs establishing to improve managers' EQ and accumulate management experience. During learning knowledge, people should pay attention to improve intuition ability, and exert the creativity of intuition and inspiration through continuous accumulation. On weekdays self-shaping, people should strengthen the critical self awareness, and debug and change character and action by using the power of will, and persistently

carry out self-examination and self-encouragement. So that they can exceed the knowledge constrains, gain wisdom enlightenment, which can promote the harmonious development of emotion and reason under the guide of sense.

Perfect the people-management, play the core role of people in management

The people-management, centered on people, is on the basis of scientific management theory and method to make strategic management process, method and system correspond with human nature, and focuses on people's inner world, bases on the real need of people and guided by emotion, exerts human nature, excavates people's potential, mobilizes people's enthusiasm and creativity to increase members' happiness, makes everyone get oneself development and satisfaction through serving for organization, and achieve the aim of harmonious development between organization and people. Strategic managers not only need respect people, but also exert people's ability and value, meet the needs of human nature, treat employees correctly, set the concept of unity among manager, employee and enterprise, increase employees' belongingness. Giving up the pursuit of efficiency, people should pay attention to the embodiment of personal value in the work, and promote the smooth achieving of strategic aim through achieving personal value.

Strengthen the emotional management and promote effective management communication

When the manager formulate and implement strategic planning, they should pay attention to the role of management communication, and strengthen emotional investment, create a relax and warm working environment, cultivate close relationship, strengthen positive incentives, pay attention to two-way communication and exchange, attract, retain and cultivate talents to make employees get self-esteem satisfaction, and reduce frustration, increase enthusiasm, inspire initiative and creativity, enhance the cohesion of the organization, meet the employees' needs of high-level demand, to truly achieve the management of fitting human nature. Through the emotional communication in the process of strategic implementation, the organization's mission, desire and ideas will form members' thought pattern and behavior through a variety of effective communication channels. They cultivate employees the common belief. Finally, it internalizes organizational culture.

Establish a sound management system and norms, weaken the negative role of irrational factors

In the process of strategic management, we emphasize the management of human nature, people-management, self-discipline of the people, at the same time, we also clearly recognize the irreplaceable role of laws and norms. A comprehensive and rational management operational mechanism and perfect management behavioral assessment system and monitoring system will help establish the concept of contract, the sense of equality, and can strengthen action constraint, improve management efficiency, thus, it can curb unreasonable needs, reduce the negative impact brought by irrational factors, such as blindly emotional and conscious impulse, and intuitive mistakes.

Study Note - 3

STRATEGIC POSITION

This Study Note includes

3.1 STRATEGIC POSITION

Strategic Positioning, is about creating and maintaining a competitive advantage in a hyper-competitive environment that is constantly changing. It is by necessity a non-linear approach which seeks to align core competencies and inner strengths with enduring market opportunities to create truly sustainable competitive advantage. When technological advances and global competition can change your competitive position overnight, you need to center your organization around core competencies that don't change easily. When markets are a moving target, you need to look below the surface at what are the enduring characteristics and needs of your customers and be unflinching in satisfying those while extremely flexible in how you do so.

Strategic positioning requires an analysis of the strengths and weaknesses of the firm and the opportunities and threats faced by the firm. This analysis will be useful helping determine which alternative strategic options has the potential to lead to long-term success for the business.

What is Strategy and Strategic Positioning?

Strategy is about making a choice as to where the business manager will focus resources and passion. In essence, strategic positioning is the way the business goes to market – the way the business creates value for the customer. The strategic positioning choice drives the firm's resource investment decisions, including how management allocates time and energy. As discussed in detail later, the choice of strategic position is built around the firm's core competencies – the primary skills and sources of competitive advantage – and the opportunities and threats that the market and external environment provide.

Six Principles of Strategic Positioning

To establish and maintain a distinctive strategic positioning, a company needs to follow six fundamental principles.

First, it must start with the right goal: superior long-term return on investment. Only by grounding strategy in sustained profitability will real economic value be generated. Economic value is created when customers are willing to pay a price for a product or service that exceeds the cost of producing it. When goals are defined in terms of volume or market share leadership, with profits assumed to follow, poor strategies often result. The same is true when strategies are set to respond to the perceived desires of investors.

Second, a company's strategy must enable it to deliver a value proposition, or set of benefits, different from those that competitors offer. Strategy, then, is neither a quest for the universally best way of competing nor an effort to be all things to every customer. It defines a way of competing that delivers unique value in a particular set of uses or for a particular set of customers.

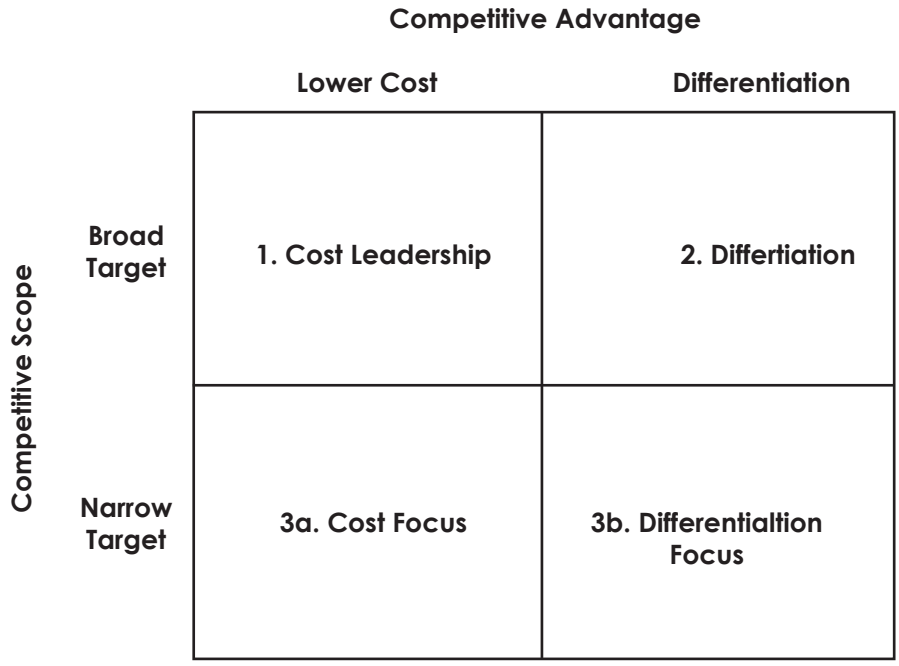
Third, strategy needs to be reflected in a distinctive value chain. To establish a sustainable competitive advantage, a company must perform different activities than rivals or perform similar activities in different ways. A company must configure the way it conducts manufacturing, logistics, service delivery, marketing, human resource management, and so on differently from rivals and tailored to suit its unique value proposition. If a company focuses on adopting best practices, it will end up performing most activities similarly to competitors, making it hard to gain an advantage.

Fourth, robust strategies involve trade-offs. A company must abandon or forgo some product features, services, or activities in order to be unique at others. Such trade-offs, in the product and in the value chain, are what make a company truly distinctive. When improvements in the product or in the value chain do not require trade-offs, they often become the new best practices that are imitated because competitors can do so with no sacrifice to their existing ways of competing. Trying to be all things to all customers almost guarantees a company will lack any advantage.

Fifth, strategy defines how all the elements of what a company does fit together. A strategy involves making choices throughout the value chain that are interdependent; all a company's activities must be mutually reinforcing. A company's product design, for example, should reinforce its approach to the manufacturing process, and both should leverage the way it conducts after-sales service. Fit not only increases the competitive advantage but also makes a strategy harder to imitate. Rivals can copy one activity or product feature fairly easily, but will have much more difficulty duplicating a whole system of competing. Without fit, discrete improvements in manufacturing, marketing, and distribution are quickly matched.

Finally, a strategy involves continuity of direction. A company must define a distinctive value proposition that it will stand for, even if that means forgoing certain opportunities. Without continuity of direction, it is difficult for companies to develop unique skills and assets or build strong reputations with customers. Frequent corporate "reinvention", then, is usually a sign of poor strategic thinking and a route to mediocrity. Continuous improvement is a necessity, but it must always be guided by a strategic direction.

A firm's relative position within its industry determines whether a firm's profitability is above or below the industry average. The fundamental basis of above average profitability in the long run is sustainable competitive advantage. There are two basic types of competitive advantage a firm can possess: low cost or differentiation. The two basic types of competitive advantage combined with the scope of activities for which a firm seeks to achieve them, lead to three generic strategies for achieving above average performance in an industry: cost leadership, differentiation, and focus. The focus strategy has two variants, cost focus and differentiation focus.



1. Cost Leadership

In cost leadership, a firm sets out to become the low cost producer in its industry. The sources of cost advantage are varied and depend on the structure of the industry. They may include the pursuit of economies of scale, proprietary technology, preferential access to raw materials and other factors. A low cost producer must find and exploit all sources of cost advantage. if a firm can achieve and sustain overall cost leadership, then it will be an above average performer in its industry, provided it can command prices at or near the industry average.

2. Differentiation

In a differentiation strategy a firm seeks to be unique in its industry along some dimensions that are widely valued by buyers. It selects one or more attributes that many buyers in an industry perceive as important, and uniquely positions itself to meet those needs. It is rewarded for its uniqueness with a premium price.

3. Focus

The generic strategy of focus rests on the choice of a narrow competitive scope within an industry. The focuser selects a segment or group of segments in the industry and tailors its strategy to serving them to the exclusion of others.

The focus strategy has two variants.

(a) In cost focus a firm seeks a cost advantage in its target segment, while in **(b)** differentiation focus a firm seeks differentiation in its target segment. Both variants of the focus strategy rest on differences between a focuser's target segment and other segments in the industry. The target segments must either have buyers with unusual needs or else the production and delivery system that best serves the target segment must differ from that of other industry segments. Cost focus exploits differences in cost behaviour in some segments, while differentiation focus exploits the special needs of buyers in certain segments.

According to Porter, strategic positioning entails doing things differently from competitors in a way that delivers a unique type of value to customers, such as through a different set of features, a different array of services, or different logistical services. The logic of strategic positioning is that competitive

strategy which is about being different. It means deliberately choosing a different set of activities to deliver a unique mix of value. The basic idea behind this concept is that choosing to perform activities differently or to perform different activities than rivals.

Porter argues that the three basic strategic positions are based on;

(a) the range of customer needs to be served,

(b) the variety of products to be offered, and

(c) the means by which customers are assessed.

The terms Porter uses are 'need-based positioning, variety-based positioning and access-based positioning'.

Need-based Positioning - It is based on needs of a particular customer group. The tailor-made strategies are framed appropriate to different customer groups to serve the specific needs of those customer groups. This concept is similar to that of target marketing.

Variety-based Positioning - It is based on producing a subset of an industry's products or services. It emphasizes on a variety of products/services rather than customer segments.

Access-based Positioning - It is applicable when the needs of different set of customers are similar but the best ways of accessibility are different due to factors like geography or customer scale.

There are three key aspects of strategic position, all of which have a powerful influence on the organisation's strategy:

- the external environment.
- the organisation's strategic capability in terms of its resources and competences.
- culture and ethical values of the organisation and stakeholder influences.

The real art of understanding strategic position is in being aware of the linkages between these three aspects, how they change over time and how they can be integrated to create value. Johnson and Scholes point out that a successful organisation 'will have found a way of operating such that environmental forces, organisational resources and competences, and stakeholder expectations mutually reinforce one another'.

The crucial point to remember is that the best understanding of the strategic position counts for nothing unless the organisation can use the knowledge effectively to develop and implement a successful strategy.

Prior to the 1990s, strategic management tended to focus on the interface between strategy and the external environment in which the organisation operated. However, during the 1990s, the emphasis shifted towards internal factors or the 'resource based view' which stressed the role of the organisation's resources and capabilities as the principal basis for its strategy. The organisation can exploit its unique collection of resources and competences to gain competitive advantage and in a way that is difficult for competitors to imitate.

Application

There are a number of tools and techniques that organisations can use to understand their strategic position. In respect of strategic position, it is important that:

- The organisation needs to use the resulting information effectively. It needs to be discussed, debated and challenged so that the implications can be understood.
- The organisation might need to develop its own tools and techniques to understand its position effectively. What really matters is that understanding the strategic position should help the organisation to formulate and implement a successful strategy.
- The organisation should not paralyse itself through analysis. It may be best to select just a few tools and stick to those.

- Understanding the strategic position should not be an intense one off exercise associated with the annual strategic planning cycle. Instead, it should be thin but ongoing. Some issues, such as competitor information, will need to be reviewed at least monthly.

3.2 ENVIRONMENT ANALYSIS

Business leaders can control aspects of the internal environment that can positively or negatively affect a company's operating and financial results. For example, leaders shape their company's culture, establish the company's organizational structure and create policies that guide employee behavior. However, the greatest challenges to business success may be a consequence of the external environment over which a company has little, if any, control. To address these challenges, business leaders conduct an environmental analysis and develop policies and processes that adapt company operations and products to this environment.

Internal Environment

The internal environment consists of the organization's owners, board of directors, employees, physical environment, and culture. Owners are those who have property rights claims on the organization. The board of directors, elected by stockholders, is responsible for overseeing a firm's top managers. Individual employees and the labor unions they sometimes join are other important parts of the interanal enviornment. The physical environment, yet another part of the internal environment, varies greatly across organizations.

External Environment

The external environment consists of a general environment and an operating environment. The general environment consists of the economic, political, cultural, technological, natural, demographic and international environments in which a company operates. The operating environment consists of a company's suppliers, customers, market intermediaries who link the company to its customers, competitors and the public. Both the general and operating environments provide business opportunities, harbor uncertainties and generate risks to which a business must adapt. For example, countries with large populations may coincide with a large market size for particular products. However, to offer its products in these markets, a company may be required to contend with a government that erects obstacles to trade in the form of tariffs, product standards and customs procedures.

Purpose of Environmental Analysis

Successful businesses adapt their internal environment — including human and financial resources, policies, technologies and operations — to the external environment. The company performs an environmental analysis to identify the potential influence of particular aspects of the general and operating environments on business operations. This analysis identifies the opportunities and threats in a business environment in terms of a company's strengths and weaknesses. For example, a company may consider the impact of operating in a communist country and the threats posed by government-controlled resources. A company might also consider the opportunities of a government-controlled market in terms of competing products, the implications of well-educated and well-paid consumers to product development and sales and the impact of the location of its primary suppliers in a country in economic crises.

Characteristics of Environmental Analysis

In the context of a changing environment, the process of environmental analysis is very well comparable with the functions of radar. If a boat is sailing on a "sea of uncertainty", there are two essential requirements for a successful voyage. There has to be a star to steer the ship. Secondly, there must be a radar to signal the existence of rocks, reefs, and clear water in the uncharted sea. Similarly, a business firm operating in an uncertain environment must have a vision of the business (a guiding star) and a system of environmental analysis (the radar). From this analogy, it is possible to derive three important characteristics of the process of environmental analysis.

1. Environmental analysis is a holistic exercise in the sense that - it must comprise a total view of the environment rather than viewing trends in piecemeal. A radar covers 360 degrees of the horizon, not just a segment, although it can focus on a particular segment if need be. The corporate radar must scan the whole circumference of its environment in order to minimise the chance of surprises and maximise its utility as an early warning system.
2. The analysis of environment must be a continuous process rather than being an intermittent scanning system. Like the radar, it must operate continuously in order to keep track of the rapid pace of development. Periodic analysis may not give a true and reliable indication of the situation, just as the bleeps' registered on the radar screen after a few sweeps of the horizon may not reveal a true picture of the horizon. In this continuous exercise it may be useful to keep in view the distinction between scanning and monitoring aspects of environmental analysis. General scanning of the horizon (broad sweeps of the radar) is essential to pick up new signals from the environment and to keep track of shifts in the overall pattern of developing trends. Monitoring is designed to focus closely on the track of previously identified trends which have been analysed and assessed and found to be of particular importance to the firm.
3. Environmental analysis is a heuristic or exploratory process. While the monitoring aspect of the system is concerned with present developments, a large part of the process seeks to explore the unknown terrain, the dimensions of possible futures, what could happen, not necessarily what will happen. The emphasis must be on alternative futures, seeking clarification of the assumptions about the future, speculating systematically about alternative outcomes, assessing probabilities, and drawing more rational conclusions.

Environmental Analysis Process

An organization relies on strengths to capture opportunities and recognize weaknesses to avoid becoming a victim of environmental threats. A company performs an environmental analysis to gain an understanding of these strengths, weaknesses, opportunities and threats. The environmental analysis then influences corporate planning and policy decisions. This environmental analysis is a three-step process in which a company first identifies environmental factors that affect its business. For example, the company might consider if a market is "difficult" because of its remote geographic location or the area's unfavorable economic conditions. The company then gathers information about the selected set of environmental factors that are most likely to impact business operations. For example, the company might review International Trade Center surveys that relay information about trade barriers that companies face in particular countries. This information serves as input to a forecast of the impact of each environmental factor on the business. For instance, a company might project the volume of products likely to be sold in a country in light of existing poor economic conditions and significant trade barriers.

Limitations of Environmental Analysis

An environmental analysis reviews current environmental conditions to forecast a future business environment. The static nature of the analysis ensures that unexpected environmental changes are not considered in a company's business projections. In addition, the environmental analysis is but one source of information that's evaluated as a company develops a strategic plan. As a result, the analysis does not guarantee business success. The benefit of the analysis is also limited by the reliability and timeliness of data used in the analysis.

Understanding the external environment

Organisations need to understand the external environment in terms of:

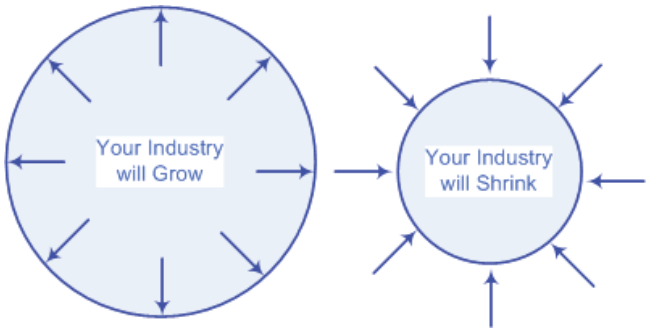
- macro influences – these include political, economic, technological and social factors
- micro influences – factors specific to the particular industry and related industries, including competition, customers, suppliers and barriers to entry.

The Macro Environment Analysis – PESTEL Framework

The Macro Environment Analysis is traditionally the first step of a strategic analysis; it is sometimes referred to as an external analysis, a pest analysis or a pestle analysis.

The purpose of the Macro Environment Analysis is to identify possible opportunities and threats to your industry as a whole that are outside the control of your industry. (Note: You will often be forecasting trends – like "interest rates will remain static" which may or may not be the case)

When completing a macro environment analyses you will be seeking to answer the questions "what will affect the growth of our industry as a whole" and "What is the likely impact of all of the things that affect the growth of your industry"



For example: An aging population is a demographic trend in many western counties, which will result in an increase in the total number of caravans sold – if you are in the caravan industry you should expect to see growth in the total size of your industry.

These opportunities and threats may affect many industries, such as possible interest rate rises, but you should only be interested if interest rate rises will affect your industry.

For example: If you are in the greeting card industry and fluctuations in interest rates will not affect the size of your industry then you do not need to consider interest rates in your macro environment analysis. (However if you are heavily geared or have large borrowings you will need to consider interest rates in your external analysis)

PESTEL Framework

Macro environment analysis is a review of all the factors that a company is unable to control Companies conduct this analysis to stay abreast of the issue in the current business environment. A common tool for conducting a macro environment analysis is the PESTEL framework, which include factors from the political, economic, social, technological, environmental and legal aspects in the business environment. The ultimate purpose of this analysis is to create a strategy that will leverage as many of these external factors as possible to the company's favor.

PEST Analysis

The acronym **PEST** (or sometimes rearranged as "STEP") is used to describe a framework for the analysis of these macroenvironmental factors. A PEST analysis is an analysis of the external macro-environment that affects all firms. P.E.S.T. is an acronym for the Political, Economic, Social, and Technological factors of the external macro-environment. Such external factors usually are beyond the firm's control and sometimes present themselves as threats. For this reason, some say that "pest" is an appropriate term for these factors. However, changes in the external environment also create new opportunities and the letters sometimes are rearranged to construct the more optimistic term of STEP analysis.

PEST analysis is concerned with the key **external environmental** influences on a business. Identifying PEST influences is a useful way of summarising the external environment in which a business operates. However, it must be followed up by consideration of how a business should respond to these influences.

A PEST analysis fits into an overall environmental scan as shown in the following diagram:

PEST Analysis Framework

Many macro-environmental factors are country-specific and a PEST analysis will need to be performed for all countries of interest. The following are examples of some of the factors that might be considered in a PEST analysis.

Political Analysis - The first element of a PEST analysis is a study of political factors. Political factors influence organisations in many ways. Political factors can create advantages and opportunities for organisations. Conversely they can place obligations and duties on organisations. Political factors include the following types of instrument:

- Political stability
- Risk of military invasion
- Legal framework for contract enforcement
- Intellectual property protection
- Trade regulations & tariffs
- Favored trading partners
- Anti-trust laws
- Pricing regulations
- Taxation - tax rates and incentives
- Wage legislation - minimum wage and overtime
- Work week
- Mandatory employee benefits
- Industrial safety regulations
- Product labeling requirements

Economic Analysis - The second element of a PEST analysis involves a study of economic factors. All businesses are affected by national and global economic factors. National and global interest rate and fiscal policy will be set around economic conditions. The climate of the economy dictates how consumers, suppliers and other organisational stakeholders such as suppliers and creditors behave within society.

An economy undergoing recession will have high unemployment, low spending power and low stakeholder confidence. Conversely a "booming" or growing economy will have low unemployment, high spending power and high stakeholder confidence.

A successful organisation will respond to economic conditions and stakeholder behaviour. Furthermore organisations will need to review the impact economic conditions are having on their competitors and respond accordingly.

In this global business world organisations are affected by economies throughout the world and not just the countries in which they are based or operate from. For example: a global credit crunch originating in the USA contributed towards the credit crunch in the UK in 2007/08.

Cheaper labour in developing countries affects the competitiveness of products from developed countries. An increase in interest rates in the USA will affect the share price of UK stocks or adverse weather conditions in India may affect the price of tea bought in an English café.

A truly global player has to be aware of economic conditions across all borders and needs to ensure that it employs strategies that protect and promote its business through economic conditions throughout the world. Examples of Economic factors are as follows :

- Type of economic system in countries of operation
- Government intervention in the free market

- Comparative advantages of host country
- Exchange rates & stability of host country currency
- Efficiency of financial markets
- Infrastructure quality
- Skill level of workforce
- Labor costs
- Business cycle stage (e.g. prosperity, recession, recovery)
- Economic growth rate
- Discretionary income
- Unemployment rate
- Inflation rate
- Interest rates

Social Analysis - The third aspect of PEST focuses its attention on forces within society such as family, friends, colleagues, neighbours and the media. Social forces affect our attitudes, interests and opinions. These forces shape who we are as people, the way we behave and ultimately what we purchase. For example within the UK peoples attitudes are changing towards their diet and health. As a result the UK is seeing an increase in the number of people joining fitness clubs and a massive growth for the demand of organic food. Products such as Wii Fit attempt to deal with society's concern, about children's lack of exercise.

Population changes also have a direct impact on organisations. Changes in the structure of a population will affect the supply and demand of goods and services within an economy. Falling birth rates will result in decreased demand and greater competition as the number of consumers fall. Conversely an increase in the global population and world food shortage predictions are currently leading to calls for greater investment in food production. Due to food shortages African countries such as Uganda are now reconsidering their rejection of genetically modified foods.

In summary organisations must be able to offer products and services that aim to complement and benefit people's lifestyle and behaviour. If organisations do not respond to changes in society they will lose market share and demand for their product or service.

- Demographics
- Class structure
- Education
- Culture (gender roles, etc.)
- Entrepreneurial spirit
- Attitudes (health, environmental consciousness, etc.)
- Leisure interests

Technological Analysis - Unsurprisingly the fourth element of PEST is technology, as you are probably aware technological advances have greatly changed the manner in which businesses operate.

Organisations use technology in many ways, they have

1. Technology infrastructure such as the internet and other information exchange systems including telephone.
2. Technology systems incorporating a multitude of software which help them manage their business.

3. Technology hardware such as mobile phones, Blackberrys, laptops, desktops, Bluetooth devices, photocopiers and fax machines which transmit and record information.

Technological factors are a multifaceted influencer. Let's just think about the sorts of technology that you come in touch with almost daily. Smart phones such as Android and iPhone are now common, and we are used to being able to access information and communication technology instantly no matter where we are. During studies or at work we have access to information on quick PCs and over the Internet, with faster broadband connections arriving in many parts of the world.

Technology also surrounds business processes. Within an organisation all departments use information technology or technology in one form or another. Our manufacturing operations use technology to produce goods and services. Our logistics and warehousing functions use forklifts and lorries as well as order tracking technology and software. The customer service department will use communication technology to talk to customers but will also have access to internal systems, such as technology to simplify credit control and stock control for example. There are many, many more examples of technology.

Technology is vital for competitive advantage, and is a major driver of globalization. Consider the following points:

1. Does technology allow for products and services to be made more cheaply and to a better standard of quality?
2. Do the technologies offer consumers and businesses more innovative products and services such as Internet banking, new generation mobile telephones, etc?
3. How is distribution changed by new technologies e.g. books via the Internet, flight tickets, auctions, etc?
4. Does technology offer companies a new way to communicate with consumers e.g. banners, Customer Relationship Management (CRM), etc?

Technology has created a society which expects instant results. This technological revolution has increased the rate at which information is exchanged between stakeholders. A faster exchange of information can benefit businesses as they are able to react quickly to changes within their operating environment.

However an ability to react quickly also creates extra pressure as businesses are expected to deliver on their promises within ever decreasing timescales.

For example the Internet is having a profound impact on the marketing mix strategy of organisations. Consumers can now shop 24 hours a day from their homes, work, Internet café's and via 3G phones and 3G cards. Some employees have instant access to e-mails through Blackberrys but this can be a double edged sword, as studies have shown that this access can cause work to encroach on their personal time outside work.

The pace of technological change is so fast that the average life of a computer chip is approximately 6 months. Technology is utilised by all age groups, children are exposed to technology from birth and a new generation of technology savvy pensioners known as "silver surfers" have emerged. Technology will continue to evolve and impact on consumer habits and expectations are huge. Organisations that ignore this fact face extinction. The important technological factors are as follows :

- Recent technological developments
- Technology's impact on product offering
- Impact on cost structure
- Impact on value chain structure
- Rate of technological diffusion

The number of macro-environmental factors is virtually unlimited. In practice, the firm must prioritize and monitor those factors that influence its industry. Even so, it may be difficult to forecast future trends with an acceptable level of accuracy. In this regard, the firm may turn to scenario planning techniques to deal with high levels of uncertainty in important macro-environmental variables.

PEST Analysis Example – Restaurant

The various Political, Economic, Social and Technical factors that a firm needs to consider and research in order to enter the restaurant business in a new environment may be depicted as follows:-

Political Factors:

- Government regulations regarding hygiene, health and food regulations, food standards, etc.
- Economic policies of government regarding the restaurant industry and running eating joints; these may include licenses, inspections by Health and Food Ministry departments, etc.

Economic Factors:

- Interest rate would impact the cost of capital, the rate of interest being directly proportionate to the cost of capital.
- Rate of inflation determines the rate of remuneration of employees and directly affects the price of the restaurant's products. Again, the proportion between the inflation rate and wages/prices is direct.
- Economic trends act as an indicator of the sustenance and profitability of your business in the chosen region and help you in deciding your marketing strategy.

Social Factors:

- Certain cultures abhor certain foods. For instance, Hindus will not eat beef and Muslims would not even touch pork. Therefore knowledge of these cultural facts about your business environment will help you decide whether or not you'll be able to do any business there.
- Eating habits of the people in your chosen business environment may, and certainly will, affect your marketing decisions.
- Ratio of people preferring to eat out regularly.

Technological Factors:

- A good technical infrastructure would lead to better production, procurement and distribution logistics, resulting in reduced wastage and lower costs.
- Sound technology may be a decisive factor for food technology innovation, better presentation, more effective business marketing, etc.

That was a sample PEST report. Hotel and food processing businesses would also have a similar PEST structure with some changes here and there. All in all, PEST analysis is a great way of getting to know the battlefield environment before you jump headlong into it. A PEST report allows you to take in all details about the ring, the spectators and the opponent to better equip you for the fight! After all, it's always good to look before you leap!

PEST Analysis of Pepsi

The PEST analysis method has been successfully applied by Pepsi, which has obtained economic advantage in its industry. The PEST analysis method and examples specific to Pepsi are seen in the following factors:

Political: The manufacture, delivery, and use of numerous Pepsi products are subject to many federal regulations, like the Food, Drug and Cosmetic Act. The business is also governed by government and foreign rules. The international business is subjected to the political stability.

Economic: The products of Pepsi are influenced by the raw material yield being used in the soft drinks, juices, etc. All distribution is affected by the cost of fuel. Operations in international markets involve the study of unpredictable changes in foreign exchange rate. The economic impacts of such movements are serious because these affect the growth. Pepsi is also subjected to availability of energy, supply of money, business cycles, etc.

Social: Lifestyle has great influence on the use of Pepsi products, and their advertisements are designed accordingly. Introduction of Pepsi products in the international market requires an in depth study of the local social structure.

Technology: Pepsi is influenced by the modern manufacturing techniques applicable to their business divisions of soft drinks, juices, and snack food. Pepsi has to focus on the latest distribution techniques, and other technological advances in their industry.

PEST Analysis - Alliance Manufacturing Company

POLITICAL	ECONOMIC	SOCIAL	TECHNOLOGICAL
• Domestic and international political stability • Newly passed tax legislation • New employment law and updating employee handbook • Trade restrictions and tariffs • New environmental regulations	• State of the domestic and international economies • Interest rates • Exchange rates • Inflation rate	• Demographic shifts within product lines • Division of wealth in society • Health and safety • Population growth rate	• Rate of technological innovation • Automation advances • Process innovation • Recent technological developments

PEST Analysis - SoCal Media Company

POLITICAL	ECONOMIC	SOCIAL	TECHNOLOGICAL
• Regulatory bodies and processes • New government policies • Domestic and international activist and pressure groups	• Domestic and international economies • Taxation specific to services • Specific industry factors • Market routes and distribution trends • Customer/end-user drivers	• Lifestyle and social trends • Demographic shifts • Consumer attitudes and opinions • Media views • Brand and company image • Consumer buying patterns • Buying access and trends • Advertising and publicity • Ethical issues	• Competing technology development • R&D activity • associated/dependent technologies • Maturity of technology and adoption • Consumer buying mechanisms/technology • Intellectual property issues

PEST Analysis - ABC Software Company

POLITICAL	ECONOMIC	SOCIAL	TECHNOLOGICAL
• New federal and state tax policies affecting accounting • New employment laws affecting HR and employee handbook • Political instability in specific foreign customer and partner countries	• Domestic and international economic growth • Interest rate changes and projections	• Population growth rates • Age distribution and influence in current and target customer pools • Career attitudes and potential educational and skill-set shifts	• R&D activity • Automation • New, discontinued, and changing technology incentives • Rate of technological and innovation change

PEST Analysis - Lazer Gaming Company

POLITICAL	ECONOMIC	SOCIAL	TECHNOLOGICAL
• New ecological and environmental issues • Regulatory bodies and processes • Foreign distribution policies • Advocate adherence and lobbying/pressure groups • International pressure groups	• Domestic and international economy trends • General taxation issues • Consumer seasonality issues • Market and trade cycles • Specific industry factors • Market routes and distribution trends • Customer and end-user drivers	• Lifestyle trends • Product demographics • Consumer attitudes and opinions • Media views • Brand and company image • consumer buying patterns • Major events and influences • Buying access and trends • Marketing, advertising and publicity	• Competing technology development • R&D activity • Replacement technology/solutions • Maturity of technology • Manufacturing maturity and capacity • Consumer buying mechanisms • Technology access, licensing, patents • Intellectual property issues

PEST Analysis - Jones Consulting

POLITICAL	ECONOMIC	SOCIAL	TECHNOLOGICAL
• Current state and federal legislation • Future state and federal legislation • Regulatory bodies and processes • Funding, grants and initiatives • Lobbying and advocate groups	• Domestic and international economies • General taxation issues and trends • Taxation specific to services • Seasonality issues • Specific industry factors	• Lifestyle trends • Services demographics • Brand and firm image and perception • Major events, trade shows and influences • Advertising, marketing and publicity • Ethical issues	• Technological advances • Competitor differentiations • Replacement technology and solutions • Methodologies, information and communications • Innovation potential • Technology access, licensing, patents • Intellectual property issues • Global and domestic communications

PEST Analysis - Smith Accounting Firm

POLITICAL	ECONOMIC	SOCIAL	TECHNOLOGICAL
• Domestic political stability • New audit and tax law • regulatory bodies and processes • New employment law and HR compliance	• State of the domestic and international economies • Inflation rate • Competitor fee changes • New practice opportunities • Seasonality Issues	• Demographic shifts • Accountant roles and changes • Brand and firm image • Major events and influences • Marketing, public relations, and advertising	• Technological change • Automation • Recent technological developments • Intellectual property issues

Limitations of a PEST Analysis

If you're planning to use PEST analysis during strategy planning – it's important that you understand the limitations of a Pest Analysis before relying completely on its results. Here's a list of some of the limitations which can cloud the results of a PEST analysis.

PEST, or what is also known as PESTLE, is a strategic management tool used to study and analyze how Political, Economic, Social, Technological, Legal and Environmental factors affect a business or a project. This strategic planning tool is quite an effective way of scanning the operating environment of a project.

1. The external factors considered during PEST analysis are dynamic and they change at a very fast pace. At times, these changes may occur in less than a day's time, thus making it tricky to predict why and how these factors may affect the present or future of the project. On many occasions, environmental changes that may have an adverse effect on the project may not be noticeable during their initial stages. All that indicates that a certain amount of uncertainty still remains even after carrying out a detailed PEST analysis, which to some extent defeats the prime purpose of this analysis – cutting down the uncertainty.

2. It's simple presentation can also be considered a limitation. For PEST analysis, the usual procedure is to present a simple list of the environmental factors that can affect the project. Unless the attributing factors are critically examined in terms of the degree of impact, the findings of the analysis don't seem to be of much value.

3. Collecting enormous amounts of relevant data from the right sources becomes a bit of a problem, especially since most of the pertinent data must be collected from external agencies. This makes PEST analysis not only time consuming but costly as well. Also, getting the latest data and keeping the analysis updated with it becomes a problem.

4. The lack of easily available updated information, as mentioned in the point above, leads to one more problem – making too many assumptions. Oftentimes, the factors mentioned in the analysis are based more on assumptions and less on actual facts. An analysis based on unfounded assumptions can lead to planning disasters. So, it's important to device some method to cross-verify whether the factors mentioned in the PEST analysis are not merely based on tenuous assumptions.

5. A proper PEST analysis requires a lot of information to be collected. But when handling too much information, the users tend to get confused and lose sight of what factors are more critical. This ambiguity in prioritizing the affecting factors can put the entire planning on the wrong track.

6. PEST analysis is insufficient for the purpose of strategic planning, since it scans only the external environment while completely ignoring the internal environment and the competitive scenario. Nonetheless, there sure are ways to overcome this limitation. For PEST analysis to make some worthwhile contributions towards strategic planning it must be in conjunction with other tools like SWOT analysis to get a more realistic overall picture.

PEST does offer a viable technique for carrying out an environmental scan for a project, however, its effectiveness depends on the accuracy of the data collected, timely updates to accommodate changes and the use of additional tools that can trim down the limitations of a PEST analysis to some extent.

PESTLE Analysis

The **PESTLE Analysis** is a framework used to scan the organization's external macro environment. **PESTLE** is a mnemonic which in its expanded form denotes P for Political, E for Economic, S for Social, T for Technological, L for Legal and E for Environmental. It gives a bird's eye view of the whole environment from many different angles that one wants to check and keep a track of while contemplating on a certain idea/plan.

Some approaches will add in extra factors, such as International, or remove some to reduce it to PEST. However, these are all merely variations of a theme. The important principle is identifying the key factors from the wider, uncontrollable external environment that might affect the organization.

Purpose - The purpose of the PESTLE analysis is to assess the industry which an organisation is in. The PESTLE analysis is used in conjunction with the SWOT analysis which assesses the Strengths, Weaknesses, Opportunities and Threats to an organisation. The PESTLE analysis is also seen to assess the Opportunities and Threats to the organisation.

PESTLE as a strategic tool - Strategic management is about formulating and implementing decisions which allow an organisation to achieve its long term objectives. This can be done ad-hoc, regularly or continuously scanning. Whether the scanning is of TESCO as an entire organisation or individual store, a **PESTLE analysis** should be undertaken.

Strategies are formulated by Chief Executive Officers, approved by the Board of Directors and implemented by Senior Management. The PESTLE analysis is part of the environmental scanning branch of strategic management.

The PESTLE Factors

We start with the **Political forces**. First of all, political factors refer to the stability of the political environment and the attitudes of political parties or movements. This may manifest in government influence on tax policies, or government involvement in trading agreements. Political factors are inevitably entwined with **Legal factors** such as national employment laws, international trade regulations and restrictions, monopolies and mergers' rules, and consumer protection. The difference between Political and Legal factors is that Political refers to attitudes and approaches, whereas Legal factors are those which have become law and regulations. Legal needs to be complied with whereas Political may represent influences, restrictions or opportunities, but they are not mandatory. Political factors in a PESTEL analysis are typically external to the company's operations, such as government regulations or individual politicians who can control how a company operates. A review of political factors can help a company determine how revenue increases will affect its tax liability, the barriers to entry in new markets based on local or national laws and the penalties for acting in violation of political laws and regulations.

Economic factors are also an external factor in the PESTEL analysis. Consumer income and spending rates, available credit, current money supply levels, inflation and interest rates on paid or borrowed funds are economic factors a company cannot usually influence. Companies must be aware of these factors, however, to ensure they operate within a set of boundaries consistent with current economic factors. For example, taking on too much debt when interest rates may adjust higher in the future can negatively impact a company. Economic trends represent the wider economy so may include economic growth rates, levels of employment and unemployment, costs of raw materials such as energy, petrol and steel, interest rates and monetary policies, exchange rates and inflation rates. These may also vary from one country to another.

Socio-cultural factors represent the culture of the society that an organization operates within. They may include demographics, age distribution, population growth rates, level of education, distribution of wealth and social classes, living conditions and lifestyle. As a nation's population ages, the demand for goods and services will shift. Consumers may need fewer electronics but more health care-related items. Additionally, an increase in population from immigration or higher birth rates will also signal a change in preferences for economic goods.

Technological factors refer to the rate of new inventions and development, changes in information and mobile technology, changes in internet and e-commerce or even mobile commerce, and government spending on research. There is often a tendency to focus Technological developments on digital and internet-related areas, but it should also include materials development and new methods of manufacture, distribution and logistics. Technological changes in the PESTEL analysis is a more increasingly important factor in this analysis. As business technology changes frequently, companies must remain aware of these changes in order to take advantage of them. Failing to stay on pace with competitors who use technology to create a competitive advantage can put a company behind in the economy in terms of production output or cost reduction activities.

Environmental impacts relate to the natural environment surrounding a company. This includes natural resources like wildlife, timber, minerals, waterways and similar items. In addition to the company's direct impact on the environment, companies will most likely have to consider public opinion. Environmental factors also can include issues such as limited natural resources, waste disposal and recycling procedures. The public can have a negative opinion on a company's business practices, which in turn will dissuade consumers from patronizing the business.

Legislative factors in PESTEL analysis typically relate to future changes in laws and regulations. Most governments tend to add laws or regulations to various business activities. Unfavorable legislation can result in fewer profitable transactions or a more difficult operating environment. Companies working in multiple international markets will have to focus on the legislative factors from each country.

Additional Considerations

A newer force which is gaining importance is ethics. These can be defined by the set of moral principles and values that govern the actions and decisions of an individual or group. Ethics and morals serve as guidelines on how to act rightly and justly when individuals are faced with moral dilemmas.

This force could include corporate social responsibility, fair trade, affiliation between corporations and charities. A particular problem may exist with how ethical factors relates to legal forces as they may be at different stages in development. Something may be ethical but not protected by law, whereas other activities may not be ethical, but are legal.

A PESTLE analysis should feed into a SWOT analysis as it helps to determine the threats and opportunities represented by macro-environment forces that the organization usually cannot control.

On an international basis, it is best to perform the analysis on a country-by-country basis because factors can differ greatly between countries (or even regions).

PESTLE ANALYSIS OF TESCO

Tesco is the giant of all supermarkets due to its UK dominance. Retail analysts have identified three main reasons for this.

1. Tesco's are everywhere;
2. sell to everyone;
3. sell everything

Due to the nature of the TESCO organisation with particular reference to how it has branded and marketed itself, and the current economic climate, the assessment of external factors by a PESTLE analysis has been crucial in **TESCO's** success. This is because TESCO has taken into account the implications for consumers, employees, stakeholders, associated organisations and the company's mission statement. Each external factor would have been and continues to be examined and categorised in terms of whether its implication is negative or positive, large or minor significance, intermittent or continuous impact and so on.

PESTLE analysis factors examined:

Politically, the credit crunch may lead to higher numbers of unemployment. As one of the largest and fastest growing retailers more jobs will be available with TESCO therefore helping to reduce the levels of unemployment. A PESTLE analysis is therefore useful in keeping TESCO up to date with their environmental surroundings, for example, realising in advance that we were heading for a recession would have helped them to plan ahead.

Whilst one of **TESCO's competitive advantages** at present relates to their overwhelming physical presence, there are issues about TESCO driving out the competition from other retailers. There are policies as well as laws and regulations governing monopolies and competition which would be identified though a PESTLE analysis. This is potentially one of the main issues that TESCO's are faced with. Protecting consumers and ensuring that entrepreneurs have the opportunity to compete in the market economy are important within consumer law. Due to the current state of the economy, many small businesses are failing and many unable to enter the market. A PESTLE analysis helps to assess where location wise there is a demand for expansion. The situation is in no way being assisted by the ever expanding TESCO's chains of store. Under EU law, there is presumption that an organisation with a large market share is dominant. The concerns with this are that quality of products and services will slip and there is a risk of paying higher prices. TESCO to date has not been assessed as posing a risk of exploitation but should bear this in mind. This is the reason why regular or continuous scans making use of the PESTLE analysis will lead to continuous assessments which can ensure that TESCO's dominance is not in any way exploitative.

In addition, planning permission is an issue that TESCO seriously need to be aware of due to their continued expansion. Planning permission is heavily regulated in the UK. A thorough PESTLE analysis would help to identify the relevant laws on planning permission and whether any resistance to planning was on lawful grounds or merely local people's dissent. The PESTLE analysis would therefore initially assess the potential success of a store in a new area.

With the economy being as it is at present, TESCO are fortunate that they have not been as badly affected as some retailers by the recession. TESCO have branded themselves as selling to everyone and therefore offer a range of products and services from Value to Finest prices thus appealing to all segments of the market.

The Sociological aspect of the PESTLE analysis involves considerations such as the increase in immigration of Eastern Europeans or increase in young professionals. Naturally there is therefore a demand for new goods for example, the career minded professional who is a single person. This has seen a rise in the meals for one or quick microwaveable meals to make cooking quick and easy for those always on the go.

Technological factors which have perhaps had the most impact on TESCO has been the growth in the use of the internet. They have capitalised on the use of online shopping and provide a delivery service through their website at www.tesco.com.

TESCO's are also instrumental as a retailer in supporting carbon reductions and have created a £100 million Sustainable Technology Fund for this purpose. They also encourage their customers to make low carbon choices. Yet if TESCO's did not take their corporate responsibilities seriously in relation to environmental issues it could have dire consequences for TESCO's reputation.

A **PESTLE analysis** is therefore vital to the development and the success of TESCO's in addition to the day to day management of each store in line with strategic decisions. Without knowing what external factors affect the organisation, it is difficult to manage the business in an efficient manner.

PESTLE ANALYSIS OF NOKIA

Introduction

A PESTLE analysis would analyse the macro environment of Nokia. These are all the external forces that are out of Nokias' control but have a significant effect on how the company operates and the strategic decision they make. This model looks at the Political, Economical, Social, Technological, Legal and Environmental factors relating to Nokia and the industry they operate in.

Political

The *Political* factors relates to the factors which the government also affects such as government instability or rules and regulations which the business must follow. Nokia have recently moved one of its manufacturing facilities to India, and because of this it is important that Nokia follow the rules and regulations that are set in India, so that they can operate as efficiently as possible. The types of things they will have to be aware of is the minimum wage, the maximum hours a week employees can work and especially the Health and Safety regulations; this is to avoid any bad press or revolt from employees that will ultimately damage the reputation of Nokia both short term and long term. As well as it is vital that Nokia have a good relationship with their government in Finland, as any political instability such as a change in government or coalition may result in new laws being implemented, which will affect Nokia a lot.

Economical

Nokia is vital to the *Economy* in Finland as it currently occupies a third of the market on the Helsinki stock exchange. The organisation is so important to the economy of Finland that the government had to step in when Nokia planned job cuts in Finland in 2011 and with fears of what that would do to the economy the Finnish government stated they were prepared to help find jobs for those who are sacked (*Reuters, 2011)*.

Nokia will also have to be aware of changes in exchange rates, as they operate on a global scale and drastic changes in rates can have a devastating effect on the financial operations of the company if the business do not take appropriate steps to ensure the effects are minimum. The threat of recession on western economy has also had an effect on the interest rates in banks, which means the cost of borrowing money for business activities has increased and Nokia will need to be aware of the changes in interest rate.

Social

With Nokia mainly operating in the Western market it is important for them to fully understand the social factors in these markets and the main factor they need to understand is the culture of the society; which is to have the latest and most up to date phone, is considered a key fashion icon. Consumers are always after the most innovative and best looking Smartphone because in today's culture people are judge on how fashionable they are by their choice of mobile phone.

The increasing trend in Smartphones means when consumers purchase new mobile phones less and less consumers are choosing the standard mobiles phones over Smartphones because of the social trend in today's society. Nokia will be aware of this and may now spend the majority of their efforts developing a Smartphone that can compete with their rivals' products, in order to keep up with the trends of their consumers.

Technological

The technological advances in the industry are vital to the success of any new Smartphone in the market that is continually growing, as the level of competition rises Nokia must ensure that their Smartphones are at the highest level of innovation. With functions such as camera, internet, social networking and email all necessities on Smartphones Nokia will have to think of other functions to help differentiate and stand out from its rivals. As well as function more and more consumers are looking at the software running all the functions as a key indicator of the success and quality of the Smartphone, so Nokia's alliance with Microsoft for their latest Smartphones seems a very good move as everyone are aware of the technological capabilities of Microsoft and the value they can add to any technological product.

In the past Nokia were the market leaders in innovation in the mobile phone industry, however in recent times they have seemed well off the mark and struggle to compete with their rivals. This is why Nokia must consider their position in the industry and attempt to once again become the market leader by offering a new innovative capability and get to the market before its rivals.

Legal

Intellectual property is the key to any technological business and must be cared for and protected to the fullest amount to ensure the business does not lose out to rivals. Nokia operate in an industry where it is very difficult to have a product that is different to its competitors, when they do release a product with an innovative capability it is vital to protect the rights to it through patents, copyright, trademarks or design to ensure they are not "stolen" by their competitors. Not only are competitors a threat of intellectual, but Nokia must ensure they do not fall victim to counterfeiters who claim to be a Nokia products but are cheap knock-offs.

As Nokia have manufacturing plants in various countries it is extremely important that they abide by the laws and regulations set by the different countries as the laws will differ depending on the country, these can be employments laws, Health and Safety or even trade restrictions.

Environmental

In today's culture it is very important for organisations to be seen as environmentally friendly and ethical with its manufacturing, because of the global effect it has on global warming so Nokia must ensure that they operate in an appropriate manner. With mobile phone recycling organisations becoming more and more popular, this demonstrates how important people are regarding it. The main issue with mobile recycling is the disposal of the batteries in the phones as these can become dangerous if not disposed of appropriately.

Environmental Threat and Opportunity Profile (ETOP)

The identification of environmental factors is necessary for environmental analysis and diagnosis. Some of environmental factors produce opportunity to the firm and some factors produce threat to the firm. An opportunity is a major favourable situation in the firm's environment. Identification of good market segment, technological changes etc. may create opportunity to the firm. A threat is a major unfavourable situation in the firm's environment. The entrance of new competitor, slow market growth etc. may create threat to the firm. So, identification and appraisal of such factors are necessary. There are many techniques available to structure the environmental analysis. One such technique, suggested by Glueck, is preparation of an environmental threat and opportunity profile (ETOP) for an organisation.

As a summarised depiction of the environmental factors and their impact on future conditions the profile is a convenient means by which attention of top management may be drawn to the most critical factors and their potential impact on the strategy of the firm as a whole and key aspects of its operations.

The environmental appraisal is structured by the preparation of the environmental threats and opportunities profile (ETOP), which involves dividing the environment into different sectors and then analysing the impact of each sector on the organisation.

The preparation of ETOP involves dividing the environment into different sectors (such as market, technology, supplier, political, economic etc.) and then analysing the impact of each sector on the organisation. A comprehensive ETOP requires subdividing each environmental sector into subfactors and then requires analysing the impact of each subfactor on the organisation. It can be explained in following table : For the sake of simplicity, a summary ETOP may only show the major factors. The following table provides an example of an ETOP prepared for an established company in the bicycle industry. The main business of the company is in sports cycle manufacturing for the domestic and exports market. This example relates to a hypothetical company but the illustration is realistically based on the current Indian business environment.

Environmental Sector	**Impact (+) Opportunity (-) Threat**
Market	(+) Products have large demand.
Technological	(+) Community requires product of advanced technology and in our organization technology upgradation is in progress.
Supplier	(+) Imported raw materials easily available but (–) Sources of labour adapted in advance technology will become scarce.
Government	(+) Liberalisation of technology import policy.
Competition	(–) Customers will become more sensitive in their requirements. (–) Cheap imports of same product from China.

From the above table the strategists can plan about its product, technology, market to avoid competition and can operate advanced training programme for its labour.

Advantages :

(i) The preparation of an ETOP provides the strategists with a clear picture of which sectors (and the different sub factors in each sector) have a favourable impact on the organisation,

(ii) By means of an ETOP, the organisation can see where it stands with respect to its environment. Obviously, such an understanding can be of great helps to an organisation in formulating appropriate strategies to take advantage of the opportunities and oppose the threats in its environment,

(iii) Based on this analysis top managers could focus on some areas and delegate others,

(iv) This analysis also provide data for revenue and cost implication of these factors as well as estimates on the likelihood that certain events will occur and their timing,

(v) It provides the input for generating strategic change alternatives and determining whether gaps might exist between expected and desired outcomes.

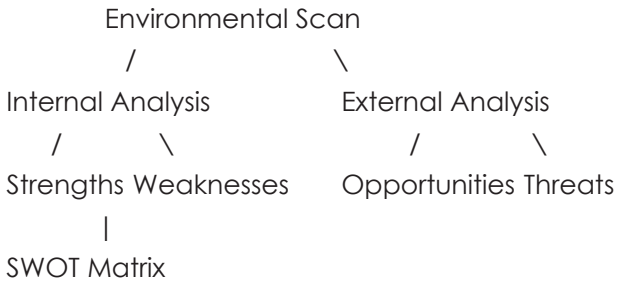
SWOT (strengths, weakness, opportunities, threats) Analysis

The prospects of a business depend both on its resources and the environment. An analysis of the strengths, weaknesses, opportunities and threats (SWOT) is very much essential for the business policy formulation.

A scan of the internal and external environment is an important part of the strategic planning process. Environmental factors internal to the firm usually can be classified as strengths (**S**) or weaknesses (**W**), and those external to the firm can be classified as opportunities (**O**) or threats (**T**). Such an analysis of the strategic environment is referred to as a **SWOT analysis**.

It is a critical analysis and assessment of strengths and weaknesses, opportunities and threats in relation to the internal and external environmental factors affecting an entity. It is simply referred to as 'SWOT analysis'. It involves a systematic analysis of the internal strengths and weaknesses of a business firm (financial, technological, managerial) and of the external opportunities and threats in the firm's environment like changes in the markets, laws, technology and the actions of the competitors. Strengths and weaknesses analysis focus on particular strengths and weaknesses of the firm itself. It is an internal appraisal and intended to shape its approach to the external world. Opportunities and threats analysis is done particularly with regard to profit making opportunities in the business environment and identifiable threats e.g. falling demand, new competition, technology advancements, government regulation, changing tastes and habits of consumers etc. It is more concerned with the appraisal of external environment of business.

The SWOT analysis provides information that is helpful in matching the firm's resources and capabilities to the competitive environment in which it operates. As such, it is instrumental in strategy formulation and selection. The following diagram shows how a SWOT analysis fits into an environmental scan:



Through such an analysis, the strengths and weakness existing within an organisation can be matched with the opportunities and threats operating in the environment so that an effective strategy can be formulated.

Strengths

A firm's strengths are its resources and capabilities that can be used as a basis for developing a competitive advantage. It is an inherent capacity which an organization can use to gain strategic advantage. It may be the availability of a particular resource with the firm or the ability of the firm to leverage it to performing certain activities better than its competitors.

Examples of such strengths include:

- patents
- strong brand names
- good reputation among customers
- cost advantages from proprietary know-how
- exclusive access to high grade natural resources
- favorable access to distribution networks

Weaknesses

The absence of certain strengths may be viewed as a weakness. It is an inherent limitation or constraint which creates strategic disadvantages. It is the nonavailability of particular resource with the firm or the inability of the firm to leverage that resource in performing certain activities better than its competitors.

For example, each of the following may be considered weaknesses:

- lack of patent protection
- a weak brand name
- poor reputation among customers
- high cost structure
- lack of access to the best natural resources
- lack of access to key distribution channels

In some cases, a weakness may be the flip side of a strength. Take the case in which a firm has a large amount of manufacturing capacity. While this capacity may be considered a strength that competitors do not share, it also may be considered a weakness if the large investment in manufacturing capacity prevents the firm from reacting quickly to changes in the strategic environment.

Opportunities

The external environmental analysis may reveal certain new opportunities for profit and growth. It is a favourable condition in the firm's environment which enables it to consolidate and strengthen its position.

Some examples of such opportunities include:

- an unfulfilled customer need
- arrival of new technologies
- loosening of regulations
- removal of international trade barriers

Threats

Changes in the external environment may present threats to the firm. It is an unfavourable condition in the organization's environment which creates a risk or causes damage to the firm, which the firm is not equipped to handle.

Some examples of such threats include:

- shifts in consumer tastes away from the firm's products
- emergence of substitute products
- new regulations
- increased trade barriers

A TYPICAL SWOT ANALYSIS

	Positive	Negative
Internal Factors	Strengths - Proved and latest technology - Reliable channel partners - High quality product - Established brand image - Experienced and loyal manpower - Established R&D facilities - Well balanced capital structure - ISO 9000:2000 quality management systems adopted - Favourable location	Weaknesses - Inadequate working capital facilities - Over dependence on imported raw materials - Uncertain cashflow - High cost of advertising and sales promotion - Inexperienced marketing staff - Existence of production bottlenecks - Lack of management information system
External Factors	Opportunities - Booming stock market - Excellent opportunities for export - Scope for backward integration - Availability of low technology options - Favourable industry trends - Low cost of debt and equity funds available - Favourable tax system	Threats - Excessive government controls - Very few entry-barriers - Entry of global corporations - Severe fluctuations in foreign exchange rates - Unstable Government - Fast changing technology - Unfavourable political environment

SWOT analysis will provide basis for evaluating the extent to which the firm is likely to achieve its various objectives and for identifying new products and market opportunity. It is an internal as well as external appraisal of a firm which will enable in identifying the strategic approach to be formulated that will fit into its business environment.

The basic objectives of conducting SWOT analysis are:

(a) to identify the shortcomings in the company's present skills and resources.

(b) to exploit the strengths of the company to achieve its objectives.

(c) to focus on profit-making opportunities in the business environment and for identifying threats.

(d) to highlight areas within the company, which are strong and which might be exploited more fully and weaknesses, where some defensive planning might be required to prevent the company from downfall,

SWOT analysis is useful at corporate, functional and competitive strategy levels as it addresses the current fit between the organization and its environment, and considers the potential impact of strategy changes. A decision taken in the light of a sound and thorough SWOT analysis can be informative to the extent that the organization becomes proactive, the basic aim of any strategic planning, and seeks to manage environment rather being reactive i.e. responding to changes that managers have failed to foresee. The organizational analysis, being part of SWOT analysis should cover each major element like leadership, organizational structure, production, marketing, finance, personnel, company image and standing etc. SWOT analysis should include economic factors, political factors, social factors, state of competition, state of technology, emerging trend of consumer needs, import, export, foreign exchange position etc.

SWOT analysis maybe undertaken effectively through a 'brainstorming' session, which should be attended by all key executives and functional heads. SWOT analysis enables a manager to present a

picture of the company before it chooses any strategy. Such assessment clarifies the perspective of the company at a given point of time. SWOT analysis offers a static picture of the company in relation to some specific environmental condition.

SWOT analysis will enable the company in the following ways:

(a) Eliminating the weaknesses that expose a company to external threats.

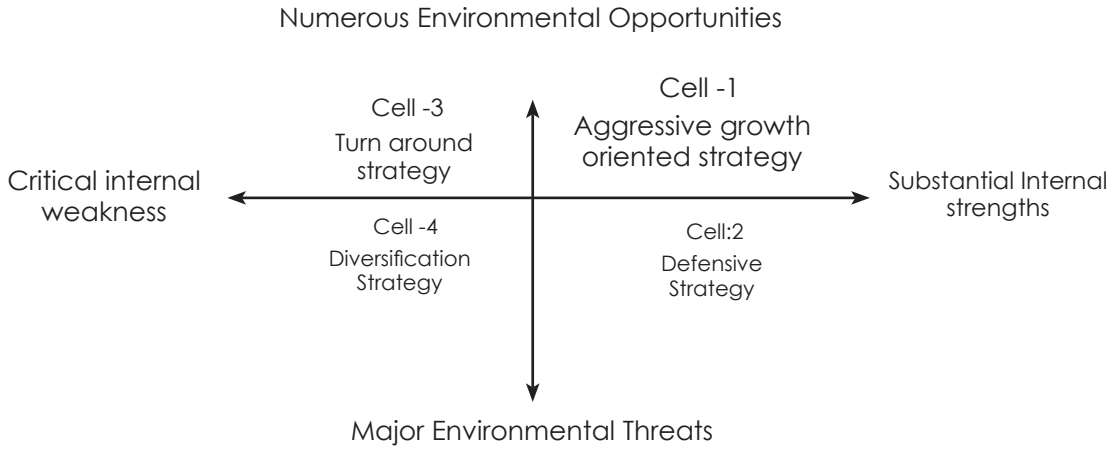
(b) Highlights the strengths, which the firm should seek to exploit.

(c) Converts the threat or weakness into an advantage.

(d) Expose the shortcomings in the company's present skills and resources.

(e) Match the company's strengths to take advantage of the opportunities in the market place.

Matching strengths and weaknesses with opportunities and threats requires that a firm should direct its strengths towards exploiting opportunities and blocking threats while minimising exposure of its weaknesses at the same time. Thus, strategies, which are based on the matching of strengths and opportunities, may be regarded as exploitative or developmental strategy. Those which direct strengths to threats may be called blocking strategies. If strengths are used to repair weaknesses, one may call it remedial strategy. SWOT analysis may provide the basis of a comprehensive approach to strategy. Capability in market research (strength) should enable a firm to seek out market segments (geographic or customer-wise) which are not so far identified by competitors (corresponding opportunity). The same capability may be used to repair the present dependence on a narrow market segment (weakness). Cost efficiency (strength) of a firm may enable it to increase market share through an appropriate pricing strategy. With a strong financial position, the firm may improve its production facilities or technological capability and thereby increase market share. If the weakness of a firm lies in its distribution network, or Research and Development, or cost levels, the appropriate strategy should be to concentrate on a market segment in which customers are less price conscious and prefer a service that can be provided without technological superiority.



Advantages

(i) It provides a logical framework to be used for systematic discussion of various issues bearing on the business situation, alternative strategies and finally the choice of strategy.

(ii) Another application of SWOT analysis is the structured approach whereby key external threats and opportunities may be systematically compared with internal strengths and weakness.

(iii) A business may have several opportunities but also face some serious threats in the environment. It may have likewise several weaknesses along with one or two major strength. In such situations, the SWOT analysis guides the strategist to visualise the overall position of the firm, and helps to identify the major purpose of the grand strategy being considered.

Criticisms

(i) It is subjective in nature and varying from person to person.

(ii) It places varities problem in terms of S,W,O,T, without stating solutions.

(iii) There is no method to increase the accuracy of measurement.

(iv) There is no method of verifying the information.

SWOT MATRIX

A firm should not necessarily pursue the more lucrative opportunities. Rather, it may have a better chance at developing a competitive advantage by identifying a fit between the firm's strengths and upcoming opportunities. In some cases, the firm can overcome a weakness in order to prepare itself to pursue a compelling opportunity.

The relationships in a SWOT analysis are generally represented by a 2 x 2 matrix. The 'strengths' and 'opportunities' are both positive considerations. The 'weaknesses' and 'threats 'are both negative considerations. The SWOT matrix is an important matching tool that helps managers in generating four types of strategies i.e. SO, WO, ST and WT. SWOT matrix is a conceptual framework for a systematic analysis for matching opportunities and threats that are external with strengths and weaknesses which are internal for the organization. When these four attributes combine, they result in four sets of different strategic alternatives. The SWOT matrix is shown as follows:

	Internal Strength (S)	**Internal Weaknesses (W)**
External Opportunities (O)	SO Strategies Maxi - Maxi Generate strategies that use strengths to take advantage of opportunities	WO Strategies Mini - Maxi Generate strategies that take advantage of opportunities by overcoming weaknesses
External Threats (T)	ST Strategies Maxi - Mini Generate strategies that use strengths to avoid threats	WT Strategies Mini - Mini Generate strategies for retrenchment, divestment and closure

SO Strategies

The SO strategies try to improve the company's strengths relative to its environmental opportunities. These strategies use firm's internal strengths to take advantage of external opportunities. It is the aim of enterprises to move from other positions of the matrix to this one. When the firm faces a weakness, it strive to overcome it, making such weaknesses into strengths. When a major threat is faced by the firm, it will try to avoid such threat by focusing on opportunities.

WO Strategies

The WO strategies will enable the firm to overcome weaknesses and focus to tap its opportunities. WO strategies are evolved to improve internal weaknesses by taking advantage of external opportunities. The firm with internal weaknesses in certain areas may overcome them by developing such competencies internally or acquire from outside to take advantage of opportunities available in the external environment.

ST Strategies

The ST strategies try to gear up the internal strengths to reduce the vulnerability of external environmental threats. The basic objective of these strategies is to maximize the advantage of internal strengths while minimizing the external environmental threats.

WT Strategies

The WT strategies are the defensive strategies used to counter the internal weaknesses as well as external threats. In this situation retrenchment, joint ventures and liquidation strategies need to be evolved to up or out.

SWOT matrix is widely used as a strategic planning tool and used to generate several strategic alternatives. The aim of a business organization is to move from one position to another desirable position in the SWOT matrix. SWOT matrix can be prepared for the whole organization or for particular strategic business unit.

The SWOT matrix is criticized for the following reasons:

(a) It does not show how to achieve a competitive position.

(b) It is a static assessment of the organization on a particular time.

(c) It lead the firm to overemphasize a single internal or external factor in formulating strategies. To analyze the business situation, a strategist need to prepare several SWOT matrix for different points of time.

SWOT analysis of Nokia

Strengths

- Nokia world's largest producer and manufacturer of cell phones as well as has the largest distribution network around the world.
- It is also known for the Creativity, Innovativeness, durability & reliability.
- It has very good financial position, higher return on equity (ROE), return on assets (ROA) and net profit margins (NPM)
- Nokia leads the global cell phone industry
- Nokia dominates the world cellular industry because it has the Strong R & D facilities.
- Nokia also possessing the all fashion strategies and four style new generation characteristic from manufacturers
- It has diverse work force and advanced technology.

Weaknesses

- It has declared its profits had dropped by 40 % in 2010.
- Nokia mobile phones prices are higher as compare to the prices of china mobiles handsets.
- Nokia presence in the US cellular industry is very low and in Japan it has very weak position.
- In India Nokia has few service centers and very appalling after sales service
- In Japan Nokia closed the mobile handset distribution and also canceled the distribution of E71 handset due to low market preference.

Opportunities

- In 2011, the global cell phone industry expected to grow by double digits
- Today, Asia-Pacific mobile phone industry is one of the fastest-growing industry in the world.
- Developing countries like China, Bangladesh, India and Pakistan has enormous demand potential.
- Nokia had a 50-50 joint venture with Siemens of Germany
- Youth wants the stylish aesthetics, fashionable handsets, it drive the new market for players.

Threats

- Consumers are becoming more complicated in the choice of handset due to new styles by china mobiles.
- Difficult for sellers to differentiate their products and retain loyalty.
- Nokia is facing very strong price pressure from china and other mobile producers
- Nokia is losing global market share after the arrival of several Chinese producers
- In the Asia/Pacific emerged competitive forces.
- Apple, RIM and the other different sellers have created strong pressure for Nokia.

SWOT analysis of Dell Computer

In the mid-1990s, **Dell Computer** used a SWOT analysis to create a strong business strategy that has helped it become a very strong competitor in its industry value chain. Dell identified its strengths in selling directly to customers and in designing its computers and other products to reduce manufacturing costs. It acknowledged the weakness of having no relationships with local computer dealers. Dell faced threats from competitors such as **Compaq** and **IBM**, both of which had much stronger brand names and reputations for quality at that time. Dell identified an opportunity by noting that its customers were becoming more knowledgeable about computers and could specify exactly what they wanted without having Dell salespersons answer questions or develop configurations for them. It also saw the internet as potential marketing tool. The results of dell's SWOT analysis are:

Strengths

- Sell directly to consumers
- Keep costs below competitors' costs

Weaknesses

- No strong relationships with computer retailers

Opportunities

- Consumer desire for one-stop shopping
- Consumers know what they want to buy
- Internet could be a powerful marketing tool

Threats

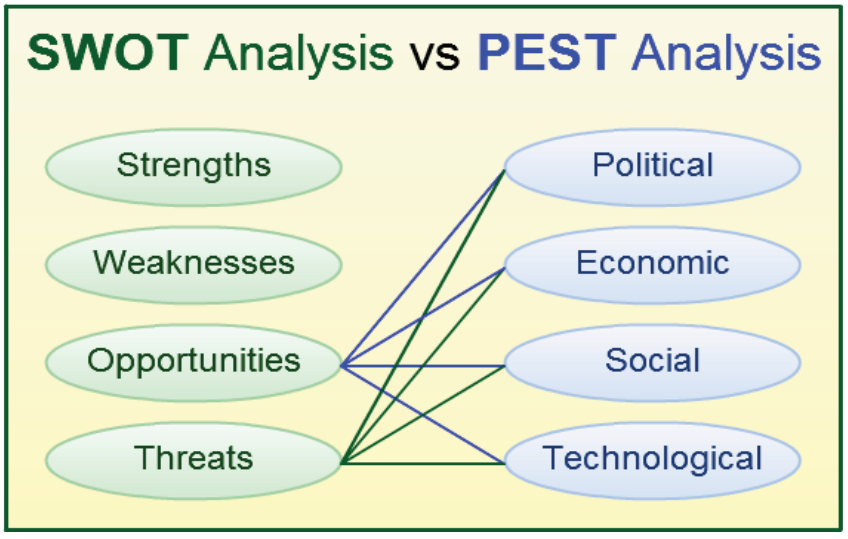
- Competitors have stronger brand names
- Competitors have strong relationships with computer retailers

The strategy that Dell followed after doing the analysis took all of the SWOT elements into consideration. Dell decided to offer customized computers built to order and sold over the phone, and eventually, over the internet. Dell's strategy capitalized on its strengths and avoiding relying on a dealer network. The brand and quality threats posed by Compaq and IBM were lessened by dell's ability to deliver higher perceived quality because each computer was custom made for each buyer.

PEST vs. SWOT

The advantage and disadvantages of SWOT analysis is that it is simple to come up with a list but far too easy to miss important external factors. Coming up with the results of each factor is not enough, for the SWOT to be successful it is essential to carry out further analysis of all the possible threats and disadvantages to make sure that they have been planned for in advance. The advantages and disadvantages of PEST analysis is that while the external factors are looked at closely there are no

internal evaluations carried out. Due to the advantages and the disadvantages of using either one or the other methods it is a good idea to combine the two to help provide you with the best analysis. **It is good practice to perform the PEST and then use the results in the opportunities and threat section of the SWOT**.



SWOT and PESTEL Analysis

Strategic management is an essential aspect of managing modern businesses that involves forming goals and instituting programs that fulfill those goals. Environmental scanning is a component of strategic management where mangers study various economic, political and social factors that might affect the business. Environmental scanning can help small businesses to identify untapped markets and avoid costly mistakes. SWOT analysis and PESTLE analysis are two common strategic management tools that can help managers brainstorm and organize ideas during the environmental scanning process.

PESTLE is an acronym for "political, economic, social, technological, legal and environmental." The purpose of a PESTLE analysis is to identify all of the various external political, economic, social, technological, legal and environmental factors that might affect a business. Managers then assess the risks that the identified factors pose and use that knowledge to inform decisions. For instance, a new restaurant might discover that local laws impose harsh penalties on businesses that give alcohol to minors as a result of a PESTLE analysis, which might prompt the company to institute a policy of checking ID on all patrons who order alcohol.

SWOT is an acronym for "strengths, weaknesses, opportunities and threats." The goal of a SWOT analysis is to create lists of all of the internal and external strengths, weaknesses, opportunities and threats to inform strategic planning decisions. SWOT is meant to help businesses double down on strengths, eliminate weaknesses, pursue opportunities and avoid or prepare for threats. For instance, if a small business conducts a customer survey and discovers that everyone loves a certain product, it could divert resources away from weaker products and put more money into developing the strong product.

The results of a PESTLE analysis can help managers when conducting a SWOT analysis. All of the political, economic, social, technological, legal and environmental identified by a PESTLE can be categorized as opportunities or threats in a SWOT analysis. Conducting PESTLE analysis to inform a SWOT analysis can result in recognizing more opportunities and threats, which can translate into better decisions.

While PESTLE and SWOT analysis can help managers make better strategic decisions, they are limited by the knowledge and creativity of the managers during the brainstorming process. Bringing in managers, workers and outside experts with diverse viewpoints and knowledge can allow for more thorough environmental scanning that is less likely to ignore key factors that could affect a business.

Use of scenarios

Scenario generation is one of the methods which strategic planners have found useful for the interpretation of a fluid, rapidly changing business environment with an uncertain future. Scenarios constitute an effective device for sensing, interpreting, organising and bringing to bear diverse information about the future in planning and strategic decision making. Simply stated, scenarios may be regarded as stories about the future. But more precisely speaking, these are descriptions of plausible alternative futures of the macro-environment. The primary purpose of scenario generation is to delimit the range of uncertainties in the most critical factors in an environment. Typical scenarios include qualitative and quantitative descriptions of the more important social, political, economic, demographic, technological and other conditions. They often describe the basic trends, assumptions, conditions and dynamics of the factors relating to the future period that the scenario covers. As such scenarios are not forecasts or predictions. Probability estimates are hardly associated with the elements of the scenario. Hence scenarios are said to be fuzzy, too imprecise and hard to apply. Also scenario generation is an expensive process. There is no doubt that scenarios represent a significant departure from the traditional methods of forecasting like the single or multiple variable extrapolation and regression methods. However, most of the environmental factors are not amenable to easy prediction on account of their complexities and the rapidity of changes. Under the circumstances scenarios are found to be an ideal complement to the various other methods of forecasting and planning.

Diagnosis

Environmental analysis cannot be complete without diagnosis of the results of analysis. Diagnosis of the environment actually involves assessment of the opportunities and threats identified in the process of analysis. On the basis of available data, the strategist must decide as to which sets of information to rely on and which sets to ignore, and sort out the more important from the less important information. This is indeed a difficult but nonetheless necessary task. For a large enterprise, the available information may be so diverse and so voluminous that effective diagnosis may be all the more difficult. And yet managers must face the problem and identify the more substantive information as well as decide to act upon them.

There are three aspects of the diagnostic exercise which need to be kept in view:

1. The role and characteristics of the strategists;
2. The strategists' job; and
3. Nature of the environment.

To what extent and how effectively diagnosis is carried out depend a great deal on the role and characteristics of the strategists. The strategic planners may consist of several groups, e.g., the top management, the Board of Directors, corporate planners and sometimes consultants. Usually, the top management team (Chief executive and heads of functional departments and divisions) is primarily concerned with, diagnosis and decision making. Corporate planners carry out detailed analysis of the environmental factors on the basis of verbal and documentary information, forecasts and studies, and render necessary advice to the top managers. Occasionally, the Board of Directors may advise top management on the relative importance of environmental information. Consultants are sometimes engaged to advise top managers on diagnostic problems. Of all these groups the top management team has the most significant role in making diagnosis relatively more effective.

How well the diagnosis is carried out, however, depends also on the characteristics of the strategists. The more important determining factors in that respect are:

— the age and experience of the executives;

— motivation and aspiration level which are governed by

  (a) their felt needs of achievement, affiliation and power, and

  (b) the rewards for performance linked with long-run results rather than short-run attainments;

— perceptual factors, i.e., predisposition towards the uncertainty of future conditions which include
  (a) risk-orientation and willingness to take risk,
  (b) ability to reflect rather than acting on. impulse,
  (c) dogmatism or closed-belief, and
  (d) ability to deal with abstract concepts and ideas;
— psychological moods reflecting optimism and pessimism; and
— psychological preparedness to accept change.

A combination of certain characteristics may be congenial for and lead to better and more accurate diagnosis. Senior executives having relevant experience, an optimistic frame of mind and willingness to take risks will perceive more of opportunities than threats in the same set of data, and will be inclined to be pro-active as well as favour changes and innovation. On the other hand, diagnosis can hardly be thorough and effective if managerial rewards are based on short-run actions and results, or if managers have been accustomed to deal with present problems and immediate remedies rather than diagnosing more fundamental long-run trends.

The second aspect of the diagnostic exercise relates to the stresses and strains of the job of diagnosis. The strains may be caused by a number of factors, e.g.,

(i) time-pressure and preoccupation of executives with pressing duties of current significance;
(ii) Inadequacy of available resources to carry out extensive search for and processing of data;
(iii) lack of discretionary powers of managers;
(iv) interpersonal conflict and power-play in the management team; and
(v) information overload with the consequent breakdown of effective diagnosis.

The stresses and strains can be reduced to a great extent by effective delegation and other means like developing managerial abilities for effective diagnosis, inculcating team-spirit and group-cohesiveness in decision-making.

The quality of diagnosis depends on a third set of factors related with the characteristics of the environment. The company's dependence on suppliers, dominance of key owners (controlling investors), intensity of competition and similar environmental conditions are likely to influence the diagnosis, for management would necessarily have to attach greater importance to information pertaining to those factors. A hostile environment characterised by unfavourable factors facing the company is likely to prompt management to devote greater attention to the threats and respond quickly to the challenges. Unfavourable conditions may consist of an impending industrial recession, social values being opposed to the operations of the company, or a hostile competitive environment. Again, a volatile, dynamic environment with irregular, less predictable changes may cause the diagnosis of environment to be more incisive, comprehensive and timely. In a complex environment, the cost of search may also be a factor affecting the quality of diagnosis. If the firm cannot afford to bear the cost of research, diagnosis may be rendered imperfect.

3.3 STRUCTURAL DRIVERS OF CHANGE

If there is anything that is stead fast and unchanging, it is change itself. Change is inevitable, and those organizations who do not keep up with change will become unstable, with long-term survivability in question.

A cursory look at organizations around the globe it is easy to discern change as perhaps the single most common feature among them. Changes come in different forms and smart leaders of organizations continually seek ways to improve strategies and transform their operations to further enhance growth. Two main drivers of change, external or outside causes, and internal or causes from within

have identified. The last few decades have witnessed more changes in organizations than any other period in history. Changes may take the form of reengineering business processes, quality restructuring programmes, outsourcing, delayering and downsizing, mergers and acquisitions, change in strategy, and of corporate culture. As constant as change is, however, it is not an easy process and many organizations (estimated between 70% and 90%) end-up on the losing side after implementing changes.

Roberts pointed out that structures and operations of organizations need to be aligned reflecting the reality of the business environment. Roberts further emphasized the need for holistic changes to be carried out so to avoid unanticipated problems as "…a change in strategy can easily affect industry and bring a reaction that leads to the need for further changes in strategy and organization" (Roberts, J. 2007, p. 282). Equally a change in organization can necessitate design changes in other areas.

Why Organizations Change

Organizations change for a number of different reasons, so they can either react to these reasons or be ahead of them. These reasons include:

1. **Crisis:** Obviously September 11 is the most dramatic example of a crisis which caused countless organizations, and even industries such as airlines and travel, to change. The recent financial crisis obviously created many changes in the financial services industry as organizations attempted to survive.
2. **Performance Gaps:** The organization's goals and objectives are not being met or other organizational needs are not being satisfied. Changes are required to close these gaps.
3. **New Technology**: Identification of new technology and more efficient and economical methods to perform work.
4. **Identification of Opportunities:** Opportunities are identified in the market place that the organization needs to pursue in order to increase its competitiveness.
5. **Reaction to Internal & External Pressure:** Management and employees, particularly those in organized unions often exert pressure for change. External pressures come from many areas, including customers, competition, changing government regulations, shareholders, financial markets, and other factors in the organization's external environment.
6. **Mergers & Acquisitions:** Mergers and acquisitions create change in a number of areas often negatively impacting employees when two organizations are merged and employees in dual functions are made redundant.
7. **Change for the Sake of Change**: When an organization appoints a new CEO, in order to prove to the board he is doing something, he will make changes just for their own sake.
8. **Sounds Good:** Another reason organizations may institute certain changes is that other organizations are doing so (such as the old quality circles and re-engineering fads). It sounds good, so the organization tries it.
9. **Planned Abandonment:** Changes as a result of abandoning declining products, markets, or subsidiaries and allocating resources to innovation and new opportunities.

What Organizations Can Change

What elements organizations can change fall into the following broad areas:

1. **Mission, Vision, & Strategy:** Organizations should continually ask themselves, "What is our business and what should it be?" Answers to these questions can lead to changes in the organization's mission (the purpose of its business), its vision for the future (what the organization should look like), and its competitive strategy.
2. **Technology:** Organizations can change their technology (for example the way they produce whatever they sell) in order to increase efficiency and lower costs.

3. **Human-Behavioral Changes:** Training can be provided to managers and employees to provide new knowledge and skills, or people can be replaced or downsized. As result of the recent financial crisis, many organizations downsized creating massive unemployment that continues to this day.
4. **Task-Job Design:** The way work is performed in the organization can be changed with new procedures and methods for performing work.
5. **Organizational Structure**: Organizations can change the way they are structured in order to be more responsive to their external environment. Again to be more responsive to the marketplace, this also includes where decisions should be made in the organization (centralized or decentralized).
6. **Organizational Culture:** Entities can attempt to change their culture, including management and leadership styles, values and beliefs. Of all the things organizations can change, this is by far the most difficult to undertake.

These are the major elements that organizations can change. It is important to note that changes in one of these elements will usually have an impact on another element. As an example, changing technology may require changes in the human-behavioral area (new knowledge and skills on how to use the technology).

There are things, events, or situations that affect the way a business operates, either in a positive or negative way. These things, situations, or events that affect a business in either a positive or negative way are called **"driving forces or environmental factors."**

There are two kinds of driving forces; **Internal driving forces**, and **external driving forces.** Internal driving forces are those kinds of things, situations, or events that occur inside the business, and are generally under the control of the company. Examples might be as follows :

- organization of machinery and equipment,
- technological capacity,
- organizational culture,
- management systems,
- financial management
- employee morale.

External driving forces are those kinds of things, situation, or events that occur outside of the company and are by and large beyond the control of the company. Examples of external driving forces might be, the industry itself, the economy, demographics, competition, political interference, etc.

Whether they are internal or external driving forces, one thing is certain for both. Change will occur! A company must be cognizant of these changes, flexible, and willing to respond to them in an appropriate way.

In order for a business to succeed and gain the competitive edge, the business must know what changes are indeed occurring, and what changes might be coming up in the future. I guess you might call this forecasting. Thus, critical to the business is what we call **"informational resources."** It is the collection and analyzation of data. Some examples of critical information might include the following:

- Competition (what are they doing?)
- Customer behavior (needs, wants, and desires)
- Industry out look (local, national, global)
- Demographics (the change populations, their density, etc.)
- Economy (are we peaking, or moving negatively)

- Political movements and/or interference
- Social environment
- Technological changes
- General environmental changes

The above are just some issues organizations must be on top of. Well it's never easy, but businesses that are successful include all of the above (and more), to develop the appropriate tactics, strategies, and best practices, to ensure successful out comes.

Drivers of change

In a 2007 research involving 28 organizations, J.S. Oakland and S.J. Tanner found that "successful change focuses on both strategic and operational issues". The research identified external drivers to be customer requirement, demand from other stakeholders, governments' regulatory demands, market competition, and shareholders. Internal drivers on the other hand were found to be desire to improve operational efficiency, need to improve product and services, and process improvement. For Child globalization, institutional constraints, technological innovations, advancement in education, hypercompetition, changes in demography, and growth of social movements are the external drivers.

Internal analysis

Internal analysis is a process through which strategists examine the internal factor and resources to determine the important strengths and weakness of the organisation.

Internal diagnosis is a process through which strategists determine how to use the opportunities and meet the threats from the environment by utilizing strength and weakness in order to get competitive advantage.

Organisational capability factors are the strategic strengths and weaknesses existing in different functional areas within an organisation which are very important in strategy formulation. In strategic advantage analysis the strategists examine the firm's resources and capabilities in the key function areas to determine where the firm has significant strengths (and weaknesses) so that it can exploit the opportunities and meet the threats in the environment. So, the necessity or importance of such analysis are :

(a) It helps in selecting a course of actions which are different from those of rival firms,

(b) It helps in development of strategy which will provide different and better outcomes than those of its competitors.

(c) It prevents to duplicate the strategy by other firms or to enter other firms in the area of opportunity.

(d) An organisation may not be strong in all their internal functional areas and therefore executives should be aware of the areas where the organisation enjoys advantage in order to utilize the environmental opportunities. Likewise, executives are also required to be aware of the areas where the organisation is weak.

Assessment of the strengths and weakness of a firm is based on analysis of following internal factors :

(a) Marketing factors : Marketing and distributions factor are important because success of business activities depends on these factors. Capability factors relate to the pricing, promotion and distribution of products or services, and all the allied aspects that have a bearing on an organisation's capacity and ability to implement its strategies. The marketing function is considered to be a key area not only because its performance depends on the success or failure of business activities, but also because it provides a vital interface and communication link between the organisation and the external environment. The analysis of marketing capabilities should include the following elements :

1. **Competitive position and market share** : Business organisations have to operate in a competitive field. So, it is necessary to know whether the firm have sizable market share.
2. **Product line** : Does the product line consist of a wide range and variety of designs and qualities?
3. **Product life cycle** : Product life cycle helps to know in which phase the main products are introductory, growth, or declining phase.
4. **Pricing** : Pricing policies, changes, protection, etc. are to be looked to know whether the pricing strategy is effective.
5. **Market** : Which type of market is ? Do the sales depend on a few customers.
6. **Marketing research** : Marketing research offers the information for taking various marketing decisions such as Pricing, Advertising, Packing, Channels of Distribution, etc.
7. **Channel of distribution** : Channel of distribution means what is the way out of goods to be distributed, means whether to sell it through wholesalers, retailers, own departmental stores etc. An effective channel of distribution in the strength of the Organisation because it distributes the product at the points where these are needed but a centralised distribution channel may be a weak point.
8. **Packaging** : How efficient and effective is the packaging and similar services.
9. **Marketing policy** : Is the policy consistent with the competition, consumer preferences, technological change and other environmental factors ?

(b) Finance and Accounting : Financial capability factors relate to the availability, usage, and management of funds and all allied aspects that have a bearing an organisations' capacity or ability to implement its strategies. The strengths and weaknesses in the areas of finance and accounting can be ascertained in the following ways.

1. **Financial resources and strength** : It helps to determine the availability of financial resources, source of fund. What are the available financial resources whether short term or long term. Are long term funds available or can be procured consistently with industry needs and relative to competitors.
2. **Capital structure** : Capital structure of an organisation determines the scope for flexibility in raising additional capital, maintaining financial leverage and maintaining minimum capital cost. How does the cost of capital compare with that of industry and competing firms ?
3. **Financial planning** : Financial planning is the determination in advance, of the quantum of Capital requirement and its forms. If the Organisation plans all these things well in advance it becomes strength of the organisation.

4. **Accounting system and audit procedure** : It is the determination of efficient account procedure and systems for costing, budgeting profit planning, and auditing. Not only determine that there is no misappropriation of funds but also provide feedback for further course of action. Absence of such systems provides inefficiency in the organisation.
5. **Tax planning and Tax advantage** : Does the company enjoy tax advantages and avail of tax concessions through tax planning ? If the organisation is planning its investment pattern properly it takes the advantages of tax benefits, under certain provisions of the Company Law and Direct Tax Laws. Advantages under these provisions may reduce the tax liability of the organisation to a very low level.
6. **Relations with shareholders** : Are the company's dividend and profit retention policies consistent with shareholders expectations ? If such relationship is cordial the company can go for smooth functioning even in case of adversity.

(c) Personnel Factors : Personnel capabilities factors relate to the existence and use of human resources and skills, and all allied aspects that have a bearing on an organisation's capacity and ability to implement its strategies.

Some of the important factors which influence the personnel capability of an organisation are as follows :

1. **Factors related to the Personnel system** : System for manpower planning, selection, development, compensation, communication and appraisal position of the personnel department within the organisation, procedures and standards, etc.
2. **Organisational and employees characteristics** : Corporate image, quality of managers, staff and workers, perception about the image of the organisation as an employer, availability of developmental opportunities for employees, working conditions etc.
3. **Industrial relations** : Union-management relationship, collective bargaining, safety, welfare and security; employee satisfaction and morale, etc. Is the degree of unionisatioin among employees of a high order ? Does the management maintain harmonious relations with the unions ?

(d) General Management Capability : General management capability relates to the integration coordination and direction of the functional capabilities towards common goals and all allied aspects that have a bearing on an organisation's capacity and ability to implement its strategies.

Some of the important factors which influence the general management capability of an organisation are as follows :

1. **Management system** : Strategic management system, processes related to mission-purpose and objective setting, strategy evaluation system, management information system, corporate planning system, rewards and incentives systems for top managers etc.
2. **External relationships** : Influence on and rapport with the government, regulatory agencies and financial institutions; public relations, sense of social responsibility, public image as corporate citizen etc.
3. **Factors related to General Managers** :

   Managers mentality :

   - Their relative preoccupation with external Vs internal problems.
   - Propensity to take risks.
   - Perception of the critical success factors and behaviours.
   - Values, norms and personal goals of managers.

Power :

- Power position of the manager in the firm.
- His ambitiousness and drive to use power.

Competence :

- Talents / Personality.
- Leadership traits / skills.
- Knowledge about the firm and environment.

Capacity :

- Personal work capacity.
- Work habits.

4. **Organisational climate**: Organisational culture, use of power, political processes, balance of vested interests, introduction acceptance and management of change, nature of organisational structure and controls etc.

   A few typical strengths which influence the general management capability of an organisation are given below :

   - Effective system for corporate planning.
   - Control, reward and incentive system for top managers geared to the achievement of objectives.
   - Entrepreneurial orientation and high propensity for risk taking.
   - Good rapport with Government and bureaucracy.
   - Favourable corporate image.
   - Commonly being perceived as a good organisation to work for.
   - Development oriented organisational culture.
   - Political processes used for consensus building in organisational interest.
   - Effective management of organisational change.

(e) Operations Capability Factors : Operations capability factors relate to the production of products or services, use of material resources, and all allied aspects that have a bearing on an Organisations Capacity and ability to implements its strategies.

1. **Factors related to the production system** : Capacity, location, layout, product or service design, work systems, degree of automation, extent of vertical integration etc.
2. **Factors related to operation and control system** : Aggregate production planning, material supply, inventory, cost and quality control; maintenance systems and procedures etc.
3. **Factors related to R & D system** : Personnel facilities product development, patient rights, level of technology used, technical collaboration and support etc.

Any change in organization's internal factors may also necessitate change. Such a change is required because of two reasons: change in managerial personnel and deficiency in existing organizational practices.

1. **Change in the top management:** Change in the top management and consequent change in the ideas to run the organization also leads to change in the system, structure and processes. Old managers are replaced by new managers which are necessitated because of retirement, promotion, transfer or dismissal. Each new manager brings his own ideas and way of working into the organization. The formal or informal relationships may change because of changes in top

management. Moreover, attitudes, ideology, leadership style of the person may be different from the earlier one, this will reflect in their actions and decisions. The result is that an organization has to change accordingly.

2. **Change in size of the organization:** Change in the organization's size leads to change in the internal structure and complexity of the operations in the organization.
3. **Performance gaps:** When a gap between set target and actual results (in terms of market share, employee productivity and profit) is identified, organizations face the forces to change and reduce the gap.
4. **Employee needs and values:** With changing needs and values of the employees, organizations change their policies. For example, attractive financial incentives, challenging assignments, vertical growth opportunities and autonomy at work may be provided in an organization to attract and retain its effective employees.
5. **Deficiency in existing organization:** Sometimes, changes are necessary because of deficiency in the present organizational arrangement and process. These deficiencies may be in the form of unmanageable span of management, large number of managerial levels, lack of co-ordination between various departments, obstacles in communication, multiplicity of committees, lack of uniformity in policy decisions, lack of co-operation between line and staff and so on.

External Analysis

Each organization has goals and responsibility related to others in its environment. Thus, an organization must not only deal with its environment in conducting its affairs, but also give consideration to the goals of others, as it establishes its goals and conducts its operations. The present-day environment is dynamic and will continue to be dynamic. Changes in social, political, economic, technological, and legal environment force organizations to change themselves. Such changes may result in organizational changes like major functions, production process, labour-management relations, nature of competition, economic constraints, organization methods, etc. In order to survive in the changing environment, organization must change.

1. **Technology:** Technological changes are responsible for changing the nature of the job performed at all levels in an organization. When there is a change in technology in the organization's environment and other organizations adopt the new technology, the organization under focus becomes less cost-effective and its competitive position weakens. Therefore, it has to adopt new technology. When the organizations adopt a new technology, its work structures are affected and a new equilibrium has to be established. We have seen that technology has impact on organization structure, organizational processes, and behavior of people. For example, computers and automation have made significant impact on organizational functioning.
2. **Business scenario:** Due to rapid changes in the business scenario with increasing competition and global economy, the needs and demands are also changing among the customers, suppliers and other stakeholders. Organizations are, therefore, forced to change their operational methods to meet the demands of the stakeholders. Since every organization exports its outputs to the environment, an organization has to face competition in the market. There may be two types of forces which may affect the competitive position of an organization, other organizations supplying the same products and, buyers who are buying the product. Any change in these forces may require suitable changes in the organization. For example, when Indian economy was liberalized (the process still continues), there were many foreign organizations which entered the Indian market. This forced many Indian organizations to re-align themselves with the new situation. The result is that there have been many cases of divesting the business and concentrating on the core business, acquiring core business, and developing competitive competence to face competitive threats. Similarly, there may be changes in buyers in terms of their needs, liking-disliking, and income disposal for a product. These changes force the organizations to bring those products which meet buyer's requirements.

3. **Environmental and National factors:** Environmental factors such as economic, political and demographic and legal factors play a vital role in devising organizational policies and strategy. Any change in these political and legal factors may affect the organizational operation. For example, organizations may have to change their employment policies in accordance with the government policy, demand of the non-government organizations and changing economic conditions of a country.

4. **Social changes:** Social changes reflect in terms of people's aspirations, their needs, and their way of working. Social changes have taken place because of the several forces like level of education, urbanization, feeling of autonomy, and international impact due to new information sources. These social changes affect the behavior of people in the organization. Therefore it is required to make adjustment in its working so that it matches with people.

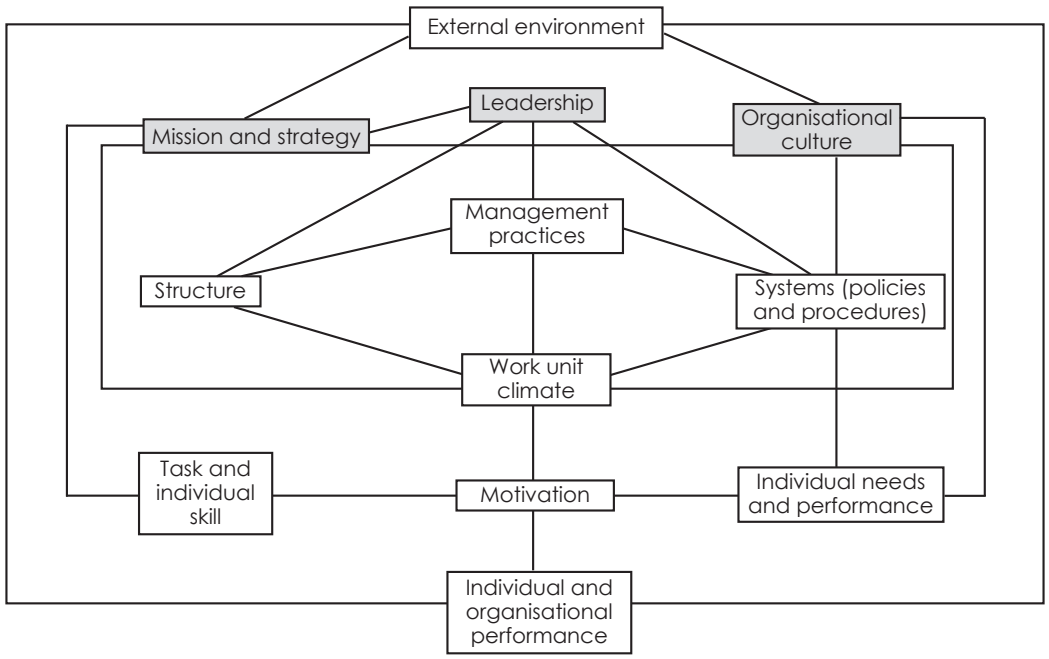
Change is inevitable but must be approached carefully through consultation and regular communication to become successful while external support should be sought when necessary. "Change is the law of life. And those who look only to the past or present are certain to miss the future" (John F Kennedy 1963).

Burke-Litwin: Understanding Drivers for Change

There are many reasons that change occurs in organisations. The Burke-Litwin model of organisational change and performance will help you identify different drivers of change and consider the implications for you as a change manager.

The Model

The Burke-Litwin model shows the various drivers of change and ranks them in terms of importance. The model is expressed diagrammatically, with the most important factors featuring at the top. The lower layers become gradually less important. The model argues that all of the factors are integrated (to greater or lesser degrees). Therefore, a change in one will eventually affect all other factors.



The Burke-Litwin model

Burke-Litwin believes environmental factors to be the most important driver for change. Indeed, most change can be traced back to external drivers for change.

Important elements of organisational success, such as mission and strategy, leadership and organisational culture, are often impacted by changes that originate outside the organisation.

It is your job to understand these external changes and identify the implications for you and your team.

Identifying and Dealing with Drivers for Change

1. **External Environment**

   This includes such factors as markets, legislation, competition and the economy. All of these will have consequences for organisations, and, as a change manager, it is vital that you continually scan the environment for issues that will affect you and your team. For example, in the world of accountancy, International Accounting Standards and International Financial Reporting Standards will have a significant impact on the way companies manage their accounts and report their results. In the public sector, legislative changes across health, local government and other services have a direct impact on the work organisations are required to carry out.

2. **Mission and Strategy**

   An organisation's mission articulates its reason for existing. It is the foundation upon which all activity should be built. The strategy then sets out, in board terms, how the organisation will go about achieving its mission. Very often, the strategy will be developed in light of environmental change, and will have a significant impact on the work you do. As a change manager, you need to understand change in strategy and be able to communicate the implications to your staff.

3. **Leadership**

   This considers the attitudes and behaviour of senior colleagues and how these behaviours are perceived by the organisation as a whole. The way in which change is implemented and accepted through the organisation will be largely influenced by the top team. Does your team believe that senior colleagues are committed to change, or is it just another initiative that will disappear in six month's time?

4. **Organisation Culture**

   Organisation culture can be described as "the way we do things around here". It considers the beliefs, behaviours, values and conventions that prevail in an organisation. Culture change does not happen overnight. It evolves over time as a result of many other changes in the organisation. As a manager, you should keep in mind the desired state for the organisation, in terms of how you expect people to behave (and not to behave), and what your organization values as important. You need to ensure that your behaviour fits with these expectations at all times, and that you 'walk the walk'.

5. **Structure**

   Very often, changes in strategy can lead to changes in the way the organisation is structured. This can impact on relationships, responsibilities and ways of working. Your job is to assess the impact of the structural change and ensure your team understands why it is required, and what it means for them.

6. **Work Unit Climate**

   This considers employees' perception of their immediate colleagues and working environment. Our immediate working environment is often what shapes our view of the organisation as a whole, and influences the extent to which we feel satisfied in our jobs.

Changes to the immediate working environment need to be managed sensitively, as they are likely to invoke a range of emotional and political responses from staff. This is particularly the case where change involves moving location, a change in personnel, or a change in terms of conditions of service, such as working hours.

7. Task Requirements and Individual Skills/Abilities

Change at a higher level in the organisation will often require changes in the work carried out and the skills available in the team. As the change manager you need to assess whether all the right skills are in place; if they can be developed; or, if you need to bring them in from outside the team.

8. Individual Needs and Values

Changes to team membership can mean a change in the team dynamic. In a perfect world, we would be able to recruit the exact fit for our teams, in terms of personal style, abilities and skills mix. However, in reality it is not always possible, and it is your job to identify any risks in this areas and mitigate them as best you can.

9. Employee Motivation

Considers the significance of individual and organisational goals. Motivation is key to effective change. The real challenge is to maintain motivation throughout a change project, particularly when change is often not well-received by those affected.

3.4 SOURCES OF COMPETITION – 5-FORCES FRAMEWORK

A structured approach to examining the competitive environment of an organisation has been suggested by Michael Porter. The logic behind this approach is that for most organisations, the strategic competitive advantages enhance and ensure long-term profit potentials, and also because competitive forces happen to be more immediate external influences which organisations are likely to be able to overcome directly by their own actions.

Reference is rightly made in this context of how the phenomenal development of the Japanese economy was largely the outcome of strategic business competition having been made a part of national policy. To compete with the western industries Japan had to obtain material resources from abroad. This required exports, which became Japanese lifeline. But to compete in the world markets, the exports required to have maximum value added, and cost saving by minimising use of materials and direct labour. Eventually, Japanese industry became increasingly more capital intensive and then technology intensive.

Porter's five forces model of competition.

Organisations do not exist in a vacuum. They operate within a competitive industry environment. The analysis of competitors in order to identify its weakness and to identify opportunities for organisation is competitor analysis.

Michael E. Porter has made contribution to the idea of competitor analysis which is known as five forces model.

The model of pure competition implies that risk-adjusted rates of return should be constant across firms and industries. However, numerous economic studies have affirmed that different industries can sustain different levels of profitability; part of this difference is explained by industry structure.

Michael Porter provided a framework that models an industry as being influenced by five forces. The strategic business manager seeking to develop an edge over rival firms can use this model to better understand the industry context in which the firm operates.

Diagram of Porter's 5 Forces

I. Rivalry

In the traditional economic model, competition among rival firms drives profits to zero. But competition is not perfect and firms are not unsophisticated passive price takers. Rather, firms strive for a competitive advantage over their rivals. The intensity of rivalry among firms varies across industries, and strategic analysts are interested in these differences.

Economists measure rivalry by indicators of industry concentration. The Concentration Ratio (CR) is one such measure. The Bureau of Census periodically reports the CR for major Standard Industrial Classifications (SIC's). The CR indicates the percent of market share held by the four largest firms (CR's for the largest 8, 25, and 50 firms in an industry also are available). A high concentration ratio indicates that a high concentration of market share is held by the largest firms - the industry is concentrated. With only a few firms holding a large market share, the competitive landscape is less competitive (closer to a monopoly). A low concentration ratio indicates that the industry is characterized by many rivals, none of which has a significant market share. These *fragmented* markets are said to be competitive. The concentration ratio is not the only available measure; the trend is to define industries in terms that convey more information than distribution of market share.

If rivalry among firms in an industry is low, the industry is considered to be disciplined. This discipline may result from the industry's history of competition, the role of a leading firm, or informal compliance with a generally understood code of conduct. Explicit *collusion* generally is illegal and not an option; in low-

rivalry industries competitive moves must be constrained informally. However, a maverick firm seeking a competitive advantage can displace the otherwise disciplined market.

When a rival acts in a way that elicits a counter-response by other firms, rivalry intensifies. The intensity of rivalry commonly is referred to as being cutthroat, intense, moderate, or weak, based on the firms' aggressiveness in attempting to gain an advantage.

In pursuing an advantage over its rivals, a firm can choose from several competitive moves:

- Changing prices - raising or lowering prices to gain a temporary advantage.
- Improving product differentiation - improving features, implementing innovations in the manufacturing process and in the product itself.
- Creatively using channels of distribution - using vertical integration or using a distribution channel that is novel to the industry. For example, with high-end jewelry stores reluctant to carry its watches, Timex moved into drugstores and other non-traditional outlets and cornered the low to mid-price watch market.
- Exploiting relationships with suppliers - for example, from the 1950's to the 1970's Sears, Roebuck and Co. dominated the retail household appliance market. Sears set high quality standards and required suppliers to meet its demands for product specifications and price.

The intensity of rivalry is influenced by the following industry characteristics:

1. **A larger number of firms** increases rivalry because more firms must compete for the same customers and resources. The rivalry intensifies if the firms have similar market share, leading to a struggle for market leadership.
2. **Slow market growth** causes firms to fight for market share. In a growing market, firms are able to improve revenues simply because of the expanding market.
3. **High fixed costs** result in an economy of scale effect that increases rivalry. When total costs are mostly fixed costs, the firm must produce near capacity to attain the lowest unit costs. Since the firm must sell this large quantity of product, high levels of production lead to a fight for market share and results in increased rivalry.
4. **High storage costs or highly perishable products** cause a producer to sell goods as soon as possible. If other producers are attempting to unload at the same time, competition for customers intensifies.
5. **Low switching costs** increases rivalry. When a customer can freely switch from one product to another there is a greater struggle to capture customers.
6. **Low levels of product differentiation** is associated with higher levels of rivalry. Brand identification, on the other hand, tends to constrain rivalry.
7. **Strategic stakes are high** when a firm is losing market position or has potential for great gains. This intensifies rivalry.
8. **High exit barriers** place a high cost on abandoning the product. The firm must compete. High exit barriers cause a firm to remain in an industry, even when the venture is not profitable. A common exit barrier is asset specificity. When the plant and equipment required for manufacturing a product is highly specialized, these assets cannot easily be sold to other buyers in another industry. Litton Industries' acquisition of Ingalls Shipbuilding facilities illustrates this concept. Litton was successful in the 1960's with its contracts to build Navy ships. But when the Vietnam war ended, defense spending declined and Litton saw a sudden decline in its earnings. As the firm restructured, divesting from the shipbuilding plant was not feasible since such a large and highly specialized investment could not be sold easily, and Litton was forced to stay in a declining shipbuilding market.

9. **A diversity of rivals** with different cultures, histories, and philosophies make an industry unstable. There is greater possibility for mavericks and for misjudging rival's moves. Rivalry is volatile and can be intense. The hospital industry, for example, is populated by hospitals that historically are community or charitable institutions, by hospitals that are associated with religious organizations or universities, and by hospitals that are for-profit enterprises. This mix of philosophies about mission has lead occasionally to fierce local struggles by hospitals over who will get expensive diagnostic and therapeutic services. At other times, local hospitals are highly cooperative with one another on issues such as community disaster planning.

10. **Industry Shakeout.** A growing market and the potential for high profits induce new firms to enter a market and incumbent firms to increase production. A point is reached where the industry becomes crowded with competitors, and demand cannot support the new entrants and the resulting increased supply. The industry may become crowded if its growth rate slows and the market becomes saturated, creating a situation of excess capacity with too many goods chasing too few buyers. A shakeout ensues, with intense competition, price wars, and company failures.

    BCG founder Bruce Henderson generalized this observation as the Rule of Three and Four: a stable market will not have more than three significant competitors, and the largest competitor will have no more than four times the market share of the smallest. If this rule is true, it implies that:

    - If there is a larger number of competitors, a shakeout is inevitable
    - Surviving rivals will have to grow faster than the market
    - Eventual losers will have a negative cash flow if they attempt to grow
    - All except the two largest rivals will be losers
    - The definition of what constitutes the "market" is strategically important.

    Whatever the merits of this rule for stable markets, it is clear that market stability and changes in supply and demand affect rivalry. Cyclical demand tends to create cutthroat competition. This is true in the disposable diaper industry in which demand fluctuates with birth rates, and in the greeting card industry in which there are more predictable business cycles.

II. Threat of Substitutes

In Porter's model, substitute products refer to products in other industries. To the economist, a threat of substitutes exists when a product's demand is affected by the price change of a substitute product. A product's price elasticity is affected by substitute products - as more substitutes become available, the demand becomes more elastic since customers have more alternatives. A close substitute product constrains the ability of firms in an industry to raise prices.

The competition engendered by a Threat of Substitute comes from products outside the industry. The price of aluminum beverage cans is constrained by the price of glass bottles, steel cans, and plastic containers. These containers are substitutes, yet they are not rivals in the aluminum can industry. To the manufacturer of automobile tires, tire retreads are a substitute. Today, new tyres are not so expensive that car owners give much consideration to retreading old tyres. But in the trucking industry new tyres are expensive and tyres must be replaced often. In the truck tyre market, retreading remains a viable substitute industry. In the disposable diaper industry, cloth diapers are a substitute and their prices constrain the price of disposables.

While the threat of substitutes typically impacts an industry through price competition, there can be other concerns in assessing the threat of substitutes. Consider the substitutability of different types of TV transmission: local station transmission to home TV antennas via the airways versus transmission via cable, satellite, and telephone lines. The new technologies available and the changing structure of the entertainment media are contributing to competition among these substitute means of connecting the home to entertainment. Except in remote areas it is unlikely that cable TV could compete with free TV from an aerial without the greater diversity of entertainment that it affords the customer.

III. Buyer Power

The power of buyers is the impact that customers have on a producing industry. In general, when buyer power is strong, the relationship to the producing industry is near to what an economist terms a **monopsony** - a market in which there are many suppliers and one buyer. Under such market conditions, the buyer sets the price. In reality few pure monopsonies exist, but frequently there is some asymmetry between a producing industry and buyers. The following tables outline some factors that determine buyer power.

Buyers are Powerful if:	**Example**
Buyers are concentrated - there are a few buyers with significant market share.	DOD purchases from defense contractors.
Buyers purchase a significant proportion of output - distribution of purchases or if the product is standardized.	Circuit City and Sears' large retail market provides power over appliance manufacturers.
Buyers possess a credible backward integration threat - can threaten to buy producing firm or rival.	Large auto manufacturers' purchases of tires.
Buyers are Weak if:	**Example**
Producers threaten forward integration - producer can take over own distribution/retailing.	Movie-producing companies have integrated forward to acquire theaters.
Significant buyer switching costs - products not standardized and buyer cannot easily switch to another product.	IBM's 360 system strategy in the 1960's.
Buyers are fragmented (many, different) - no buyer has any particular influence on product or price.	Most consumer products.
Producers supply critical portions of buyers' input - distribution of purchases.	Intel's relationship with PC manufacturers.

IV. Supplier Power

A manufacturing industry requires raw materials - labor, components, and other supplies. This requirement leads to buyer-supplier relationships between the industry and the firms that provide it the raw materials used to create products. Suppliers, if powerful, can exert an influence on the producing industry, such as selling raw materials at a high price to capture some of the industry's profits. The following tables outline some factors that determine supplier power.

Suppliers are Powerful if:	**Example**
Credible forward integration threat by suppliers.	Baxter International, manufacturer of hospital supplies, acquired American Hospital Supply, a distributor.
Suppliers concentrated.	Drug industry's relationship to hospitals.
Significant cost to switch suppliers.	Microsoft's relationship with PC manufacturers.
Customers Powerful.	Boycott of grocery stores selling non-union picked grapes.
Suppliers are Weak if:	**Example**
Many competitive suppliers - product is standardized.	Tyre industry relationship to automobile manufacturers.
Purchase commodity products.	Grocery store brand label products.

Credible backward integration threat by purchasers.	Timber producers relationship to paper companies.
Concentrated purchasers.	Garment industry relationship to major department stores.
Customers Weak.	Travel agents' relationship to airlines.

V. Barriers to Entry / Threat of Entry

It is not only incumbent rivals that pose a threat to firms in an industry; the possibility that new firms may enter the industry also affects competition. In theory, any firm should be able to enter and exit a market, and if free entry and exit exists, then profits always should be nominal. In reality, however, industries possess characteristics that protect the high profit levels of firms in the market and inhibit additional rivals from entering the market. These are ***barriers to entry***.

Barriers to entry are more than the normal equilibrium adjustments that markets typically make. For example, when industry profits increase, we would expect additional firms to enter the market to take advantage of the high profit levels, over time driving down profits for all firms in the industry. When profits decrease, we would expect some firms to exit the market thus restoring a market equilibrium. Falling prices, or the expectation that future prices will fall, deters rivals from entering a market. Firms also may be reluctant to enter markets that are extremely uncertain, especially if entering involves expensive start-up costs. These are normal accommodations to market conditions. But if firms individually (collective action would be illegal collusion) keep prices artificially low as a strategy to prevent potential entrants from entering the market, such **entry-deterring pricing** establishes a barrier.

Barriers to entry are unique industry characteristics that define the industry. Barriers reduce the rate of entry of new firms, thus maintaining a level of profits for those already in the industry. From a strategic perspective, barriers can be created or exploited to enhance a firm's competitive advantage. Barriers to entry arise from several sources:

1. **Government creates barriers.** Although the principal role of the government in a market is to preserve competition through anti-trust actions, government also restricts competition through the granting of monopolies and through regulation. Industries such as utilities are considered natural monopolies because it has been more efficient to have one electric company provide power to a locality than to permit many electric companies to compete in a local market. To restrain utilities from exploiting this advantage, government permits a monopoly, but regulates the industry. Illustrative of this kind of barrier to entry is the local cable company. The franchise to a cable provider may be granted by competitive bidding, but once the franchise is awarded by a community a monopoly is created. Local governments were not effective in monitoring price gouging by cable operators, so the federal government has enacted legislation to review and restrict prices.

   The regulatory authority of the government in restricting competition is historically evident in the banking industry. Until the 1970's, the markets that banks could enter were limited by state governments. As a result, most banks were local commercial and retail banking facilities. Banks competed through strategies that emphasized simple marketing devices such as awarding toasters to new customers for opening a checking account. When banks were deregulated, banks were permitted to cross state boundaries and expand their markets. Deregulation of banks intensified rivalry and created uncertainty for banks as they attempted to maintain market share. In the late 1970's, the strategy of banks shifted from simple marketing tactics to mergers and geographic expansion as rivals attempted to expand markets.

2. **Patents and proprietary knowledge serve to restrict entry into an industry.** Ideas and knowledge that provide competitive advantages are treated as private property when patented, preventing others from using the knowledge and thus creating a barrier to entry. Edwin Land introduced the Polaroid camera in 1947 and held a monopoly in the instant photography industry. In 1975, Kodak

attempted to enter the instant camera market and sold a comparable camera. Polaroid sued for patent infringement and won, keeping Kodak out of the instant camera industry.

3. **Asset specificity inhibits entry into an industry.** Asset specificity is the extent to which the firm's assets can be utilized to produce a different product. When an industry requires highly specialized technology or plants and equipment, potential entrants are reluctant to commit to acquiring specialized assets that cannot be sold or converted into other uses if the venture fails. Asset specificity provides a barrier to entry for two reasons: First, when firms already hold specialized assets they fiercely resist efforts by others from taking their market share. New entrants can anticipate aggressive rivalry. For example, Kodak had much capital invested in its photographic equipment business and aggressively resisted efforts by Fuji to intrude in its market. These assets are both large and industry specific. The second reason is that potential entrants are reluctant to make investments in highly specialized assets.

4. **Organizational (Internal) Economies of Scale.** The most cost efficient level of production is termed **Minimum Efficient Scale** (MES). This is the point at which unit costs for production are at minimum - i.e., the most cost efficient level of production. If MES for firms in an industry is known, then we can determine the amount of market share necessary for low cost entry or cost parity with rivals. For example, in long distance communications roughly 10% of the market is necessary for MES. If sales for a long distance operator fail to reach 10% of the market, the firm is not competitive.

   The existence of such an economy of scale creates a barrier to entry. The greater the difference between industry MES and entry unit costs, the greater the barrier to entry. So industries with high MES deter entry of small, start-up businesses. To operate at less than MES there must be a consideration that permits the firm to sell at a premium price - such as product differentiation or local monopoly.

Barriers to exit work similarly to barriers to entry. Exit barriers limit the ability of a firm to leave the market and can exacerbate rivalry - unable to leave the industry, a firm must compete. Some of an industry's entry and exit barriers can be summarized as follows:

Easy to Enter if there is:	**Difficult to Enter if there is:**
• Common technology • Little brand franchise • Access to distribution channels • Low scale threshold	• Patented or proprietary know-how • Difficulty in brand switching • Restricted distribution channels • High scale threshold
Easy to Exit if there are:	**Difficult to Exit if there are:**
• Salable assets • Low exit costs • Independent businesses	• Specialized assets • High exit costs • Interrelated businesses

GENERIC STRATEGIES TO COUNTER THE FIVE FORCES

Which do you prefer when you fly: a cheap, no-frills airline, or a more expensive operator with fantastic service levels and maximum comfort? And would you ever consider going with a small company which focuses on just a few routes?

The choice is up to you, of course. But the point we're making here is that when you come to book a flight, there are some very different options available.

Why is this so? The answer is that each of these airlines has chosen a different way of achieving competitive advantage in a crowded marketplace.

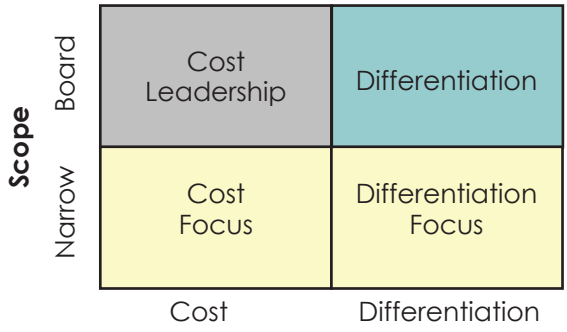
The no-frills operators have opted to cut costs to a minimum and pass their savings on to customers in lower prices. This helps them grab market share and ensure their planes are as full as possible, further

driving down cost. The luxury airlines, on the other hand, focus their efforts on making their service as wonderful as possible, and the higher prices they can command as a result make up for their higher costs.

Meanwhile, smaller airlines try to make the most of their detailed knowledge of just a few routes to provide better or cheaper services than their larger, international rivals.

These three approaches are examples of "generic strategies", because they can be applied to products or services in all industries, and to organizations of all sizes. They were first set out by Michael Porter in 1985 in his book *Competitive Advantage: Creating and Sustaining Superior Performance*. Porter called the generic strategies "Cost Leadership" (no frills), "Differentiation" (creating uniquely desirable products and services) and "Focus" (offering a specialized service in a niche market). He then subdivided the Focus strategy into two parts: "Cost Focus" and "Differentiation Focus". These are shown in Figure below.

Porter's Generic Strategies



Cost Leadership Strategy

This generic strategy calls for being the low cost producer in an industry for a given level of quality. The firm sells its products either at average industry prices to earn a profit higher than that of rivals, or below the average industry prices to gain market share. In the event of a price war, the firm can maintain some profitability while the competition suffers losses. Even without a price war, as the industry matures and prices decline, the firms that can produce more cheaply will remain profitable for a longer period of time. The cost leadership strategy usually targets a broad market.

Some of the ways that firms acquire cost advantages are by improving process efficiencies, gaining unique access to a large source of lower cost materials, making optimal outsourcing and vertical integration decisions, or avoiding some costs altogether. If competing firms are unable to lower their costs by a similar amount, the firm may be able to sustain a competitive advantage based on cost leadership.

Firms that succeed in cost leadership often have the following internal strengths:

- Access to the capital required to make a significant investment in production assets; this investment represents a barrier to entry that many firms may not overcome.
- Skill in designing products for efficient manufacturing, for example, having a small component count to shorten the assembly process.
- High level of expertise in manufacturing process engineering.
- Efficient distribution channels.

Each generic strategy has its risks, including the low-cost strategy. For example, other firms may be able to lower their costs as well. As technology improves, the competition may be able to leapfrog the production capabilities, thus eliminating the competitive advantage. Additionally, several firms following a focus strategy and targeting various narrow markets may be able to achieve an even lower cost within their segments and as a group gain significant market share.

Differentiation Strategy

A differentiation strategy calls for the development of a product or service that offers unique attributes that are valued by customers and that customers perceive to be better than or different from the products of the competitor. The value added by the uniqueness of the product may allow the firm to charge a premium price for it. The firm hopes that the higher price will more than cover the extra costs incurred in offering the unique product. Because of the product's unique attributes, if suppliers increase their prices the firm may be able to pass along the costs to its customers who cannot find substitute products easily.

Firms that succeed in a differentiation strategy often have the following internal strengths:

- Access to leading scientific research.
- Highly skilled and creative product development team.
- Strong sales team with the ability to successfully communicate the perceived strengths of the product.
- Corporate reputation for quality and innovation.

The risks associated with a differentiation strategy include imitation by competitors and changes in customer tastes. Additionally, various firms pursuing focus strategies may be able to achieve even greater differentiation in their market segments.

Focus Strategy

Companies that use Focus strategies concentrate on particular niche markets and, by understanding the dynamics of that market and the unique needs of customers within it, develop uniquely low cost or well-specified products for the market. Because they serve customers in their market uniquely well, they tend to build strong brand loyalty amongst their customers. This makes their particular market segment less attractive to competitors.

As with broad market strategies, it is still essential to decide whether you will pursue Cost Leadership or Differentiation once you have selected a Focus strategy as your main approach: Focus is not normally enough on its own.

But whether you use Cost Focus or Differentiation Focus, the key to making a success of a generic Focus strategy is to ensure that you are adding something extra as a result of serving only that market niche. It's simply not enough to focus on only one market segment because your organization is too small to serve a broader market (if you do, you risk competing against better-resourced broad market companies' offerings.)

The "something extra" that you add can contribute to reducing costs (perhaps through your knowledge of specialist suppliers) or to increasing differentiation (though your deep understanding of customers' needs).

Some risks of focus strategies include imitation and changes in the target segments. Furthermore, it may be fairly easy for a broad-market cost leader to adapt its product in order to compete directly. Finally, other focusers may be able to carve out sub-segments that they can serve even better.

A Combination of Generic Strategies

These generic strategies are not necessarily compatible with one another. If a firm attempts to achieve an advantage on all fronts, in this attempt it may achieve no advantage at all. For example, if a firm

differentiates itself by supplying very high quality products, it risks undermining that quality if it seeks to become a cost leader. Even if the quality did not suffer, the firm would risk projecting a confusing image. For this reason, Michael Porter argued that to be successful over the long-term, a firm must select only one of these three generic strategies. Otherwise, with more than one single generic strategy the firm will be "stuck in the middle" and will not achieve a competitive advantage.

Porter argued that firms that are able to succeed at multiple strategies often do so by creating separate business units for each strategy. By separating the strategies into different units having different policies and even different cultures, a corporation is less likely to become "stuck in the middle."

However, there exists a viewpoint that a single generic strategy is not always best because within the same product customers often seek multi-dimensional satisfactions such as a combination of quality, style, convenience, and price. There have been cases in which high quality producers faithfully followed a single strategy and then suffered greatly when another firm entered the market with a lower-quality product that better met the overall needs of the customers.

Choosing the Right Generic Strategy

Your choice of which generic strategy to pursue underpins every other strategic decision you make, so it's worth spending time to get it right.

But you **do** need to make a decision: Porter specifically warns against trying to "hedge your bets" by following more than one strategy. One of the most important reasons why this is wise advice is that the things you need to do to make each type of strategy work appeal to different types of people. Cost Leadership requires a very detailed internal focus on processes. Differentiation, on the other hand, demands an outward-facing, highly creative approach.

So, when you come to choose which of the three generic strategies is for you, it's vital that you take your organization's competencies and strengths into account.

Use the following steps to help you choose.

Step 1: For each generic strategy, carry out a SWOT Analysis of your strengths and weaknesses, and the opportunities and threats you would face, if you adopted that strategy.

Having done this, it may be clear that your organization is unlikely to be able to make a success of some of the generic strategies.

Step 2: Use Five Forces Analysis to understand the nature of the industry you are in.

Step 3: Compare the SWOT Analyses of the viable strategic options with the results of your Five Forces analysis. For each strategic option, ask yourself how you could use that strategy to:

- Reduce or manage supplier power.
- Reduce or manage buyer/customer power.
- Come out on top of the competitive rivalry.
- Reduce or eliminate the threat of substitution.
- Reduce or eliminate the threat of new entry.

Select the generic strategy that gives you the strongest set of options.

Generic Strategies and Industry Forces

These generic strategies each have attributes that can serve to defend against competitive forces. The following table compares some characteristics of the generic strategies in the context of the Porter's five forces.

Generic Strategies and Industry Forces

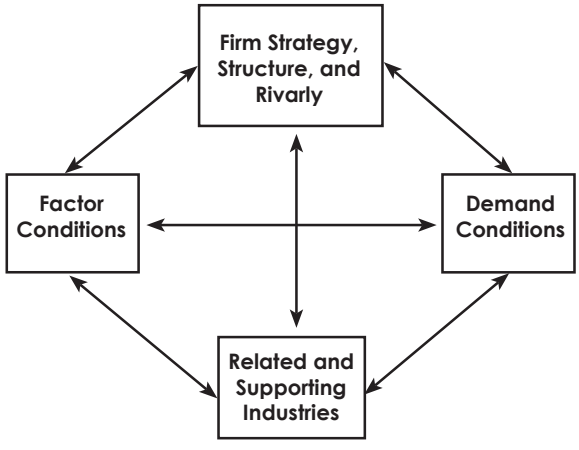
Industry Force	*Generic Strategies*		
	Cost Leadership	**Differentiation**	**Focus**
Entry Barriers	Ability to cut price in retaliation deters potential entrants.	Customer loyalty can discourage potential entrants.	Focusing develops core competencies that can act as an entry barrier.
Buyer Power	Ability to offer lower price to powerful buyers.	Large buyers have less power to negotiate because of few close alternatives.	Large buyers have less power to negotiate because of few alternatives.
Supplier Power	Better insulated from powerful suppliers.	Better able to pass on supplier price increases to customers.	Suppliers have power because of low volumes, but a differentiation-focused firm is better able to pass on supplier price increases.
Threat of Substitutes	Can use low price to defend against substitutes.	Customer's become attached to differentiating attributes, reducing threat of substitutes.	Specialized products & core competency protect against substitutes.
Rivalry	Better able to compete on price.	Brand loyalty to keep customers from rivals.	Rivals cannot meet differentiation-focused customer needs.

Porter's Diamond of National Advantage

Classical theories of international trade propose that comparative advantage resides in the factor endowments that a country may be fortunate enough to inherit. Factor endowments include land, natural resources, labor, and the size of the local population.

Michael E. Porter argued that a nation can create new advanced factor endowments such as skilled labor, a strong technology and knowledge base, government support, and culture. Porter used a diamond shaped diagram as the basis of a framework to illustrate the determinants of national advantage. This diamond represents the national playing field that countries establish for their industries.

Michael E. Porter's Diamond Model



The individual points on the diamond and the diamond as a whole affect four ingredients that lead to a national comparative advantage. These ingredients are:

1. the availability of resources and skills,
2. information that firms use to decide which opportunities to pursue with those resources and skills,
3. the goals of individuals in companies,
4. the pressure on companies to innovate and invest.

The points of the diamond are described as follows.

I. Factor Conditions

- A country creates its own important factors such as skilled resources and technological base.
- The stock of factors at a given time is less important than the extent that they are upgraded and deployed.
- Local disadvantages in factors of production force innovation. Adverse conditions such as labor shortages or scarce raw materials force firms to develop new methods, and this innovation often leads to a national comparative advantage.

II. Demand Conditions

- When the market for a particular product is larger locally than in foreign markets, the local firms devote more attention to that product than do foreign firms, leading to a competitive advantage when the local firms begin exporting the product.
- A more demanding local market leads to national advantage.
- A strong, trend-setting local market helps local firms anticipate global trends.

III. Related and Supporting Industries

- When local supporting industries are competitive, firms enjoy more cost effective and innovative inputs.
- This effect is strengthened when the suppliers themselves are strong global competitors.

IV. Firm Strategy, Structure, and Rivalry

- Local conditions affect firm strategy. For example, German companies tend to be hierarchical. Italian companies tend to be smaller and are run more like extended families. Such strategy and structure helps to determine in which types of industries a nation's firms will excel.
- In **Porter's Five Forces** model, low rivalry made an industry attractive. While at a single point in time a firm prefers less rivalry, over the long run more local rivalry is better since it puts pressure on firms to innovate and improve. In fact, high local rivalry results in less global rivalry.
- Local rivalry forces firms to move beyond basic advantages that the home country may enjoy, such as low factor costs.

The Diamond as a System

- The effect of one point depends on the others. For example, factor disadvantages will not lead firms to innovate unless there is sufficient rivalry.
- The diamond also is a self-reinforcing system. For example, a high level of rivalry often leads to the formation of unique specialized factors.

Government's Role

The role of government in the model is to:

- Encourage companies to raise their performance, for example by enforcing strict product standards.
- Stimulate early demand for advanced products.
- Focus on specialized factor creation.
- Stimulate local rivalry by limiting direct cooperation and enforcing antitrust regulations.

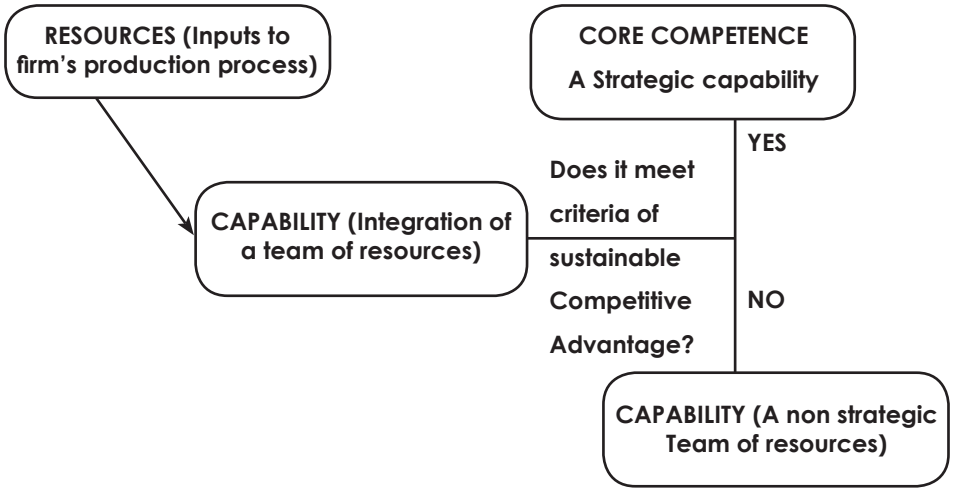
Application to the Japanese Fax Machine Industry

The Japanese facsimile industry illustrates the diamond of national advantage. Japanese firms achieved dominance in this industry for the following reasons:

- Japanese factor conditions: Japan has a relatively high number of electrical engineers per capita.
- Japanese demand conditions: The Japanese market was very demanding because of the written language.
- Large number of related and supporting industries with good technology, for example, good miniaturized components since there is less space in Japan.
- Domestic rivalry in the Japanese fax machine industry pushed innovation and resulted in rapid cost reductions.
- Government support - NTT (the state-owned telecom company) changed its cumbersome approval requirements for each installation to a more general type approval.

3.5 COMPETENCIES AND CORE COMPETENCIES

A competency is defined as "any knowledge, skill, set of actions, or thought pattern that distinguishes reliably between superior and average performer i.e. a competency is what superior performers do more and with better results than average performers on the job."



Core competency is a unique skill or technology that creates distinct customer value. For instance, core competency of Federal Express (Fed Ex) is Logistics Management. The organizational unique capabilities are mainly personified in the collective knowledge of people as well as the organizational system that influences the way the employees interact. As an organization grows, develops and adjusts to the new environment, so do its core competencies. Thus, core competencies are flexible and developing with

time. They do not remain rigid and fixed. The organization can make maximum utilization of the given resources and relate them to new opportunities thrown by the environment.

Resources and **capabilities** are the **building blocks** upon which an organization create and execute value-adding strategy so that an organization can earn reasonable returns and achieve strategic competitiveness.

Competency may be categorized as core and non-core depending on the nature of capabilities.

Core competencies are seen as an organization's primary source of competitive advantage, and the areas that an organization should focus its resources and attention. Core competencies are to be protected and nurtured, and all non-core functions should be outsourced. Core competencies help one to recognize the opportunities of the new facets of creating values which are different for every organization.

'Competitive advantage' for an organization means discovering the needs of the customers and then satisfying and even exceeding their expectations for the purpose of achieving the goals of the organization. Core competencies are resources or capabilities that can serve as a source of competitive advantage, strategic competitiveness and ability to earn above average returns. Competitive advantage relates the company's activities to those of its competitors. Competitive advantage does not mean just matching or surpassing what our competitors are doing. As a result of technological development and highly competitive environment, the organizations are compelled to work in an environment wherein the customers are having easy access to goods and services and they are in a position to identify and acquire the best of what they want, at reasonable prices immaterial of the goods, place of production in the world. Cost function plays a vital role among all the functions of an organization to ensure success and organizational growth in the environment of global competition.

According to Michael E. Porter, competitive advantage potential offer the strongest basis for a strategic offensive. These competitive advantage potential include:

(a) Developing a lower-cost product design.

(b) Making changes in production operations that lower costs and/or enhance differentiation.

(c) Developing product features that deliver superior performance or lower user costs.

(d) Giving customers more responsive post-sale service and support.

(e) Escalating the marketing effort in an undermarketed industry.

(f) Pioneering a new distribution channel.

(g) Eliminating wholesalers/distributors/dealers and selling direct to the ultimate consumers/users.

The identification of core competence of a business firm basically aims to find new strategies to grow and improve a firm's business. A company's core competence is defined by that set of products, customer segments, processes and technologies in which one can build the greatest competitive edge. Investigating into core competencies can lead to better strategies. Core competence means resources and capabilities that serve as a source of competitive advantage for a firm over its competitors. A core business is an activity that an organization does particularly in comparison to its competitors. A core competency is something a company can do exceedingly well. It is its key strength. When these competencies or capabilities are superior to those of its competitors, they are called 'distinctive competencies'.

According to Prahalad and Hamel, the firms must operate only in areas in which it has core competency. It must market only those products/services which:

(a) Customers perceive as of some distinctive value;

(b) Uniqueness (should be superior to competitors' capabilities); and

(c) Extendable (something to be used to develop new-products or enter new markets.

A core competence not only integrates the technology but it also organizes workforce and delivery of value. Core competence includes interest, involvement and commitment to working across the organization. A company can gain access to distinctive competence through:

(a) asset endowment such as a key patent;

(b) acquisition from someone else; and

(c) sharing with other business unit.

Competency	Potential Use
1. Technology	Produce wide range of products using the same products.
2. Surplus cash inflow	Acquire other businesses.
3. Skilled sales force	Establish market for new products using the salesmen skill.
4. Research and Development	Emphasize on development of high technology products.
5. Quality	Select markets where the product quality is more recognised and established.
6. Material Supplies	Select the low cost provider of quality materials.

Some of the ways in which a firm can effectively employ its various 'distinctive' or 'core competencies' as follows:

To identify a core competence, Prahlad and Hamel prescribe three tests:

(a) It should be able to provide potential access to a wide variety of markets;

(b) It should make a significant contribution to the perceived customer of the end product; and

(c) It should be difficult for the competitors to imitate.

Having identified core business, the analysis requires the following steps:

Step 1 Define the core business clearly, it means narrowing our focus.

Step 2 Detail those activities that lie outside the core business.

Step 3 Evaluate core business markets in depth.

Step 4 Deliver excellence in the operation of the core business operations.

Step 5 Use value chain analysis, to find new strategies that deepen our focus on the core business.

Step 6 Explore financial performance potential.

Step 7 Prioritize most promising strategies and estimate the impact of each.

Step 8 Contemplate the disinvestment of activities that lie outside the core business.

Step 9 Penetrate the market deeply and finally

Step 10 Look to adjacent businesses.

In their 1990 article entitled, *The Core Competence of the Corporation*, C.K. Prahalad and Gary Hamel coined the term **core competencies**, or the collective learning and coordination skills behind the firm's product lines. They made the case that core competencies are the source of competitive advantage and enable the firm to introduce an array of new products and services.

According to Prahalad and Hamel, core competencies lead to the development of core products. Core products are not directly sold to end users; rather, they are used to build a larger number of end-user products. For example, motors are a core product that can be used in wide array of end products. Each business units of the corporation tap into relatively few core products to develop a larger number of end user products based on the core product technology.

The intersection of market opportunities with core competencies forms the basis for launching new businesses. By combining a set of core competencies in different ways and matching them to market opportunities, a corporation can launch a vast array of businesses.

Without core competencies, a large corporation is just a collection of discrete businesses. Core competencies serve as the glue that bonds the business units together into a coherent portfolio.

Core Products

Core competencies manifest themselves in core products that serve as a link between the competencies and end products. Core products enable value creation in the end products. Examples of firms and some of their core products include:

- 3M - substrates, coatings, and adhesives
- Black & Decker - small electric motors
- Canon - laser printer subsystems
- Matsushita - VCR subsystems, compressors
- NEC - semiconductors
- Honda - gasoline powered engines

The core products are used to launch a variety of end products. For example, Honda uses its engines in automobiles, motorcycles, lawn mowers, and portable generators.

Because firms may sell their core products to other firms that use them as the basis for end user products, traditional measures of brand market share are insufficient for evaluating the success of core competencies. Prahalad and Hamel suggest that core product share is the appropriate metric. While a company may have a low brand share, it may have high core product share and it is this share that is important from a core competency standpoint.

Once a firm has successful core products, it can expand the number of uses in order to gain a cost advantage via economies of scale and economies of scope.

Why Core Competencies are relevant?

Core Competencies, by their very definition, are not ordinary skills, that can be acquired by any business organization, anywhere in the world, very easily. These are bundles of skills and competencies that are built over a very long period of time. Their main strength lies in the fact that such competencies are very much unique to the particular organization and to the particular industry, in which the organization operates. However, since the competencies are always skill-based, any competitor being able to copy such skills is very difficult or simply, impossible. This gives the organization, an unbeatable competitive advantage.

Certain examples from India, illustrate the concept very clearly.

For example, the Chennai-based Sundram Fasteners supplies over seven thousand different types of tools to one of India's finest organizations -- Tata Motors, which has now launched the cheapest car in the world -- the Nano at around 21,000 US dollars.

Each fastener requires as many as forty different tools to make, and Sundram Fasteners has over four lakh tools in its tool library. This tool making competency, is a clear core competency of the organization. Its tool library is two and a half times the size of its nearest competitor, and the organization has lost not a single manday due to strikes or lock-outs in over fifty years of its existence.

The secret of such stupendous success lies in the superb leadership style of the present CEO of the organization, Mr. Suresh Krishna. He reaches out to his employees in a very personal way. The employees have the highest regard for their organization, as they are assured of very good salary and perks. The organization is world-famous for quality products. In fact, it is part of the Chennai-based TVS group, at least four organizations of which group, are Deming Award winners.

In the several years of its existence, Sundram Fasteners has never missed a single shipment, and is the sole supplier of radiator caps to different plants of General Motors throughout the world. This is the kind of Core Competencies, which makes it tickle, as one of its kind. In the past decade, this particular organization has gone in for acquisitions and has cemented its place in the particular business it operates in.

Imagine for a moment, the complexity of building such a vast tool library, over a period of twenty-five years. Even if a new competitor were to attempt to copy the same, it would take as many as fifteen years. And during this period Sundram Fasteners would have grown to several times its present size.

In today's world of cut-throat competition, Core Competencies clearly stand out. Apple, for example, has been able to come out with stunning products like the i-pod. Disruptive innovation, is clearly its Core Competence. In fact, Apple and Sundram fasteners might as well qualify as fit cases for having employed, what is famously called the Blue Ocean Strategy, as they have consciously avoided fighting in markets where there is too much competition, and where skills can be easily copied.

There are questions that are often raised as to whether Core Competencies cannot be freshly acquired. The answer is in the affirmative. For example, ITC, the multinational giant, has effectively used its marketing prowess to enter the highly competitive and complex Fast Moving Consumer Goods industry in India. This market is a multi-billion dollar lucrative market, but requires marketing skills of a very tall order.

It has succeeded in taking on the might of the market leader -- Britannia -- through very innovative advertising campaigns and smart packaging. Its product range is also very unique, as it has products that cater to the lower middle-class, the middle middle-class and the upper middle-classes as well. It also has products for the rich. Since it has acquired new competencies in marketing, it has been very successful, in a huge range of products.

In fact, even smaller organizations like the Chennai-based Cavinkare, have innovated in bringing out superb products that match those of the Hindustan Lever, in product categories such as shampoos. However, developing marketing expertise does take considerable time, and this organization has succeeded in poaching high calibre professionals from Hindustan Unilever and other FMCG organizations.

Core Competencies can also built by even educational institutions. For example, in a small town called Vellore in the South Indian State of Tamil Nadu, there is now one famous deemed University called the Vellore Institute of Technology. Its founder, Mr. Vishwanathan, has adopted a unique model of building formidable Core Competencies. He has made huge investments in creating world-class infrastructure, which has attracted the best minds as students not only from various parts of India, but also from other countries of the world, including developed countries like Canada, and several African nations. What has really mattered is that the quality of teaching has improved, as VIT has been able to attract high-calibre teachers from all over the country. The National and international seminars that it has been able to conduct, very regularly, has opened up many vistas of knowledge, and opened up many doors, in the international arena, through very innovative tie-ups with foreign Universities.

In fact, VIT is just one example of a deemed University that has made India proud. Since it supplies high-quality information technology professionals to all IT companies world-wide, VIT has already made a name for itself, among such companies. The campus recruitments are one hundred percent. This has made it a very formidable learning centre in India.

Building Core Competencies also allows any business organization enough elbow room to experiment and innovate. General Electric, which already has several Core Competencies, is now dabbling with what is called "Reverse Innovation", that is, innovating through breakthrough products in countries in India, and then taking these products to the advanced countries.

Core Competencies are relevant now, than ever before. It all depends on how the organizations take advantage of the central theme of the concept and go to greater heights in terms of building Core Competencies. In the years to come, when business organizations become very complex, they will have no choice but to build such competencies to succeed in a very competitive environment, at the global level.

Developing Core Competencies

According to Prahalad and Hamel, core competencies arise from the integration of multiple technologies and the coordination of diverse production skills. Some examples include Philip's expertise in optical media and Sony's ability to miniaturize electronics.

There are three tests useful for identifying a core competence. A core competence should:

1. provide access to a wide variety of markets, and
2. contribute significantly to the end-product benefits, and
3. be difficult for competitors to imitate.

Core competencies tend to be rooted in the ability to integrate and coordinate various groups in the organization. While a company may be able to hire a team of brilliant scientists in a particular technology, in doing so it does not automatically gain a core competence in that technology. It is the effective coordination among all the groups involved in bringing a product to market that results in a core competence.

It is not necessarily an expensive undertaking to develop core competencies. The missing pieces of a core competency often can be acquired at a low cost through alliances and licensing agreements. In many cases an organizational design that facilitates sharing of competencies can result in much more effective utilization of those competencies for little or no additional cost.

To better understand how to develop core competencies, it is worthwhile to understand what they do not entail. According to Prahalad and Hamel, core competencies are not necessarily about:

- outspending rivals on R&D
- sharing costs among business units
- integrating vertically

While the building of core competencies may be facilitated by some of these actions, by themselves they are insufficient.

The Loss of Core Competencies

Cost-cutting moves sometimes destroy the ability to build core competencies. For example, decentralization makes it more difficult to build core competencies because autonomous groups rely on outsourcing of critical tasks, and this outsourcing prevents the firm from developing core competencies in those tasks since it no longer consolidates the know-how that is spread throughout the company.

Failure to recognize core competencies may lead to decisions that result in their loss. For example, in the 1970's many U.S. manufacturers divested themselves of their television manufacturing businesses, reasoning that the industry was mature and that high quality, low cost models were available from Far East manufacturers. In the process, they lost their core competence in video, and this loss resulted in a handicap in the newer digital television industry.

Similarly, Motorola divested itself of its semiconductor DRAM business at 256Kb level, and then was unable to enter the 1Mb market on its own. By recognizing its core competencies and understanding the time required to build them or regain them, a company can make better divestment decisions.

Core Competencies Examples

A core competency is defined as something unique that an organization has, or as something unique it can do. A company that develops a unique core competency can create long lasting competitive advantage.

A core competency will typically meet all rules on the following checklist:

- it provides benefit to the customer

- it is difficult to imitate
- it can be leveraged widely to create many products (or operate in many markets)
- it will uniquely identify the organization
- it will be difficult to pin down, because it seems to be a combination of things such as technology, process, and know-how.

Now that we know what core competencies are, and we're armed with a checklist to check for one, let's look at some core competency examples…

Core Competency Example 1: Apple

The core competency of Apple can be said to be "making user friendly interfaces and design". Let's examine this statement against our checklist:

Criteria	**Yes/No**
Customer benefit?	Yes. The customer clearly benefits from great user interfaces
Difficult to imitate?	Yes. Companies have been trying for years and not yet succeeded.
Can be leveraged?	Yes. This core competency has been rolled out to the iPod, the iPhone, and most recently, the iPad.
Uniquely identifies the organization?	Yes
Difficult to pin down?	Yes – it's not just design, but marketing, software, hardware etc.

Core Competency Example 2: Walmart

The core competency of Walmart can be said to be "Groceries at a low cost". Let's examine this statement against our checklist:

Criteria	**Yes/No**
Customer benefit?	Yes. The customer gets their goods cheaper than anywhere else.
Difficult to imitate?	Yes. A company would require huge scale to replicate, and that is obviously not an easy thing to achieve.
Can be leveraged?	Yes. Walmart sells all kinds of goods using the same model.
Uniquely identifies the organization?	Yes, I think in the US at least, most consumers would identify Walmart as being amongst the cheapest in this space.
Difficult to pin down?	Yes – it's scale, but also supply chain management, and high inventory turnover etc.

Core Competency Example 3: Dell

The core competency of Dell can be said to be "custom made PC direct from manufacturer at a low cost". Let's examine this statement against our checklist:

Criteria	**Yes/No**
Customer benefit?	Yes. The customer gets a PC at a inexpensive price point.
Difficult to imitate?	Marginal – and this could be Dell's downfall
Can be leveraged?	Yes. They have rolled the model out to laptops, printers etc
Uniquely identifies the organization?	Yes. Dell would certainly be identified by consumers as one of the most affordable in this space.
Difficult to pin down?	Yes (but probably the easiest to identify of all 3 examples) – it's a combination of just in time manufacturing, low cost sales channels (Internet), outsourced R&D etc.

COMPETITIVE ADVANTAGE & CORE COMPETENCE

Attributes of Core Competence:

Core competence is fundamental, unique and inimitable strength of the firm that:

(i) Provides the firm, the access to a variety of products/markets.

(ii) Contributes significantly to customer benefits in the end products.

(iii) Is an exclusive preserve of the firm and cannot be imitated easily by competitors.

Core competence is largely a technological competence, a competence at the root technology in particular. This is because new businesses/new products are largely the result of technology. This is especially true in today's technology-driven world, where technology is fast altering existing boundaries of businesses. The core competencies of these corporations are the outcome of their command over several overarching technologies.

Corporations who enjoy a core competence in the root technology / process / expertise keep gaining lasting advantage, through new and proprietary products and fresh value enhancement.

In particular, for firms playing the business game through the product route, core competence is very essential. Often, command over multiple streams of interrelated and overarching technologies, (e.g. tele-computers, fiber optics) confers a core competences to a firm in the composite area, giving rise to many unique products.

Core competence is a knowledge base, which gives rise to a variety of products with widely varying product missions. Core competency idea does not restrict the number of Businesses.

The core competency concept is sometimes misunderstood as a perspective that restricts the numbers of businesses a company can be in. Firms wrongly assume that when they adopt the concept of core competence, it compels them to remain with a single business.

In reality the core competence perspective helps the firm to operate a number of businesses by having one core skill. The businesses will have a linkage to the core skill. And, with two or three core skills, a firm can have a very large basket of businesses.

3M, for example, is in a multitude of businesses and has over 60,000 products. One core product sticky tape accounts for a large number of end products. Behind such a vast spectrum of products lie 3Ms core skills / core competencies in making substrates, coatings and adhesives and combining them in multiple ways.

Distinction between Competitive Advantage and Core Competence:

- A competitive advantage does not necessarily imply a core competence while a core competence does imply a number of competitive advantages.
- A competitive advantage does not constitute a sure success formula for a firm over a long term; a core competence usually does.
- A core competence provides a lasting superiority to the company while a competitive advantage provides a temporary competitive superiority. And behind any lasting competitive superiority, one can always find a core competence.

While a competitive advantage accrues from a functional strength in any of the manifold functions performed by a firm, a core competence does not normally accrue from functional strength. The strength has to be at the root of businesses and product; it has to be core strength like a unique capability in technology or process.

A competitive advantage helps a firm in a specific and limited way; a core competence helps it in a general, far-reaching and multifaceted manner. A competitive advantage provides competitive strength to the firm in a given business or product. A core competence helps the firm to excel in a variety of businesses and products.

To conclude, a core competence is fundamental and unique to a firm. A competitive advantage can be easily imitated and competitors catch up fast. Core competence is an exclusive and inimitable preserve of a firm. It is long lasting; competitors cannot easily catch up with the firm. Competitive advantages are not unique to any firm over the long term.

Implications for Corporate Management

Prahalad and Hamel suggest that a corporation should be organized into a portfolio of core competencies rather than a portfolio of independent business units. Business unit managers tend to focus on getting immediate end-products to market rapidly and usually do not feel responsible for developing company-wide core competencies. Consequently, without the incentive and direction from corporate management to do otherwise, strategic business units are inclined to underinvest in the building of core competencies.

If a business unit does manage to develop its own core competencies over time, due to its autonomy it may not share them with other business units. As a solution to this problem, Prahalad and Hamel suggest that corporate managers should have the ability to allocate not only cash but also core competencies among business units. Business units that lose key employees for the sake of a corporate core competency should be recognized for their contribution.

Leveraging Core Competencies

The concept of core competencies can be illustrated by the imagery of the diversified corporation as a tree. The trunk and major limbs represent core products; the smaller branches are business units; and the leaves, flowers, and fruit are end products. The core competencies are represented by the root system, which provides nourishment, sustenance, and stability. Managers often misread the strength of competitors by looking only at their end products, just as we can fail to appreciate the strength of a tree by looking only at its leaves. Core competencies may also be viewed as the "glue" that binds existing businesses together or as the engine that fuels new business growth.

Core competencies reflect the collective learning in organizations—how to coordinate diverse production skills, integrate multiple streams of technologies, and market and merchandise diverse products and services. The theoretical knowledge necessary to put a radio on a chip does not in itself assure a company of the skill needed to produce a miniature radio approximately the size of a business card. To accomplish this, Casio, a giant electronic products producer, must synthesize know-how in miniaturization, micro-processor design, material science, and ultrathin precision castings. These are the same skills that it applies in its miniature card calculators, pocket TVs, and digital watches.

For a core competence to create value and provide a viable basis for synergy among the businesses in a corporation, it must meet three criteria.

- The core competence must enhance competitive advantage(s) by creating superior customer value. It must enable the business to develop strengths relative to the competition. Every value-chain activity has the potential to provide a viable basis for building on a core competence. At Gillette, for example, scientists developed the Mach 3 and Sensor Excel after the introduction of the tremendously successful Sensor System because of a thorough understanding of several phenomena that underlie shaving. These include the physiology of facial hair and skin, the metallurgy of blade strength and sharpness, the dynamics of a cartridge moving across skin, and the physics of a razor blade severing hair. Such innovations are possible only with an understanding of such phenomena and the ability to combine such technologies into innovative products. Customers have consistently been willing to pay more for such technologically differentiated products.
- Different businesses in the corporation must be similar in at least one important way related to the core competence. It is not essential that the products or services themselves be similar. Rather, at least one element in the value chain must require similar skills in creating competitive advantage if the corporation is to "capitalize on its core "competence. At first glance you might think that

motorcycles, clothes, and restaurants have little in common. But at Harley-Davidson, they do. Harley-Davidson has capitalized on its exceptionally strong brand image as well as merchandising and licensing skills to sell accessories, clothing, and toys and has licensed the Harley-Davidson Cafe in New York City—further evidence of the strength of its brand name and products.

- The core competencies must be difficult for competitors to imitate or find substitutes for. Competitive advantages will not be sustainable if the competition can easily imitate or substitute them. Similarly, if the skills associated with a firm's core competencies are easily imitated or replicated, they are not a sound basis for sustainable advantages. Consider Sharp Corporation, a $17 billion consumer electronics giant. It has a set of specialized core competencies in optoelectronics technologies that are difficult to replicate and contribute to its competitive advantages in its core businesses. Its most successful technology has been liquid crystal displays (LCDs) that are critical components in nearly all of Sharp's products. Its expertise in this technology enabled Sharp to succeed in videocassette recorders (VCRs) with its innovative LCD viewfinder and led to the creation of its Wizard, a personal electronic organizer.

Sharing Activities

As we saw above, leveraging core competencies involves transferring accumulated skills and expertise across business units in a corporation. When carried out effectively, this leads to advantages that can become quite sustainable over time. Corporations also can achieve synergy by sharing tangible activities across their business units. These include value-creating activities such as common manufacturing facilities, distribution channels, and sales forces. As we will see, sharing activities can potentially provide two primary payoffs: cost savings and revenue enhancements.

Deriving Cost Savings through Sharing Activities

Typically, this is the most common type of synergy and the easiest to estimate. Peter Shaw, head of mergers and acquisitions at the British Chemical and Pharmaceutical Company refers to cost savings as "hard synergies" and contends that the level of certainty of their achievement is quite high. Cost savings come from many sources, including elimination of jobs, facilities, and related expenses that are no longer needed when functions are consolidated, or from economies of scale in purchasing. Cost savings are generally highest when one company acquires another from the same industry in the same country. Shaw Industries, recently acquired by Berkshire Hathaway, is the nation's largest carpet producer. Over the years, it has dominated the competition through a strategy of acquisition which has enabled Shaw, among other things, to consolidate its manufacturing operations in a few, highly efficient plants and to lower costs through higher capacity utilization.

It is important to note that sharing activities inevitably involve costs that the benefits must outweigh. One often overlooked cost is the greater coordination required to manage a shared activity. Even more important is the need to compromise the design or performance of an activity so that it can be shared. For example, a salesperson handling the products of two business units must operate in a way that is usually not what either unit would choose if it were independent. If the compromise erodes the unit's effectiveness, then sharing may reduce rather than enhance competitive advantage.

Enhancing Revenue and Differentiation through Sharing Activities

Often an acquiring firm and its target may achieve a higher level of sales growth together than either company could on its own. Shortly after Gillette acquired Duracell, it confirmed its expectation that selling Duracell batteries through Gillette's existing channels for personal care products would increase sales, particularly internationally. Gillette sold Duracell products in 25 new markets in the first year after the acquisition and substantially increased sales in established international markets. In a similar vein, a target company's distribution channel can be used to escalate the sales of the acquiring company's product. Such was the case when Gillette acquired Parker Pen. Gillette estimated that it could gain an additional ₹25 million in sales of its own Waterman pens by taking advantage of Parker's distribution channels.

Firms also can enhance the effectiveness of their differentiation strategies by means of sharing activities among business units. A shared order-processing system, for example, may permit new features and services that a buyer will value. Also, sharing can reduce the cost of differentiation. For instance, a shared service network may make more advanced, remote service technology economically feasible. To illustrate the potential for enhanced differentiation though sharing, consider ₹5.1 billion VF Corporation—producer of such well-known brands as Lee, Wrangler, Vanity Fair, and Jantzen.

VF's acquisition of Nutmeg Industries and H. H. Cutler provided it with several large customers that it didn't have before, increasing its plant utilization and productivity. But more importantly, Nutmeg designs and makes licensed apparel for sports teams and organizations, while Cutler manufactures licensed brand-name children's apparel, including Walt Disney kids' wear. Such brand labeling enhances the differentiation of VF's apparel products. According to VF President Mackey McDonald, "What we're doing is looking at value-added knitwear, taking our basic fleece from Basset-Walker [one of its divisions], embellishing it through Cutler and Nutmeg, and selling it as a value-added product." Additionally, Cutler's advanced highspeed printing technologies will enable VF to be more proactive in anticipating trends in the fashion-driven fleece market. Claims McDonald, "Rather than printing first and then trying to guess what the customer wants, we can see what's happening in the marketplace and then print it up."

As a cautionary note, managers must keep in mind that sharing activities among businesses in a corporation can have a negative effect on a given business's differentiation. For example, with the merger of Chrysler and Daimler-Benz, many consumers may lower their perceptions of Mercedes's quality and prestige if they feel that common production components and processes are being used across the two divisions. And the Jaguar division of Ford Motor Company may be adversely affected as consumers come to understand that it shares many components with its sister divisions at Ford, including Lincoln.

3.6 STRATEGIC GROUP ANALYSIS

According to Porter, a strategic group is the group of firms in an industry following the same or similar strategy along the strategic dimensions. A strategic group is a set of business units or firms that pursue similar strategies with similar resources. The classification of firms in the industry into a set of strategic groups is highly useful in better understanding of the competitive environment and enable to form a level playing field for competitive strategies. Strategic groups are conceptually defined clusters of competitors that share similar strategies and therefore, compete more directly with one another than with other firms in the same industry. The theory of strategic groups emphasizes that within an industry, firms with similar asset configurations will pursue similar competitive strategies with similar performance results. The firms in strategic groups with high mobility barriers will have greater profit potential than those in groups with lower mobility barriers. These barriers also provide a rationale for why firms continue to compete with different strategies despite the fact that all strategies are not quickly successful.

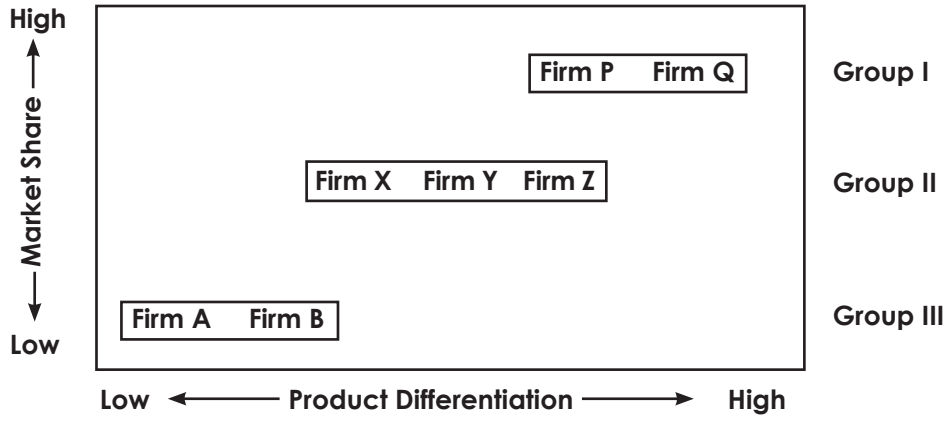
A strategic group is a concept used in strategic management that groups companies within an industry that have similar business models or similar combinations of strategies. For example, the restaurant industry can be divided into several strategic groups including fast-food and fine-dining based on variables such as preparation time, pricing, and presentation. The number of groups within an industry and their composition depends on the dimensions used to define the groups. Strategic management professors and consultants often make use of a two dimensional grid to position firms along an industry's two most important dimensions in order to distinguish direct rivals (those with similar strategies or business models) from indirect rivals. Strategy is the direction and scope of an organization over the long term which achieves advantages for the organization while business model refers to how the firm will generate revenues or make money.

Hunt (1972) coined the term strategic group while conducting an analysis of the appliance industry after he discovered a higher degree of competitive rivalry than suggested by industry concentration ratios. He attributed this to the existence of subgroups within the industry that competed along different dimensions making tacit collusion more difficult. These asymmetrical strategic groups caused the industry to have

more rapid innovation, lower prices, higher quality and lower profitability than traditional economic models would predict.

Michael Porter (1980) developed the concept and applied it within his overall system of strategic analysis. He explained strategic groups in terms of what he called "mobility barriers". These are similar to the entry barriers that exist in industries, except they apply to groups within an industry. Because of these mobility barriers a company can get drawn into one strategic group or another. Strategic groups are not to be confused with Porter's generic strategies which are internal strategies and do not reflect the diversity of strategic styles within an industry.

Originally, the analysis of intra-industry variations in the competitive behaviour and performance of firms was based primarily on the use of secondary financial and accounting data. The study of strategic groups from a cognitive perspective, however, has gained prominence during the past years (Hodgkinson 1997).



Businesses that sell similar products or services to the same segment of the population are in a strategic group. For example, a fine dining restaurant and a fast food restaurant are both restaurants, but the businesses would be in different strategic groups because of divergent clientele. Similarly, a fashion boutique and a fine dining restaurant serve the same clientele but are in different strategic groups because the businesses offer different products. The examination of businesses that function within the same strategic group is called strategic group analysis.

Strategic group analysis is often discussed in conjunction with market focus. Market focus splits the consumer population into market segments that share characteristics such as education level, income, age and gender. Companies research the general preferences of market segments and then use the preferences to gear products and services toward specific market segments that are served by strategic groups.

The goals of strategic group analysis vary depending several strategic group characteristics, including the size of the market, the diversity of products offered, the geographical proximity of the competing companies and where the products are sold. Branding, marketing, quality and price also are factors that must be considered. For example, a company that serves consumers who value low prices might conduct a strategic group analysis to determine where competitors' products fall on the low-price-versus-quality scale. The results of this group analysis might help the company determine how to price products and set quality control.

A company might use strategic group analysis to identify competitors and determine how businesses within the group compete. Corporations that launch a new product might conduct an analysis to determine how to compete when entering the market. Creating a map of which businesses serve each market segment helps analysts discover any markets that are under-served or not served at all by the existing strategic groups.

Product positioning and differentiation are two strategic marketing techniques that benefit from strategic group analysis. Positioning means ensuring that a product occupies a unique place in the consumer's mind, and differentiation means making a product seem different from competing products. In both cases, strategic group analysis offers a competitive frame of reference to aid making a product seem uniquely better than other products in the same strategic group.

Strategic Group Analysis (SGA) aims to identify organizations with similar strategic characteristics, following similar strategies or competing on similar bases. Such groups can usually be identified using two or perhaps three sets of characteristics as the bases of competition.

Examples of the SGA:

- Extent of product (or service) diversity.
- Extent of geographic coverage.
- Number of market segments served.
- Distribution channels used.
- Extent of branding.
- Marketing effort.
- Degree of vertical integration.
- Product (or service) quality.
- Pricing policy.

STRATEGIC GROUPING

The companies belong to the same strategic group in the industry might have one or more of the following common features:

(a) Marketing and distribution channels

(b) Product features, attributes and quality

(c) Pricing of product and discounts

(d) Technological processes

(e) Product lines and product range

(f) After sales service and customer support facilities

(g) Degree of vertical and horizontal integration

(h) Geographical coverage and logistic services

(i) Market share and cost structure

(j) Industry experience curve in which firm is lying etc.

Strategic group in an industry can be mapped by plotting the market positions of competitors in a two dimensional graph by selecting any two variables. By comparing the market positions of each firm separately or grouping them into like positions.

Steps in Strategic Grouping

Step 1 Identify the competitive characteristics that differentiate firms in the industry like price, market share, quality, brand image etc.

Step 2 Plot the firms on a two-variable map, using pairs of differentiating characteristics.

Step 3 Classify firms that fall into same category into one strategic group.

Step 4 Determine the position of each strategic group, by making proportional to the size of the group's respective share of total industry sales revenues.

The firms within a strategic group are in direct competition with each other than those in other strategic groups within the industry. Firms in each of the strategic groups might have different effects of the Porter's five forces. The kind of opportunities and threats might vary across different strategic groups. Many empirical studies observes that very weak evidence of a link between strategic group membership and company profit rates inspite of the fact that strategic group model predicts otherwise.

Use of Strategic Group Analysis

This analysis is useful in several ways:

- Helps identify who the most direct competitors are and on what basis they compete.
- Raises the question of how likely or possible it is for another organization to move from one strategic group to another.
- Strategic Group mapping might also be used to identify opportunities.
- Can also help identify strategic problems.

Strategic Groups & the 5-Forces Framework

Michael E. Porter defines a Strategic Group as 'the group of firms in an industry following the same or a similar strategy along the strategic dimensions.' This essentially means that a Strategic Group, within an industry, is a group of firms that operate in a similar fashion in terms of their respective Specialization and Vertical Integration. If we take the example of the Passenger Car Industry, a group of firms are characterized by broad product lines, heavy advertising, medium integration, extensive distribution, mass-market appeal and widely-available service, let us call this Group A, while another group of companies would be characterized as extremely narrow product lines, minimal, often no advertising, high integration, selective distribution and service and superior performance, let us call this Group B. The firms that fall in Group A, internationally, are to the likes of Hyundai, Ford, Chevrolet, Volkswagen, Fiat, Toyota, Renault etc., while firms like Ferrari, Bugatti, Bentley, Rolls Royce, Lamborghini, Maybach etc, belong to the latter group. Then there exists a group in between wherein performance meets mass-market appeal. This, Group C, would consist of firms like BMW, Audi, Daimler-Benz (Mercedes), Porsche, Alfa-Romeo, Nissan etc., which are a match between performance and luxury, and wide-appeal through narrow product lines. Another group of manufacturers, say Group D, such as Proton, Tata Motors, Maruti-Suzuki, Daihatsu, Mahindra & Mahindra, etc. exists which has most characteristics of the first group, barring an international appeal, meaning that manufacturers like these are broadly limited to their home countries and a few other countries, with product lines which are neither narrow nor broad, but have extensive distribution channels, at least in their home countries. Firms in Group B are highly vertically integrated primarily because of the focus on quality in their products, which is essentially why most products from these firms are hand-built with in-house manufacturing of components unlike other groups where most, and in some cases, all components are purchased, ranging from the Chassis to the Design, and Automobiles are just assembled in the plants.

Interestingly, the Strategic Groups, as mentioned, also have a lot in common with market shares of these firms. While Group A firms tend to enjoy a high market share with their products with mass-market appeal internationally, Group B, on the other end of the spectrum, has firms with products of very limited appeal, primarily because of the exorbitant price tags. Group C firms have much smaller market shares than that of Group A, and have a middle-of-the-road appeal in terms of luxury and performance and price. Group D, on the other hand, consists of firms with large market shares in only a few markets, most commonly in the country they originate from. It is also interesting to understand the ownership patterns of firms across various Strategic Groups. Broadly, the largest Global players enjoy a presence, through one or more of their brands, in at least three of the four strategic groups. For example, Volkswagen Group has a presence in Group A with its Volkswagen brand, in Group B with Bugatti & Bentley, in Group C with Audi & Porsche, and in Group D with Skoda & SEAT. Similarly, Fiat Group has a presence in the three groups with Fiat in Group A, Ferrari in Group B and Alfa-Romeo in Group C. The benefits are primarily in the form of platform sharing and in effect, cost saving because of reduced Research & Development costs, Market Power and the sharing of critical components.

Industry Rivalry

Rivalry within a Strategic Group is likely to be more in industries where there is a great difference between product lines of firms, especially in terms of pricing. In the Automobile Industry, the rivalry among the firms within a Group is far greater than the inter-group rivalry, as opposed to an industry where the substitutes are very close and are available in plenty. The inter-group rivalry is at a far lower level internationally because of the scale and appeal of products of firms from different groups. On the customers' part, there can be a shift from one group to another, especially when upgrading to a more expensive automobile, the firms effectively compete for customers in different market segments on their parts. For example, Ford does not compete with Ferrari, but it does, in some segments, with BMW, Audi & Mercedes. This is because Ford's more expensive and less mass-market range of cars are in similar segments with BMW's lesser expensive, more mass-market cars. So a Ford Focus would compete with a BMW 1-Series and not a BMW 7-Series as the target customers for both are poles apart. Similarly, firms from Group D can often compete with firms from Group A on a regional level, which is why we see Maruti-Suzuki competing with Ford, Fiat & Chevrolet because their target customers in the Indian market are broadly similar, but differ in the global context.

Bargaining Power of Suppliers

Different strategic groups enjoy different degreed of bargaining power of suppliers. In Strategic Groups where firms are primarily assemblers, the bargaining power of suppliers tends to be low primarily because of the scale of production of these firms. Often firms that operate in the mass-market enjoy market power because of their market share. This allows them to leverage their position to bargain with suppliers and have components customized for their use than that of other players. For example, Denso is a key supplier of Toyota to such an extent that Denso follows Toyota to whichever market Toyota enters. The bargaining power of Toyota over Denso is fairly high because of standardization of components and faster product development times across the industry because of which Toyota has the advantage of purchasing similar components from Bosch or Delphi. But because Denso is so dependent on Toyota for its revenues, it has to operate in a manner which suits Toyota, hence effectively lowering possibilities of serving another client. The existence of multiple-suppliers allows firms to pick and choose from a bouquet of firms and attain the lowest possible costs, keeping in mind the specification of the components in concern. In other strategic groups such as Group B, the bargaining power of suppliers is fairly high because of the focus on quality of the product. Most firms in Group B product most components of their cars and outsource only a few. The few components that they outsource come from specialist suppliers. The switching costs may not be very high, but the costs of customization of products to suit the manufacturer is very high because of the nature of the product.

Bargaining Power of Buyers

Bargaining power of buyers varies from group to group. Groups where mass-market players exist with minimal product differentiation have to deal with high bargaining power of buyers while groups with highly differentiated products enjoy low bargaining power of buyers. Strategic Group A, where firms are mass-market players with low product differentiation in most cases, have to deal with very high bargaining power of customers, primarily because of the availability of a plethora of options both from the same firm as well as from constituents of the Strategic Group. The bargaining power of buyers is slightly lower for Group C firms than that of Group A, because each Group C firm has a brand identity which is peculiar to that firm alone while others are close to achieving similar results, but are not widely known for the same. For example, BMWs are identified with their handling and performance, while Mercedes cars are identified as the more luxurious of the two. While customers pick between one of the brands, they have an agenda in mind while purchasing cars from this particular group. A customer who would like more performance than luxury is likely to go for one brand over the other, but at the same time, the customer also enjoys the presence of multiple players and can shift from one brand to another because the products are so close to each other in terms of specifications, features, luxury and performance. Firms in Group B enjoy low bargaining power of buyers, primarily because they have highly differentiated products with varied features and specifications. The products are normally either extremely high on

luxury, or on performance. While all products in this strategic group are far more luxurious and better in performance than those in the other groups, they tend to have an inclination towards one side of the spectrum. While Rolls Royce cars are the epitome of luxury on wheels, Ferrari's are the best performers of the lot, which is not to say Rolls Royce is archaic in terms of performance and Ferrari in luxury. The customers here have a clear-cut demand which can only normally be filled by one of the brands, which essentially goes to say that the bargaining power of buyers is low for Strategic Group B firms.

Threat of Substitutes

Substitutes to passenger cars are broadly based on the price points of the vehicles. While at the lower-end of the spectrum, substitutes are public transport and 2-wheelers, the higher-end of the spectrum only has air-travel as a substitute, which is only applicable for inter-city travel. Group A and Group D face the threat of substitutes such as 2-wheelers and public transport because of their price points. For example, the Tata Nano faces threat of substitutes by Motorbikes in India, especially for unmarried individuals, married without children and empty-nesters. The other threat to lower-end cars is Public Transport, primarily because of the limited spending capacity of the target customers of these products. Firms in Strategic Group B only face threat from substitutes such as Helicopters and Airplanes, the latter primarily for inter-city travel and the former for intra-city travel. The threat is low because of the scarcity of helipads in most parts of the world.

Threat of New Entrants

Threat of new entrants is low across the industry at a global level primarily because of the capital requirements for setting up of production facilities and distribution channels. The threat is low on a global level, but at a local level, threat in parts of the world is high. For example, in India, the threat of new entrants is at a medium level because of the absence of multiple global players. When these players decide to enter India, they can, and are willing to, spend Millions of dollars in setting up infrastructure to support their products. This is aided by a huge potential market for products of these firms, which are primarily members of Group A. Establishing of brands is also a very difficult task, especially for firms looking to enter Group B or Group C. Most firms in these groups have been present in the market for decades and have established their brands over years and years of existence and can hence charge a huge price tag for their offerings.

Group A: Hyundai, Ford, Chevrolet, Fiat, Volkswagen, Toyota, Renault etc.

Group B: Bentley, Rolls Royce, Ferrari, Maybach etc.

Group C: BMW, Daimler-Benz, Audi, Porsche, Nissan etc.

Group D: Maruti-Suzuki,Tata Motors, M&M, Skoda, Proton etc.

3.7 ORGANISATIONAL FIELD

For early neo-institutional theory, the central unit of analysis was variously referred to as the institutional field, societal sector and institutional environment. But the term organizational field has become the accepted term for the constellation of actors that comprise this central organizing unit.

An organizational field can be defined as a social area where organizations interact and take one another into account in their actions. Organizational fields contain organizations that have enduring relationships to each other. While these relationships can be cooperative or hierarchical, most fields have a power structure such that those organizations with the most resources dictate the rules of the game. Organizational fields are governed by shared rules and meanings. Rules define conventions that can be normative or consensual. Actors in organizations have cognitive frameworks that incorporate these shared cultural understandings of the rules and allow them to make sense of the behavior of other organizations in the field.

As studies of interorganizational relations evolved, scholars broadened the field to include organizations that were not necessarily bound by geography or goals, but instead made up a recognized area of institutional life. These could include organizations that produced similar services or products, suppliers, resources and product consumers, regulatory agencies, and others. What these organizations had in common was that they comprised a community or organizations that partook of a common meaning system and whose participants interacted more frequently and fatefully with one another that with other organizations focused on the organizational field as a means to understand the impact of rationalization on organizations.

Organizational field is defined as "sets of organizations that, in the aggregate, constitute a recognized area of institutional life; key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products"

Table 1: Theoretical Perspectives on Organizational Fields

Theoretical Perspective	Authors	Key Elements	Description
Field as the totality of relevant actors	DiMaggio; Powell	Signification and Relationship	Set of organizations sharing systems of common meanings and interacting more frequently among themselves than with actors from outside the field, thus constituting a recognized area of institutional life.
Field as a functionally specific arena	Scon; Meyer.	Social Function	Set of similar and different interdependent organizations that are operating in a functionally specific arena, technically and institutionally defined, in association will their exchange partners, sources of funding and regulatory bodies.
Field as a center of dialog and discussion	Hoffman; Zietsma; Winn.	Debate for Thematic Interest	Set of organizations, often with different purposes, that are recognized as participants in the same debate surrounding specific issues, plus those concerned with the reproduction of institutional practices or arrangements related to the matter.
Field as an arena of power and conflict	Vieira: Carvalho: Misoczky.	Domination and Power of Position	Field as a result of the dispute for its domination in a dynamic marked by [re] allocation of the resources of power of the actors and by their position in relation to other actors.
Field as an institutional sphere of disputed interests	Fligstein; Swedberg; Jepperson.	Power and Cognitive Structures	Constructions produced by power-holding organizations that influence the rules of interaction and dependence in the field owing to their interest which, in turn. are reflections of their position in the social structure.
Field as a structured network of relationships	Powell; White: Owen-Smith	Structural Articulation	Set formed by relational networks that are commonly integrated and intertwined, emerging as structured and structuring environments for organizations and individuals revealed from topological and structural cohesion studies.

Source: Specialized literature on organizational fields

3.8 CUSTOMER VALUE

Customer value is the benefit that a customer will get from a product or service in comparison with its cost. This benefit might be measured in monetary terms, such as when a product helps to save the customer money that would have been spent on something else. A benefit can be difficult to quantify, such as the enjoyment that a customer receives from a product or service. The term "customer value" should not be confused with the value of customers to businesses. It refers to the value that the customers receive, not to how valuable customers are.

Realization vs. Sacrifice

Some businesspeople explain customer value as realization compared with sacrifice. "Realization" is a formal term for what customers get out of their purchases. Sacrifice is what they pay for the product or service.

Measuring Value

A product or service can provide value in many ways. Along with helping a customer, save money or providing enjoyment, it also could save the consumer time, provide a benefit that could not be obtained without the product or increase the value of something the customer already owns. For example, if a self-employed woman buys a computer that allows her to save time doing tasks such as creating invoices, keeping records or managing a budget, she might be able to devote more time to the aspects of her business that make money. This could allow her to increase her monthly profits by more than the original cost of the computer, making it easy to identify the net value that she received from her investment of buying the computer.

Used by Businesses

Businesses of all sizes use customer value as part of a greater analysis to determine how well they are serving their customer base. Detailed research might include what customers generally do with the products they purchase or how they use services to increase the value of their assets, such as real estate or cars. Businesses also look at the prices of their products in comparison with the value that customers receive from them, in order to price them competitively and to maximize profits.

Promoting to Customers

When a business identifies the value of its products or services provided to customers, it might consider a customer value proposition. This basically is a promise of benefits to customers who buy the products or services. Examples of customer value propositions can be seen in advertising. Companies pinpoint the benefits that they believe customers will realize, and they display them in advertisements in the hope of attracting more customers. Laws that ensure truth in advertising make it illegal for companies to advertise greatly exaggerated or false customer values for their products or services.

Related Concepts

Along with the basic idea of customer value, other terms help to further define that value precisely. Relative performance identifies how a company's product or service provides customer value in comparison with that of competitors' products or services. Access cost is something that business analysts add as an estimated cost of the effort involved in a purchase. Value propositions often include these levels of detail to help managers look at how well a business is serving its intended audience.

Delivering value to customers is important to managers, leaders, and entrepreneurs alike. To be willing to pay, a customer must derive value from a market offer.

There are various interpretations of what is meant by customer value. The term may mean low price, receiving what is desired, receiving quality for what is paid, or receiving something in return for what is given (Zeithaml, 1988). Woodruff's (1997) definition of customer value is widely cited and encompasses most interpretations of customer value. Woodruff defines customer value as: "a customer perceived

preference for and evaluation of those products attributes, attribute performances, and consequences arising from use that facilitate (or block) achieving the customer's goals and purposes in use situations".

The definition above suggests that there are two aspects to customer value: desired value and perceived value. Desired value refers to what customers desire in a product or service. Perceived value is the benefit that a customer believes he or she received from a product after it was purchased.

Customer value can be examined at different levels. At a low level, customer value can be viewed as the attributes of a product that a customer perceives to receive value from. At a higher level, customer value can be viewed as the emotional payoff and achievement of a goal or desire. When customers derive value from a product, they derive value from the attributes of the product as well as from the attribute performance and the consequence of achieving desired goals from the use of the product (Woodruff, 1997).

An entrepreneurial firm must deliver value along the dimensions that matter most to its customers. For example, from a customer's perspective, the value of a cup of coffee enjoyed with a friend at a coffee shop might be greater than the value of a take-out cup of coffee. While the monetary cost of the cup of coffee in both cases might be the same, the value the customer extracts is different.

To develop compelling customer value propositions, a supplier needs to keep in mind the following:

1. There are two stages at which customers assess value: before and after they purchase a product or service.
2. Value is perceived at various levels; therefore, value needs be delivered at various levels.
3. Understanding what customers value is the first step in delivering customer value.

For a complete view on the customer value creation strategies that managers, entrepreneurs, and leaders can implement to help distinguish themselves from competitors, Smith and Colgate (2007) provide a comprehensive framework. However, the challenge for suppliers is not just recognizing what value to create or what the benefits are, but to operationalize customer-facing processes to deliver value to customers. Table 1 synthesizes views from the extant literature pool on customer value creation and delivery; it shows how entrepreneurs can use their understanding of customer value to their advantage.

Table 1. The customer value delivery process

Understanding of customer value concept	Actions that entrepreneurs can take	The entrepreneur's advantage
Points of value that matter to customers (Anderson et al., 2006).	Develop market offer based on points of value that matter to customers.	Create customer value proposition with a resonating focus (Anderson et al., 2006)
Dimensions along which value is perceived (Woodruff, 1997).	Identify opportunities for new value creation propositions (Smith and Colgate, 2007).	Compete based on points of value other than just cost.
Customer's desired needs change over time (Flint et al., 2002).	Observe customer environment to better understand changes in customer requirements.	Deliver value proactively by anticipating changes in customer's desired needs (Flint et al., 2002).
Customer feedback (Woodruff, 1997).	Combine existing organizational capabilities (market orientation, knowledge management, customer relationship management) (Landroguez et al., 2011).	Improve value proposition of existing products and services.

As an example application of the concepts in Table 1, consider an entrepreneur that has developed a new user interface for a point-of-sales system that can be used in a coffee shop. Although the entrepreneur might think that the software solution provides value to the customer (i.e., the coffee shop owner) in terms of cost or ease of use, the customer might consider the greatest point of value to be 24/7 technical support because the coffee shop is open overnight during examination periods on a university campus. In this particular case, processes relating to the first and second row of the Table could be implemented by an entrepreneur and they could showcase the technical support plan as a point of value that would resonate with the customer; instead of focusing on advantages that other competitors could also potentially deliver. Similarly, the third and fourth row of the Table could be used by entrepreneurs as a guideline to process customer value knowledge and anticipate changes in customer needs and improve existing value propositions.

Entrepreneurial firms focus their scarce resources on the dimensions of value (e.g., cost, use value, emotional value, social value) (Smith and Colgate, 2007) that most matter to customers and market their capabilities in terms that their customers can associate with and are known to value. However, delivering customer value is not a one-off event. Firms must continuously strive to better understand and anticipate what their customers will value and then keep delivering it. As Steve Jobs once said: "You can't just ask customers what they want and then try to give that to them. By the time you get it built, they'll want something new."

A customer value analysis allows a firm to understand how its customers experience value, and gain insight from its customers' decision making criteria and processes. It maps customer needs and objectives in terms of the customer's value chains; thus looking beyond end-user and decision maker needs and revealing the net total effect of the customer-vendor relationship on all of the customer's processes, costs and benefits.

Customer value and strategy

From a firm's perspective, customer value analysis is relevant for two important reasons. First, a number of strategy researchers have highlighted the need to account for changing customer perceptions and expectations in devising firm strategy (e.g., Prahalad and Hamel, 1994; Slater and Narver, 1998). Specifically, Porter (1985), in discussing a firm's goal in using differentiation as a competitive advantage, has introduced the notion of a "buyer's value chain" (as contrasted from that of a firm).

This value chain represents the factors and activities that are important from the point of view of buyers as they begin to derive value from the products and services they buy. Moreover, according to the author, the success of a firm's differentiation strategy depends on the extent to which the firm's value chain relates to the buyers' one. Importantly, the value chain for a buyer extends from their broad notions of performance and cost into more concrete and measurable characteristics (called "purchase criteria" by Porter) that firms can identify in their offerings. This idea is similar to a means-end chain (e.g., Zeithaml 1988) where buyer-perceived performance or quality is developed as a second-order phenomenon from their perceptions of "objective" (intrinsic and extrinsic) attributes of a firm's offering. The CVA methodology is well-suited to identify and calibrate the effects of the "lower-level" attributes on overall buyer-perceived value.

The second reason why customer value should be of interest to strategy researchers and practitioners is the positive economic consequences that it has for firms. There is now an increasing body of evidence that establishes that firms that deliver superior value secure loyal customers and, in turn, reap favorable firm-level outcomes in terms of higher revenues, lower churn, and less overhead costs (see Reichheld, 1996). At the individual buyer level, these studies have shown that value (mediated through loyalty) results in increased purchases, increased cross-buying, increased wordof-mouth referrals, and less returns. Likewise, in the strategy literature, Nayyar (1995) finds that changes in a firm's customer service level are positively associated with stock market reactions.

Thus, customer service increases result in higher market valuation and vice versa. Although, Nayyar does not explicitly focus on customer value, clearly customer service is one of the value-creating activities that a firm may implement.

3.9 GAP ANALYSIS

A strategy gap refers to the gap between the current performance of an organisation and its desired performance as expressed in its mission, objectives, goals and the strategy for achieving them.

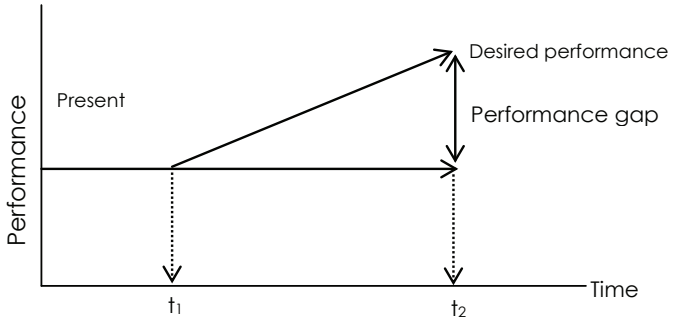
Often unseen, the strategy gap is a threat to the future performance—and even survival—of an organisation and is guaranteed to impact upon the efficiency and effectiveness of senior executives and their management teams. The strategy gap is considered to be real and exists within most organisations. An article in the "Fortune magazine" (June 1999 edition) stated that some 70% of CEOs' failures were the result of poor execution rather than poor strategies.

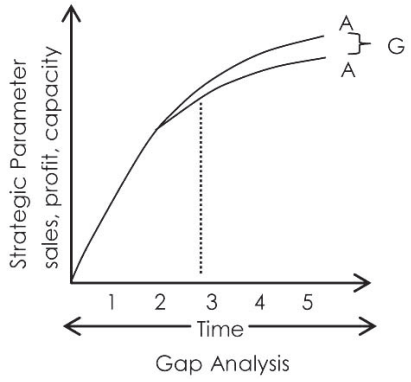
There are various schools of thought on what causes the gap between vision and execution, and how the strategy gap might be avoided. In 2005, Paul R. Niven, a thought leader in Performance Management Systems, pinpointed four sources for the gap between strategy and execution, namely: lack of vision; people; management; and, resources. He argued that few understand the organisation's strategy and as most employees' pay is linked to short-term financial results, maximising short-term gains becomes the foremost priority which leads to less rational decision making. Management is spending little attention to the linkage between strategy and financial planning. Unless the strategic initiatives are properly funded and resourced, their failure is virtually assured.

Gap analysis is the process of identifying the gap between the optimized allocation and integration of inputs and the current level of allocation. Gap analysis done by comparing current level of performance of the organization or SBU with the previously set goals. The gap analysis process involves determining, documenting and approving the variance between business requirements and current capabilities. When the current performance does not meet the predetermined objectives, a firm must select a strategy to reduce gap. This analysis provide insight into areas that have opportunities for improvement. While performing gap analysis, the attention is focused on the gap between actual or anticipated values and the most desirable values expected to attain. This will help in formulation of suitable strategies to close the gap.

Performance gap means the inability of the strategy adopted to give the desired results. To bridge this gap the management must strive hard for new strategies.

Gap analysis is defined as a technique which attempts to analyze the gap between targets and expected results by identifying the extent of the strategic task and its ways in which the gap might be closed. Here firm's strengths, weakness, environmental opportunities and threats are assessed and possible actions (such as expansion of production, merge with another company etc.) are reviewed. Selections of alternative strategies depend on how wide or narrow the gap, what are its importance and the possibility of its being reduced. Where the gap is narrow, stability strategies would seem to be a feasible alternative. If the gap is large, due to expected environmental opportunities, expansion strategies are more suitable. If it is large due to past and expected bad performance, retrenchment strategies may be more suitable.





Gap analysis will cover the planning period, year by year and the size of the gap will vary over time. Typically the size of gap will grow larger overtime.

When gaps are found, the manager has three alternative courses of action :

1. Redefine the objectives: The first thing to do when a discrepancy between objectives and forecast is found is to check that the objectives are realistic and achievable. It objectives has deliberately been set at a very high level to stimulate action, it is usually advisable to set less high intermediate objectives.
2. Do nothing : This option is under-utilised by the manager, but should always be considered.
3. Change the strategy : When a gap is found between objectives and forecast and the first two options have been considered and rejected, the only alternative is to change the current strategy and develop a new one.

Before managers make decision to change strategies the following conditions must exist:

(a) A gap must exist between the existing and desired state of affairs.

(b) The gap must be large enough to be noticed, and must be seen as worthy of attention.

(c) The organization must be motivated to reduce the gap.

(d) The management of the firm must believe that there is something that can be done to reduce the gap.

Stages in Gap Analysis

The stages in the diagnosis of gap analysis are:

(a) Identify the current strategy. What are the assumptions or predictions about the environment on which current strategy is based?

(b) Predict the future environment. Are the assumptions or predictions the same? Is there a gap?

(c) Assess the significance of the gap between the current and future environments tor the firm. Are changes in objective needed? Do changes in strategy appear useful to consider? Will they reduce the gap?

A variety of gaps can be analyzed. These includes :

(1) Performance gap : The gap between expected performance and actual performance is performance gap. It can be grouped as

   (i) Improvement gap – It is the gap that can be reduced by improving current activities.

   (ii) Expansion gap – It is the gap that can be reduced by expanding the present activities within the present setup and resources.

   (iii) Diversification gap – It is the gap that can be reduced by diversifying the product line, that is, by adding new product.

   In situations where the causes of performance are spread throughout the organization, gap analysis may be most appropriate technique for evaluating alternative strategies. However, portfolio analysis may be useful in tracing the overall poor performance to a particular portion of the business.

   The business firms may take the following strategic actions to reduce or close performance gaps:

   (a) Changing strategic plans for current business units.

   (b) Adding units to the business portfolio.

(c) Deleting business units that are performing poorly.

(d) Improve business climate and alter conditions for the poor performance.

(e) Reducing corporate performance objectives if they are unrealistic.

(2) Product / market gap : The gap between actual sales and sales potential is known as product / market gap. Here actual sales is measured from sales data for a given period of time. Industry market potential = total number of relevant customer x (number of use occasions per relevant customer in a given time period). Relevant customers are people who actually use the product.

(i) Product line gap – The gap arising out of an incomplete product of service line.

(ii) Distribution gap – Here product is available but due to faulty distribution the product is not available to the consumer.

(iii) Usage gap – Gap arising out of lack of usage of the existence product / service.

(iv) Competitive gap – When the customers are buying the product offered by the competitor instead of the company under consideration.

(3) Profit gap : Gap between target profit and actual profit. The company sets objectives for a future period of time, say five years, and then works backward to find out where it can reach through present level of efforts. By analyzing the difference between the projected and desired performance, a gap could be found. While conducting gap analysis, a comparison of forecasted profit of the whole organization with the desired level of profit as expected by the shareholders is made.

The identified gap in between them is called 'planning gap which is divided into the following four elements:

(a) Product-line Gap - this portion of gap is due to each product in the full product line.

(b) Distribution Gap - this portion of gap is caused due inadequate distribution system.

(c) Usage Gap - this portion of gap is mainly caused due to less usage of the products/services than expected.

(d) Competitive Gap - this portion of gap is caused by sales lost to competitors due to inefficient marketing management.

For each of the above gaps, a distinct set of strategies to be evolved to reduce the overall gap. The gap analysis requires the review of the following:

(a) Environmental position

(b) Functional level strategies

(c) Business level strategies

(d) Corporate level strategies

(4) Man power gap : Gap between required number and qualities of human resource and actual strength of human resource.

Strategies to close the gap would include :

(i) New product development strategies or new market development strategies.

(ii) A strategy of product and market diversification through a takeover policy.

(iii) A marketing-mix strategy, to gain the required position in target markets.

3.10 LINKAGES

To better understand the activities through which a firm develops a competitive advantage and creates shareholder value, it is useful to separate the business system into a series of value-generating activities referred to as the value chain. In his 1985 book Competitive Advantage, Michael Porter introduced a generic value chain model that comprises a sequence of activities found to be common to a wide range of firms.

Value chain activities are not isolated from one another. Rather, one value chain activity often affects the cost or performance of other ones. Linkages may exist between primary activities and also between primary and support activities.

Consider the case in which the design of a product is changed in order to reduce manufacturing costs. Suppose that inadvertently the new product design results in increased service costs; the cost reduction could be less than anticipated and even worse, there could be a net cost increase.

Sometimes however, the firm may be able to reduce cost in one activity and consequently enjoy a cost reduction in another, such as when a design change simultaneously reduces manufacturing costs and improves reliability so that the service costs also are reduced. Through such improvements the firm has the potential to develop a competitive advantage.

Analyzing Business Unit Interrelationships

Interrelationships among business units form the basis for a horizontal strategy. Such business unit interrelationships can be identified by a value chain analysis.

Tangible interrelationships offer direct opportunities to create a synergy among business units. For example, if multiple business units require a particular raw material, the procurement of that material can be shared among the business units. This sharing of the procurement activity can result in cost reduction. Such interrelationships may exist simultaneously in multiple value chain activities.

Unfortunately, attempts to achieve synergy from the interrelationships among different business units often fall short of expectations due to unanticipated drawbacks. The cost of coordination, the cost of reduced flexibility, and organizational practicalities should be analyzed when devising a strategy to reap the benefits of the synergies.

Outsourcing Value Chain Activities

A firm may specialize in one or more value chain activities and outsource the rest. The extent to which a firm performs upstream and downstream activities is described by its degree of vertical integration.

A thorough value chain analysis can illuminate the business system to facilitate outsourcing decisions. To decide which activities to outsource, managers must understand the firm's strengths and weaknesses in each activity, both in terms of cost and ability to differentiate. Managers may consider the following when selecting activities to outsource:

- Whether the activity can be performed cheaper or better by suppliers.
- Whether the activity is one of the firm's core competencies from which stems a cost advantage or product differentiation.
- The risk of performing the activity in-house. If the activity relies on fast-changing technology or the product is sold in a rapidly-changing market, it may be advantageous to outsource the activity in order to maintain flexibility and avoid the risk of investing in specialized assets.
- Whether the outsourcing of an activity can result in business process improvements such as reduced lead time, higher flexibility, reduced inventory, etc.

The Value Chain System

A firm's value chain is part of a larger system that includes the value chains of upstream suppliers and downstream channels and customers. Porter calls this series of value chains the value system, shown conceptually below:

The Value System

... > Supplier Value Chain > Firm Value Chain > Channel Value Chain > Buyer Value Chain

Linkages exist not only in a firm's value chain, but also between value chains. While a firm exhibiting a high degree of vertical integration is poised to better coordinate upstream and downstream activities, a firm having a lesser degree of vertical integration nonetheless can forge agreements with suppliers and channel partners to achieve better coordination. For example, an auto manufacturer may have its suppliers set up facilities in close proximity in order to minimize transport costs and reduce parts inventories. Clearly, a firm's success in developing and sustaining a competitive advantage depends not only on its own value chain, but on its ability to manage the value system of which it is a part.

Identify the links among processes.

While individual value activities are considered separate and discrete, they are not necessarily independent. Most activities within a value chain are interdependent. Firms must not overlook value chain linkages among interdependent activities that may impact their total cost. For example, cost improvement programs in one value chain process may lower or increase costs and/or revenues in other processes. Transfers of goods and services from one value chain process to another increases cost. Eliminating these transfers reduces the costs of purchasing, invoicing and other recordkeeping functions.

Tandem Computers eliminated its costs of purchase orders, invoicing and other functions by jointly developing a detailed bar code process with its suppliers. By improving its upstream design and engineering processes for the Taurus, Ford saved on downstream production and customer service costs. Using fewer floppy drives and motherboards in its PCs has enabled IBM to halve its delivered cost in two years.

As sources of competitive advantage, these relationships or linkages among activities can be as important as the activities themselves. Such linkages may also offer sustainable competitive advantage, because their subtle, complex nature makes them difficult for competitors to imitate.

3.11 BENCHMARKING

Definition and Meaning

Dictionary defines a benchmark as "a standard or a point of reference against which things may be compared and by which something can be measured or judged".

Benchmarking is defined "as the continuous, systematic process of measuring one's output and/or work processes against the toughest competitors or those recognized best in the industry."

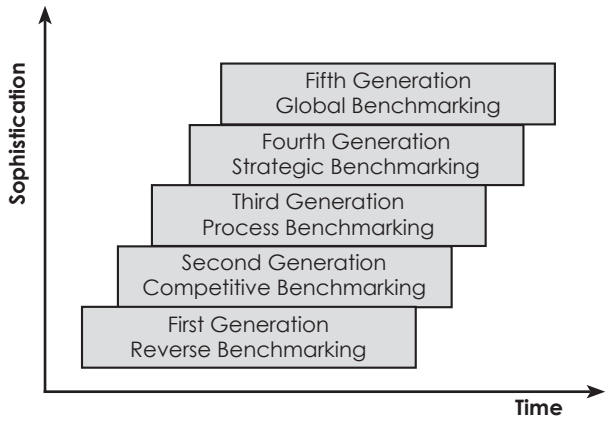
Benchmarking is an approach of setting goals and measuring productivity based on best industry practices. Benchmarking helps in improving performance by learning from best practices and the processes by which they are achieved. It involves regularly comparing different aspects of performance with the best practices, identifying gaps and finding out novel methods to not only reduce the gaps but to improve the situations so that the gaps are positive for the organization. Benchmarking is periodical exercise for continuous improvement within the organization so that the organization does not lag behind in the dynamic business environment.

Benchmarking should not be treated as just comparison. It is necessary to have a point of reference to know how well one is doing. In a business environment with cut-throat competition it is necessary to gain edge over their competitors. Benchmarking helps organization to get ahead of competition.

Comparing the results with a competitor helps the management to get a goal that is both desirable and achievable but provides no clue on how the goals are to be achieved. It is a comparison of work progress that tells us how the competitor follows a process which produce outstanding results and this is the essence of benchmarking.

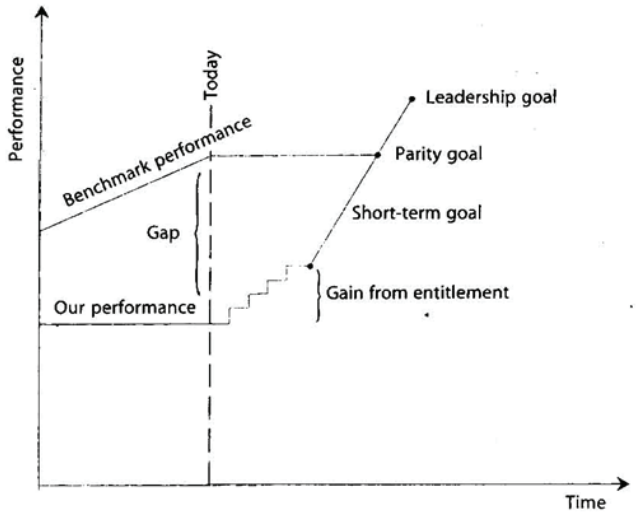
Evolution of Benchmarking Concept

Benchmarking is a systematic and continuous measurement process. It is a process of measuring and comparing an organization's business processes against business process leaders anywhere in the world, to gain information which will help the organization to improve its performance. It is basically a quality practice. Companies choose to benchmark excellent companies whose business processes are analogous to their own. Benchmarking identifies practices that have enabled the successful company's superior performance and that can be adopted to the benchmarking company's business. This process results in two types of outputs; benchmarks or measures of comparative performance, and enables or practices that lead to exceptional performance. Often, benchmarking has been equated to copying or imitating and it is said that benchmarking is 'stealing shamelessly'. Benchmarking was originated in Japan during the early 1960s due to the Japanese curiosity and fondness for imitation. Benchmarking has evolved through a process which has resembled the classic 'art-transitioning-to-science' model for the emergence of new management discipline.



The above Figure reveals the evaluation from first generation reverse engineering to the fifth generation global benchmarking which is in the emergent stage. The benchmarking practice has started with product-oriented reverse engineering or competitive product analysis. The former involved a tear-down and evaluation of technical product characteristics. While the later was market-oriented and evaluate the relative capabilities of the competitive product offerings. Strategic benchmarking is similar to process benchmarking in nature but differs in scope and depth. It involves a systematic process by which a company identifies and evaluates alternatives, implements strategies and improves overall performance levels by incorporating successful strategies from companies engaged with it in a strategic alliance. The issues addressed in this process include building core competence to sustain competitive advantage, targeting specific shifts in strategy -such as entering a new market or developing a new product, making acquisition and creating a learning and adaptive organization. The future generation will be in global benchmarking through which distinctions in international culture, business processes and trade practices across companies are bridged and their ramifications for business process improvements are understood and utilized. The benchmarking process involves the identification and closing of the benchmarking gap shown in the figure below.

Methodology in Implementation



The following methodology is used in successful implementation of benchmarking program:

Identification of Need to Benchmark -This step will define the objectives of the benchmarking exercise. It will also involve selecting the type of benchmarking. Organizations identify realistic opportunities for improvements.

Identification of Areas to Benchmark - Benchmarking is a must for the few critical process such as product development, customer service, inventory control, asset base, profitability, shareholder value etc. To work properly this should commence by identifying the outcomes which drive the profits, sales and costs of the business. Factors which might be considered are:

(a) Activities which generate the greatest costs

(b) Process which have been subject to customer complaints

(c) Processes essential to delivering the firm's competitive advantage

Understanding Existing Process - This step will involve compiling information and data on performance. This will include mapping of existing processes. Information and data is collected by different methods for example, interviews, visits, observation and filling of questionnaires.

Identification Best Process -Within the selected framework, best processes are identified. These may be within the organization or outside the organization.

Senior Managers Commitment -To ensure that the program enjoys the cooperation and commitment of senior managers, they should be informed of:

(a) the objectives and benefits of benchmarking

(b) the likely costs of the program

(c) the possibility that sensitive data may be revealed to outside organizations

(d) the long-term nature of benchmarking program and its expected benefits to the organization

Understanding the Benchmarking Process - Before the benchmarking process put to implementation it should be discussed with process managers, operative staff, customers and suppliers.

Development of Appropriate Measures - The benchmarking team should study the whole organization and its subunits and then document the activities and problems.

Monitor Process Measurement System - For successful implementation of benchmarking program, proper monitor and control system should be developed. It requires the reliable data capture and management information system.

Selection of Appropriate Organization to Benchmark Against - The purpose of benchmarking is to help management understand how will the firm is carrying out its activities and how its performance compares with competitors and with other organizations who carry out similar operations.

Obtain and Analyze Data -The level of process performance and the trends revealed by these measures are used to establish an internal baseline for comparison with external process. The two sets of figures are compared, lessons are learnt (indicated by benchmarks), enablers are identified and adopted to suit the requirements.

Development of Benchmarking Program - Differences in the operating environment should be discussed with the senior management, and operating staff. Benchmarking is not a process of pinpointing mistakes but it is a process of organizational improvement through identification and closing of benchmarking gap.

Evaluation of Results -The benchmark firm will need to monitor the success of its improvement strategies. Organizations evaluate the results of the benchmarking process in terms of improvements vis-a-vis objectives and other criteria set for the purpose. It is also periodically evaluates and reset the benchmarks in the light of changes in the conditions that impact the performance.

Types of Benchmarking

Internal Benchmarking - It involves looking within the organization to determine other departments, locations and projects which have similar activities and then defining the best practices amongst them. It involves seeking partners from within the same organization. For example, from business units located in different areas. The main advantages of internal benchmarking are that access to sensitive data and information are easier; standardized data is often readily available; and usually less time and resources are needed. There maybe fewer barriers to implementation as practices maybe relatively easy to transfer across the same organization. However real innovation may be lacking and best in class performance is more likely to be found through external benchmarking.

External Benchmarking - External benchmarking involves seeking help of outside organizations that are known to be best in class. External benchmarking provides opportunities of learning from those who are at the leading edge, although it must be remembered that not every best practice solution can be transferred to others. In addition, this type of benchmarking may take up more time and resource to ensure the comparability of data and information, the credibility of the findings and the development of sound recommendations.

Generic Benchmarking - Generic benchmarking involves comparing with organizations that have similar processes. It involves the comparison of an organization's critical business processes and operations against best practice organization that performs similar work or deliver similar services. For example, how do best practice organization process customers orders. It extends the benchmarking process outside the organization and its industry to get inspiration from organizations in dissimilar industry.

Functional Benchmarking- This type of benchmarking is used when organizations look to benchmark with partners drawn from different business sectors or areas of activity to find ways of improving similar functions or work processes. This sort of benchmarking can lead to innovation and dramatic improvements.

Competitive Benchmarking - It involves examining the products, services and processes of competitors and then comparing them with their own. It involves the comparison of competitors' products, process and business results with own. It requires that the company perform a detailed analysis of its competitors' products, services, and processes. Benchmarking partners are drawn from the same sector. However to protect confidentiality it is common for the companies to undertake this type of benchmarking through trade associations or third parties.

Compatible Industry Benchmarking - Compatible industry will include those companies that are not directly competing for the same customer. It make comparisons within A general industry category. For example, a company, which is manufacturing automobile spare parts, compares itself with another company which is manufacturing automobile accessories.

Strategic Benchmarking - It is similar to the process benchmarking in nature but differed in its scope and depth. It involves a systematic process by which a company seeks to improve their overall performance by examining the long-term strategies. It involves comparing high-level aspects such as developing new products and services, core competencies etc.

Global Benchmarking - It is a benchmarking through which distinction in international culture, business processes and trade practices across companies are bridged and their ramification for business process improvement are understood and utilized. Globalization and advances in information technology leads to use this type of benchmarking.

Merits and Demerits of Benchmarking

Merits

The important merits of benchmarking are summarized as follows:

(a) It increases customer satisfaction.

(b) It leads to significant cost savings and improvements in products and services.

(c) It helps in improving strategic planning by providing assessment of strengths and weaknesses of current process.

Demerits

(a) It increases the diversity of information which must be monitored by management. This increases the potential for information overload.

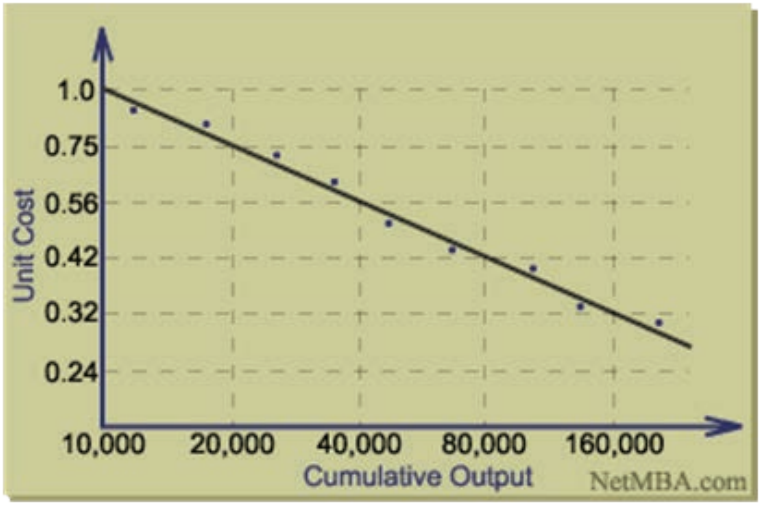
(b) It may reduce managerial motivation if they are compared with a better resourced rival.

(c) There is a danger that confidentiality of data will be compromised.

(d) It encourages management to focus on increasing the efficiency of their existing business instead of developing new lines of business. As one writely put it: Benchmarking is the refuge of the manager who's afraid of the future.

(e) Successful benchmarking firms may find that they are later overloaded with requests for information form much less able firms whom they can learn little.

The Experience Curve



The ultimate goal of any company is to achieve competitive advantage in the marketplace. A key component in a company's effort to achieve this advantage is to increase the experience it has in its particular field or domain. This experience can come with time, by hiring experienced staff, or by acquiring / partnering with other organizations.

While "experience" is a relatively qualitative term, its impact has been quantified: costs tend to decrease by 20-30% as a company's "experience" in delivering a specific product or service is doubled.

The foundation for this key concept of business strategy is the Experience Curve. The Experience Curve helps to explain many issues top of mind for senior management in a company: evolution of costs associated with a product, drivers of change in product lifecycles, and variations in market share and position.

As a result, understanding what the Experience Curve is (and is not) can help management to evaluate the overall performance of the company it is running, evaluate potential behaviour of its competitors, and can play a role in determining its pricing strategy.

In the 1960's, management consultants at The Boston Consulting Group observed a consistent relationship between the cost of production and the cumulative production quantity (total quantity produced from the first unit to the last). Data revealed that the real value-added production cost declined by 20 to 30 percent for each doubling of cumulative production quantity:

The Experience Curve

The vertical axis of this logarithmic graph is the real unit cost of adding value, adjusted for inflation. It includes the cost that the firm incurs to add value to the starting materials, but excludes the cost of those materials themselves, which are subject the experience curves of their suppliers.

Note that the experience curve differs from the learning curve. The learning curve describes the observed reduction in the number of required direct labor hours as workers learn their jobs. The experience curve by contrast applies not only to labor intensive situations, but also to process oriented ones.

The experience curve relationship holds over a wide range industries. In fact, its absence would be considered by some to be a sign of possible mismanagement. Cases in which the experience curve is not observed sometimes involve the withholding of capital investment, for example, to increase short-term ROI. The experience curve can be explained by a combination of learning (the learning curve), specialization, scale, and investment.

Implications for Strategy

The experience curve has important strategic implications. If a firm is able to gain market share over its competitors, it can develop a cost advantage. Penetration pricing strategies and a significant investment in advertising, sales personnel, production capacity, etc. can be justified to increase market share and gain a competitive advantage.

When evaluating strategies based on the experience curve, a firm must consider the reaction of competitors who also understand the concept. Some potential pitfalls include:

- The fallacy of composition holds: if all other firms equally pursue the strategy, then none will increase market share and will suffer losses from over-capacity and low prices. The more competitors that pursue the strategy, the higher the cost of gaining a given market share and the lower the return on investment.
- Competing firms may be able to discover the leading firm's proprietary methods and replicate the cost reductions without having made the large investment to gain experience.
- New technologies may create a new experience curve. Entrants building new plants may be able to take advantage of the latest technologies that offer a cost advantage over the older plants of the leading firm.

As the experience curve has been observed over almost all industries, it has important strategic implications. In particular, should a firm obtain more market share than any of its competitors; it will produce more units, hence gaining greater experience effects and ultimately a cost advantage. This provides additional support to the use of penetration pricing and mass production strategies, as well as significant marketing investments in the early stages of a product, to maximise its demand and hence benefit from rapid experience effects.

However, when a company plans to use the experience curve in developing its strategy, it needs to consider potential competitor reactions to this. For example, if all firms follow a penetration strategy no one will gain market share and will only be able to sell a few more units as the market grows. As such, there will only be a small experience effect, which will be outweighed by the excessive production levels and low prices. In addition, if technology diffusion rates are high in the industry, competitors may benefit from some of the company's experience effects without having to make the same level of investment, thus maintaining a similar cost base. Finally, new technologies may effectively start a whole new experience curve starting from a lower initial cost. As such, new entrants who embrace the new technology may obtain a cost advantage over more experienced incumbents using older technologies.

APPLICATIONS AND USES

There are three general areas for the application and use of experience curves; strategic, internal, and external to the organization. Strategic uses include determining volume-cost changes, estimating new product start-up costs, and pricing of new products. Internal applications include developing labor standards, scheduling, budgeting, and make-or-buy decisions. External uses are supplier scheduling, cash flow budgeting, and estimating purchase costs. The usefulness of experience and learning curves depends on a number of factors; the frequency of product innovation, the amount of direct labor versus machine-paced output, and the amount of advanced planning of methods and tooling. All lead to a predictable rate of reduction in throughput time.

Knowledge on the practical application of experience curves and learning curves has increased greatly since 1936. Interest was renewed in the early 1990s with the publication of The Fifth Discipline by Peter Senge. Senge melded theories on mental models, the systems approach, and learning curves in a way that made sense for executives.

These curves offer potential competitive advantage to managers who can capitalize on the cost reductions they offer. The experience and learning curves rely, however, on keeping the knowledge gained within their organization. Given rapid communication, high manager and engineer turnover, and skills in reverse engineering, this is harder to accomplish with each passing year. However, Hatch and Dyer found that in the case of the semiconductor manufacturing industry, in particular, skills acquired in one firm are not necessarily effectively transferable to another firm since knowledge is specific to the original work environment. Therefore, even if the employee is hired away, there is limited threat to the original firm.

Hatch and Dyer conclude that to truly maintain an advantage over the competition, firms must employ effective human resource selection, training, and deployment processes that facilitate learning by doing. Those firms that meet this challenge may enjoy the only truly sustainable advantage ability to learn (and improve) faster than competitors. As manufacturing and service product lives become shorter, management must be keenly on top of experience and learning curves to continue to enjoy the advantages.

Study Note - 4

STRATEGIC CHOICE

This Study Note includes

4.1 STRATEGIC CHOICE

At the root of all strategy lies the ability to make good choices. A company's strategy is defined by the multiple and varied choices it makes—choices about when and where to compete and how to win in the businesses it has chosen. For the most part the primary strategic choices that a company makes are exclusive. That is, a decision to go in one direction precludes setting off in another. A decision to stay focused on the North American market, for example, precludes becoming a truly global firm, while a decision to continue to sell through an existing distribution channel precludes a new initiative that takes the product directly to the consumer.

Orginsations continually face the challenge of exercising choice among alternatives. Choice is an inalienable part of the decision-making process. Bajaj and Allianz, both must have faced the choice of picking up a business partner from the several available. They ended up choosing each other, creating Bajaj Allianz. That level of choice is what is called a strategic choice. It is strategic as it is for keeps, involves a lot of commitment from either side and affects the future of both the organizations. Naturally, a lot of analysis goes into making a strategic choice. An organization has to look inwards, outwards and sideways before taking a leap into the unknown. Once on the course, things often happens that were not foreseen. An organization has to be prepared with contingency strategies for the anonymous possibilities.

Strategic choice may be defined as "the decision to select from among the grand strategies considered, the strategy which will best meet the enterprise's objectives. The decision involves focusing on a few alternatives, considering the selection factors, evaluating the alternatives against these criteria and making the actual choice."

Process of Strategic Choice

The process of strategic choice is essentially a decision-making process. The decision-making process consists of setting objectives, generating alternatives, choosing one or more alternatives that will help the organisation achieve its objectives in the best possible manner and finally, implementing the

chosen alternative. For making a choice from among the alternatives, a decision maker has to set certain criteria on which to accept or reject alternatives. These criteria are the selection factors. They act as guides to decision making and considerably simplify the process of selection, which otherwise would be a very difficult task.

There are four steps in the process of strategic choice as enumerated below:

1. Focusing on strategic alternatives
2. Analysing the strategic alternatives
3. Evaluating the strategic alternatives
4. Choosing from among the strategic alternatives

These four steps in the process of strategic choice are described further.

Focusing on Strategic Alternatives

The aim of focusing on a few strategic alternatives is to narrow down the choice to a manageable number of feasible strategies. Theoretically, it is possible to consider all the alternatives. On the other hand, a decision maker would, in practice, limit the choice to a few alternatives. Such a situation frequently poses a dilemma before the decision maker: considering too many alternatives would make the process unwieldy and unproductive; but if only a few alternatives are considered, the decision maker may ignore others which should have been considered. For resolving this dilemma, a decision maker has to focus on a reasonable number of alternatives. It is still difficult to tell what that 'reasonable' number would be.

Focusing on alternatives could be done by visualising the future state and working backwards. This is done through gap analysis. A company sets objectives for a future period of time, say three to five years and then works backward to find out where it can reach through the present level of efforts. By analysing the difference between the projected and desired performance, a gap could be found.

At the corporate level, the strategic alternatives are four: expansion, stability, retrenchment and combination. Where the gap is narrow, stability strategies would seem to be a feasible alternative. If the gap is large, due to expected environmental opportunities, expansion strategies are more likely. If it is large due to past and expected bad performance, retrenchment strategies may be more suitable. In a complex scenario where multiple reasons are responsible for the gap, combination strategies are likely.

At the business level, organisations need to think of alternative ways of competing. The choice is essentially between positioning the business as being low-cost, differentiated or focused. Organisations need to understand the conditions in the industry and weigh carefully, the risks and benefits of each competitive positioning before making a choice. In practice, the choice leads to a situation of dynamic competitive positioning where low-cost and differentiation are not discrete positions, but lie on a continuum.

Analysing the Strategic Alternatives

Narrowing down the strategic choice should lead to a few feasible alternatives. These alternatives have to be subjected to a thorough analysis. Such an analysis has to rely on certain factors. These factors are termed as selection factors. They determine the criteria on the basis of which the evaluation of strategic alternatives can take place.

The selection factors can be broadly divided into two groups: the objective and the subjective factors. Objectives factors are based on analytical techniques and are hard facts or data used to facilitate a strategic choice. They could also be termed as rational, normative or prescriptive factors. An example of an objective factor for selection is the market share, expressed as a per cent of the total market share of a company's business in its industry. Subjective factors, on the other hand, are based on one's personal judgement, collective or descriptive factors. An example of a subjective factor is the

perception of the company's top management regarding the prospects of the business in the next 2-3 years. The alternatives that are generated in the first step have to be subjected to analysis on the basis of these selection factors.

Evaluating the Strategic Alternatives

Selection factors are the criteria on the basis of which a final choice of strategy has to be made. Narrowing the choice leads to a few alternatives, each one of which has to be evaluated for its capability to help the organisation achieve its objectives. Evaluation of strategic alternatives basically involves bringing together the analysis done on the basis of the objective and subjective factors. Successive iterative steps of analysing the different alternatives on the basis of selection factors, lie at the heart of such an evaluation. There is no set procedure and strategists may use any approach which suits the circumstances. What is important to observe is that if we consider only the objective or subjective factors, it does not help in evaluation. Both the factors have to be considered together. How this is done is of considerable interest to management researchers and academicians.

Choosing from among the Strategic Alternatives

The evaluation of strategic choice should lead to a clear assessment of which alternative is the most suitable under the existing conditions. The final step is, therefore, of making the strategic choice. One or more strategies have to be chosen for implementation. A blueprint has to be made that will describe the strategies and the conditions under which they would operate. Besides the chosen strategies, some contingency strategies would also have to be devised.

4.2 CORPORATE LEVEL STRATEGY

Corporate level strategy is the top management plan to direct and run the enterprise as a whole. It represents the pattern of industrial actions and goal underlying the organisation's strategic interest in different business, divisions, product lines, customer groups, technologies etc. Corporate strategy emphasises upon the fact that how one should manage the scope of the various activities and how the resources should be allocated over the different activities. The corporate level strategy is based on the environmental factors and internal capabilities of the organisation as a whole.

Important characteristics of corporate-level strategy -

(i) The corporate level strategy is formulated by the top management of the organization.

(ii) It is formulated on the basis of a clear and collective point of view about the future.

(iii) The corporate level strategy defines the overall direction of the organisation and the broad boundaries based on which the business unit strategy and functional strategy are formulated.

(iv) It is formulated on the basis of an analysis of available resources on the one hand and environmental opportunities on the other.

(v) The corporate level strategy deals with decision relating to the two-way flow of resources and information between corporate level and product/service lines and businesses. This is done through a coordination mechanism formulated by the top management with inputs from top management of SBUs.

(vi) It is applicable for a long period of time.

Corporate-level strategies (or simply, corporate strategies) are basically about decisions related to:

- allocating resources among the different businesses of a firm
- transferring resources from one set of businesses to others and
- managing and nurturing a portfolio of businesses.

These decisions are taken so that the overall corporate objectives are achieved.

Corporate strategies help to exercise the choice of direction that an organisation adopts. There could be small business firm involved in a single business or a large, complex and diversified conglomerate with several different businesses. The corporate strategy in both these cases would be about the basic direction of the firm as a whole. In the case of the small firm having a single business, it could mean the adoption of courses of action that yield better profitability for the firm. In the case of the large, multi-business firm, the corporate strategy would also be about managing the various businesses for maximising their contribution to the overall corporate objectives and transferring resources from one set of business to others.

Abell has suggested defining a business along the three dimensions of customer groups, customer functions and alternative technologies. The business definition for a small firm would be simple while that for a large firm, it would be quite complex. A large firm would consist of several businesses, each of which could be defined in terms of these three dimensions.

The complexity of large firms arises from the fact that each of its businesses, defined along the three dimensions, result in a variety of customer groups, customer functions and alternative technologies that a firm is involved with. It is therefore common to find multi-business firms with interests in serving a diverse base of customer groups, performing for them a variety of customer functions, and making use of a range several different technologies.An analysis based on business definition provides a set of strategic alternatives that an organisation can consider. 'Strategic alternatives revolve around the question of whether to continue or change the business the enterprise is currently in or improve the efficiency and effectiveness with which the firm achieves corporate objectives in its chosen business sector'. According to Glueck, there are four strategic alternatives: expansion, stability, retrenchment and any combination of these three.

Expansion Strategies

Every enterprise seeks growth as its long-term goal to avoid annihilation in a relentless and ruthless competitive environment. Growth offers ample opportunities to everyone in the organization and is crucial for the survival of the enterprise. However, this is possible only when fundamental conditions of expansion have been met. Expansion strategies are designed to allow enterprises to maintain their competitive position in rapidly growing national and international markets. Hence to successfully compete, survive and flourish, an enterprise has to pursue an expansion strategy. Expansion strategy is an important strategic option, which enterprises follow to fulfill their long-term growth objectives. They pursue it to gain significant growth as opposed to incremental growth envisaged in stability strategy. Expansion strategy is adopted to accelerate the rate of growth of sales, profits and market share faster by entering new markets, acquiring new resources, developing new technologies and creating new managerial capabilities.

Expansion strategy provides a blueprint for business enterprises to achieve their long term growth objectives. It allows them to maintain their competitive advantage even in the advanced stages of product and market evolution. Growth offers economies of scale and scope to an organization, which reduce operating costs and improve earnings. Apart from these advantages the organization gains a greater control over the immediate environment because of its size. This influence is crucial for survival in mature markets where competitors aggressively defend their market shares.

Conditions for Opting for Expansion Strategy

Firms opt for expansion strategy under the following circumstances:

1. When the firm has lofty growth objectives and desires fast and continuous growth in assets, income and profits. Expansion through diversification would be especially useful to firms that are eager to achieve large and rapid growth since it involves exploiting new opportunities outside the domain of current operations.

2. When enormous new opportunities are emerging in the environment and the firm is ready and willing to expand its business scope.
3. Firms find expansion irresistible since sheer size translates into superior clout. When a firm is a leader in its industry and wants to protect its dominant position.
4. Expansion strategy is opted in volatile situations. Substantive growth would act as a cushion in such conditions.
5. When the firm has surplus resources, it may find it sensible to grow by levering on its strengths and resources.
6. When the environment, especially the regulatory scenario, blocks the growth of the firm in its existing businesses, it may resort to diversification to meets its growth objectives.
7. When the firm enjoys synergy that ensues by tapping certain opportunities in the environment, it opts for expansion strategies. Economies of scale and scope and competitive advantage may accrue through such synergistic operations. Over the last decade, in response to economic liberalisation, some companies in India expanded the scale of existing businesses as well as diversified into many new businesses.

Growth of a business enterprise entails realignment of its strategies in product-market environment. This is achieved through the basic growth approaches of intensive expansion, integration (horizontal and vertical integration), diversification and international operations. Firms following intensification strategy concentrate on their primary line of business and look for ways to meet their growth objectives by increasing their size of operations in this primary business. A company may expand externally by integrating with other companies. An organization expands its operations by moving into a different industry by pursuing diversification strategies. An organization can grow by "going international", i.e., by crossing domestic borders by employing any of the expansion strategies discussed so far.

Expansion Through Intensification

Intensification involves expansion within the existing line of business. Intensive expansion strategy involves safeguarding the present position and expanding in the current product-market space to achieve growth targets. Such an approach is very useful for enterprises that have not fully exploited the opportunities existing in their current products-market domain. A firm selecting an intensification strategy, concentrates on its primary line of business and looks for ways to meet its growth objectives by increasing its size of operations in its primary business. Intensive expansion of a firm can be accomplished in three ways, namely, market penetration, market development and product development first suggested in Ansoff's model. Intensification strategy is followed when adequate growth opportunities exist in the firm's current products-market space.

Ansoff's Product-Market Expansion Grid

The product/market grid first presented by Igor Ansoff (1968), shown in the following figure, has proven to be very useful in discovering growth opportunities. This grid best illustrates the various intensification options available to a firm. The product/market grid has two dimensions, namely, products and markets. Combinations of these two dimensions result in four growth strategies. According to Ansoff's Grid, the following distinct strategies are possible for achieving growth through the intensification route. These are:

Ansoff's Grid

Markets/Products	Current Markets	New Markets
Current Products	Market Penetration	Market Development
New Products	Product Development	Diversification

1. **Market Penetration:** The firm seeks to achieve growth with existing products in their current market segments, aiming to increase its markets share. In a growing market, simply maintaining market share will result in growth, and there may exist opportunities to increase market share if competitors reach capacity limits. While following market penetration strategy, the firm continues to operate in the same markets offering the same products. Growth is achieved by increasing its market share with existing products. However, market penetration has limits, and once the market approaches saturation another strategy must be pursued if the firm is to continue to grow. Unless there is an intrinsic growth in its current market, this strategy necessarily entails snatching business away from competitors. The market penetration strategy is the least risky since it leverages many of the firm's existing resources and capabilities. Another advantage of this strategy is that it does not require additional investment for developing new products.
2. **Market Development:** The firm seeks growth by targeting its existing products to new market segments. Market development options include the pursuit of additional market segments or geographical regions. The development of new markets for the product may be a good strategy if the firm's core competencies are related more to the specific product than to its experience with a specific market segment or when new markets offer better growth prospects compared to the existing ones. Because the firm is expanding into a new market, a market development strategy typically has more risk than a market penetration strategy. This is because managers do not normally possess sound knowledge of new markets, which may result in inaccurate market assessment and wrong marketing decisions.

   The two possible methods of implementing market development strategy are, (a) the firm can move its present product into new geographical areas. This is done by increasing its sales force, appointing new channel partners, sales agents or manufacturing representatives and by franchising its operation; or (b) the firm can expand sales by attracting new market segments. Making minor modifications in the existing products that appeal to new segments can do the trick.
3. **Product Development:** The firm develops new products targeted to its existing market segments. The firm remains in its present markets but develops new products for these markets. Growth will accrue if the new products yield additional sales and market share. This strategy is likely to succeed for products that have low brand loyalty and/or short product life cycles. A Product development strategy may also be appropriate if the firm's strengths are related to its specific customers rather than to the specific product itself. In this situation, it can leverage its strengths by developing a new product targeted to its existing customers. Although the firm operates in familiar markets, product development strategy carries more risk than simply attempting to increase market share since there are inherent risks normally associated with new product development.
4. **Diversification:** The firm grows by diversifying into new businesses by developing new products for new markets.

   The three possible ways of implementing the product development strategy are:

   1. The company can expand sales through developing new products.
   2. The company can create different or improved versions of the current products.
   3. The company can make necessary changes in its existing products to suit the different likes and dislikes of the customers.

Combination Strategy

Combination strategy combines the intensification strategy variants i.e., market penetration, market development and product development to grow. In the market development and market penetration strategy, the firm continues with its current product portfolio, while the product development strategy involves developing new or improved products, which will satisfy the current markets.

Expansion Through Integration

In contrast to the intensive growth, integration strategy involves expanding externally by combining with other firms. Combination involves association and integration among different firms and is essentially driven by need for survival and also for growth by building synergies. Combination of firms may take the merger or consolidation route. Merger implies a combination of two or more concerns into one final entity. The merged concerns go out of existence and their assets and liabilities are taken over by the acquiring company. A consolidation is a combination of two or more business units to form an entirely new company. All the original business entities cease to exist after the combination. Since mergers and consolidations involve the combination of two or more companies into a single company, the term merger is commonly used to refer to both forms of external growth. As is the case in all the strategies, acquisition is a choice a firm has made regarding how it intends to compete (Markides, 1999). Firms use integration to (1) increase market share, (2) avoid the costs of developing new products internally and bringing them to the market, (4) reduce the risk of entering new business, (5) speed up the process of entering the market, (6) become more diversified and (7) quite possibly to reduce the intensity of competition by taking over the competitor's business. The costs of integration include reduced flexibility as the organization is locked into specific products and technology, financial costs of acquiring another company and difficulties in integrating various operations. There are many forms of integration, but the two major ones are vertical and horizontal integration.

(i) **Vertical Integration:** Vertical integration refers to the integration of firms involved in different stages of the supply chain. Thus, a vertically integrated firm has units operating in different stages of supply chain starting from raw material to delivery of final product to the end customer. An organization tries to gain control of its inputs (called backwards integration) or its outputs (called forward integration) or both. For instance, Nirma undertook backward integration by setting up plant to manufacture soda ash and linear alkyl benzene, both important inputs for detergents and washing soaps, to strengthen its hold in the lower-end detergents market. Forward integration refers to moving closer to the ultimate customer by increasing control over distribution activities. For example, a personal computer assembler could own a chain of retail stores from which it sells its machines (forward integration). Many firms in India such as DCM, Mafatlal and National Textile Corporation have set up their own retail distribution systems to have better control over their distribution activities.

(ii) **Horizontal Combination / Integration:** The acquisition of additional business in the same line of business or at the same level of the value chain (combining with competitors) is referred to as horizontal integration. Horizontal growth can be achieved by internal expansion or by external expansion through mergers and acquisitions of firms offering similar products and services. A firm may diversify by growing horizontally into unrelated business. Integration of oil companies, Exxon and Mobil, is an example of horizontal integration. Aditya Birla Group's acquisition of L&T Cements from Reliance to increase its market dominance is an example of horizontal integration. This sort of integration is sought to reduce intensity of competition and also to build synergies.

Stability Or Consolidation Strategy

Nature of stability strategy

A firm following stability strategy maintains its current business and product portfolios; maintains the existing level of effort; and is satisfied with incremental growth. It focuses on fine-tuning its business operations and improving functional efficiencies through better deployment of resources. In other words, a firm is said to follow stability/ consolidation strategy if:

1. It decides to serve the same markets with the same products;
2. It continues to pursue the same objectives with a strategic thrust on incremental improvement of functional performances; and
3. It concentrates its resources in a narrow product-market sphere for developing a meaningful competitive advantage.

Conditions Favouring Stability Strategy

Stability strategy does entail changing the way the business is run, however, the range of products offered and the markets served remain unchanged or narrowly focused. Hence, the stability strategy is perceived as a non-growth strategy. As a matter of fact, stability strategy does provide room for growth, though to a limited extent, in the existing product-market area to achieve current business objectives. Implementing stability strategy does not imply stagnation since the basic thrust is on maintaining the current level of performance with incremental growth in ensuing periods. An organization's strategists might choose stability when:

1. The industry or the economy is in turmoil or the environment is volatile. Uncertain conditions might convince strategists to be conservative until they became more certain.
2. Environmental turbulence is minimal and the firm does not foresee any major threat to itself and the industry concerned as a whole.
3. The organization just finished a period of rapid growth and needs to consolidate its gains before pursuing more growth.
4. The firm's growth ambitions are very modest and it is content with incremental growth.
5. The industry is in a mature stage with few or no growth prospects and the firm is currently in a comfortable position in the industry.

Approaches to Stability Strategy

There are various approaches to developing stability/consolidation strategy. The Management has to select the one that best suits the corporate objective. Some of these approaches are discussed below. In all these approaches, the fundamental course of action remains the same, but the circumstances in which the firms choose various options differ.

Holding Strategy: This alternative may be appropriate in two situations: (a) the need for an opportunity to rest, digest, and consolidate after growth or some turbulent events - before continuing a growth strategy, or (b) an uncertain or hostile environment in which it is prudent to stay in a "holding pattern" until there is change in or more clarity about the future in the environment. With a holding strategy the company continues at its present rate of development. The aim is to retain current market share. Although growth is not pursued as such, this will occur if the size of the market grows. The current level of resource input and managerial effort will not be increased, which means that the functional strategies will continue at previous levels. This approach suits a firm, which does not have requisite resources to pursue increased growth for a longer period of time. At times, environmental changes prohibit a continuation in growth.

Stable Growth: This alternative essentially involves avoiding change, representing indecision or timidity in making a choice for change. Alternatively, it may be a comfortable, even long-term strategy in a mature, rather stable environment, e.g., a small business in a small town with few competitors. It simply means that the firm's strategy does not include any bold initiatives. It will just seek to do what it already does, but a little better. In this approach, the firm concentrates on one product or service line. It grows slowly but surely, increasingly its market penetration by steadily adding new products or services and carefully expanding its market.

Harvesting Strategy: Where a firm has the dominant market share, it may seek to take advantage of this position and generate cash for future business expansion. This is termed has harvesting strategy and is usually associated, with cost cutting and price increases to generate extra profits. This approach is most suitable to a firm whose main objective is to generate cash. Even market share may be sacrificed to earn profits and generate funds. A number of ways can be used to accomplish the objective of making profits and generating funds. Some of these are selective price increases and reducing costs without reducing price. In this approach, selected products are milked rather than nourished and defended. Hindustan Lever's Lifebuoy soap is an example in point. It yielded large profits under careful management.

Profit or Endgame Strategy: A profit strategy is one that capitalizes on a situation in which old and obsolete product or technology is being replaced by a new one. This type of strategy does not require new investment, so it is not a growth strategy. Firms adopting this strategy decide to follow the same technology, at least partially, while transiting into new technological domains. Strategists in these firms reason that the huge number of product based on older technologies on the market would create an aftermarket for spare parts that would last for years. Sylvania, RCA, and GE are among the firms that followed this strategy. They decided to stay in the vacuum tube market until the "end of the game." As with most business decisions, timing is critical. All competitors eventually must shelve the old assets at some point of time and move to the new product or technology. The critical question is, "Can we make more money by using these assets or by selling them?" The answer to that question changes as time passes.

Retrenchment Strategies

Retrenchment is a short-run renewal strategy designed to overcome organizational weaknesses that are contributing to deteriorating performance. It is meant to replenish and revitalize the organizational resources and capabilities so that the organization can regain its competitiveness. Retrenchment may be thought as a minor surgery to correct a problem. Managers often try a minimal treatment first-cost cutting or a small layoff-hoping that nothing more painful will be needed to turn the firm around. When performance measures reveal a more serious situation, more drastic action must be taken to restore performance.

Retrenchment strategies call for two primary actions:

1. **Cost cutting and**
2. **Restructuring.**

One or both of these tools will be employed more extensively in turnaround situations, because the problems are deeper there than in retrenchment situations. A cost cutting program should be preceded by careful thought and analysis. Rarely is it wise to use a simplistic "across-the-board" cost cutting program. Some departments or projects may need additional funding, while others need modest cuts, and still others need drastic cuts or need to be eliminated altogether. If cost cutting is a part of the strategy implementation, then the plan of implementation should clearly specify how it will be applied across the organization and why is it being proposed.

Variants of Retrenchment Strategy:

The three major variants of retrenchment strategy are -

1. Turnaround strategy,
2. Survival strategy **and**
3. Liquidation strategy.

Turnaround strategy

Turnaround is a strategy adopted by firms to arrest the decline and revive their growth. A turnaround situation exists when a firm encounters multiple years of declining Financial performance subsequent to a period of prosperity (Bibeault, 1982; Hambrick & Schecter, 1983; Schendel et al., 1976; Zammuto & Cameron, 1985). Turnaround situations are caused by combinations of external and internal factors (Finkin, 1985; Heany, 1985; Schendel et al., 1976) and may be the result of years of gradual slowdown or months of precipitous financial decline. The strategic causes of performance downturns include increased competition, raw material shortages, and decreased profit margins, while operating problems include strikes and labour problems, excess plant capacity and depressed price levels. The immediacy of the resulting threat to company survival posed by the turnaround situation is known as situation severity (Altman, 1983; Bibeault, 1982; Hofer, 1980). Low levels of severity are indicated by declines in sales or income margins, while extremely high severity would be signaled by imminent bankruptcy. The

recognition of a relationship between cause and response is imperative for a turnaround process and hence, the importance of properly assessing the cause of the turnaround situation so that it could be the focus of the recovery response is very important.

Survival strategy

When the company is on the verge of extinction, it can follow several routes for renewing the fortunes of the company. These are discussed in the following sections.

Divestment

An organization divests when it sells a business unit to another firm that will continue to operate it.

Spin-Off

In a spin-off, a firm sets up a business unit as a separate business through a distribution of stock or a cash deal. This is one way to allow a new management team to try to do better with a business unit that is a poor or mediocre performer.

Restructuring the Business Operations

The company tries to survive by restructuring its management team, financial reengineering or overall business reengineering. Business reengineering involves throwing aside all old business processes and starting from scratch to design more efficient processes. This may cut costs and assist a turnaround situation. This is much easier to visualize in a manufacturing process, where each step of assembly is examined for improvement or elimination. It would be foolish to find more efficient ways to perform processes that should be abandoned and hence, reengineering is strongly suggested in such cases.

Liquidation strategy

Liquidation is the final resort for a declining company. This is the ultimate stage in the process of renewing company. Sometimes a business unit or a whole company becomes so weak that the owners cannot find an interested buyer. A simple shutdown will prevent owners from throwing good money after bad once it is clear that there is no future for the business. In such a situation, liquidation is the best option.

Bankruptcy is a last resort when the business fails financially. The court will liquidate its assets. The proceeds will be used to pay off the firm's outstanding debts. Some companies file for bankruptcy instead of liquidating. Under this option, the firm reorganizes its operations while being protected from its creditors. If the firm can emerge from bankruptcy, it pays off its creditors as best as it can.

Combination Strategies

The combination strategy is followed when an organisation adopts a mixture of stability, expansion and retrenchment strategies, either at the same time in its different businesses or at different times in one of its businesses, with the aim of improving its performance.

Any combination strategy is the result of a serious attempt on the part of strategists to take into account the variety of environmental and organisational factors that affect the process of strategy formulation.

Complicated situations generally require complex solutions. Combination strategies are the complex solutions that strategists have to offer when faced with the challenges of real-life business. Observe how the two companies below deal with the complex situations they face.

- A paints company augments its offering of decorative paints to provide a wider variety to its customers (stability) and expands its product range to include industrial and automotive paints (expansion). Simultaneously, it decides to close down the division which undertakes large-scale painting contract jobs (retrenchment).
- Over the years, strategic changes at a large business group indicate that it has been strengthening its manufacturing base and divesting its trading activities. Stability has been aimed at in some of its divisions, by retrenching the unprofitable products and services, while major expansion has taken

place in the case of its industrial products and construction business. A variety of strategies have thus been followed, both sequentially and simultaneously, creating a complex web of strategies, in line with the nature of the conglomerate that the company actually is.

Combination Strategy is adopted because:

1. The organisation is large and faces complex environment.
2. The organisation is composed of different businesses, each of which lies in a different industry, requiring a different response.

4.3 CORPORATE PORTFOLIO ANALYSIS

Corporate Portfolio Analysis is used when an organization's corporate strategy involves a number of businesses. When the company is in more than one business, it can select more than one strategic alternative depending upon demand of the situation prevailing in the different portfolios. It is necessary to analyze the position of different business of the business house which is done by corporate portfolio analysis.

Portfolio analysis is an analytical tool which views a corporation as a basket or portfolio of products or business units to be managed for the best possible returns.

When an organization has a number of products in its portfolio, it is quite likely that they will be in different stages of development. Some will be relatively new and some much older. Many organizations will not wish to risk having all their products at the same stage of development. It is useful to have some products with limited growth but producing profits steadily, and some products with real growth potential but may still be in the introductory stage. Indeed, the products that are earning steadily may be used to fund the development of those that will provide the growth and profits in the future.

So the key strategy is to produce a balanced portfolio of products, some with low risk but dull growth and some with high risk but great potential for growth and profits. This is what we call as portfolio analysis.

The aim of portfolio analysis is:

1) to analyze its current business portfolio and decide which businesses should receive more or less investment
2) to develop growth strategies, for adding new businesses to the portfolio
3) to decide which business should not longer be retained

Balancing the portfolio – Balancing the portfolio means that the different products or businesses in the portfolio have to be balanced with respect to four basic aspects –

1) Profitability
2) Cash flow
3) Growth
4) Risk

Advantages and Disadvantages of Portfolio Analysis

Portfolio analysis offers the following **advantages**:

1. It encourages management to evaluate each of the organization's businesses individually and to set objectives and allocate resources for each.
2. It stimulates the use of externally oriented data to supplement management's intuitive judgment.
3. It raises the issue of cash flow availability for use in expansion and growth.

Portfolio analysis does, however, have some limitations.

1. It is not easy to define product/market segments.
2. It provides an illusion of scientific rigor when some subjective judgments are involved.

Considering both its advantages and disadvantages, portfolio analysis should be regarded as a disciplined and organized way of thinking about asset allocation. It is only a subjective tool, however, and is not a substitute for the ultimate professional judgment of the responsible decision-makers.

Strategic Portfolio Analysis, alternatively termed Business Portfolio planning or Portfolio strategy or Policy-Strategy Profile or Organisational Portfolio Plan, is a broad term and refers to a technique found in many different variations. This analytical technique helps to satisfy the emerging need for centralised decisions on key strategic issues in multinational corporations. It provides a means of comparing numerous business activities in relation to each other, establishing priorities and deciding between winners and losers.

Strategic portfolio analysis has, as its primary objective, the optimal allocation of cash resource among the various business activities comprising a diversified corporate portfolio. In addition, it can help top management decide what business activities the company should be in, how performance of the different business units should be evaluated, and who should manage these units.

The formulation of the organisational portfolio plan is the final phase of the strategic planning process. Strategic portfolio analysis assumes that most organisations, at a particular time and in reality, are a portfolio of businesses. For example, an appliance manufacturer may have several product lines (such as TV, Refrigerators, Stereos, Washers, Dryers) as well as two divisions (consumer appliances and industrial appliances). In other words, the corporate portfolio consists of all of the businesses, product lines, divisions or other components of the parent multi-industry corporation.

Managing such groups of businesses is made little easier if resources and cash are plentiful and each group is experiencing 'growth' and 'profits'. Unfortunately, providing larger and larger budgets each year to all business groups [may be Strategic Business Units (SBU's)] is no longer feasible. Many are not experiencing growth, and profits and/or resources (financial and non-financial) are becoming more and more scarce. In such a situation, strategic portfolio analysis helps the management make choices in the form of master strategies as well as programme strategies (included would be competitive strategies, financial strategies, and so on).

In this approach of strategic portfolio analysis, General Electric and Boston Consulting Group made pioneering contributions. General Electric introduced the concept of dividing business activities into SBU's with like characteristics, related to the life cycles of the products. Boston Consulting Group (BCG) deserves much of the credit for developing and popularising this analytical technique. BCG approach consisted of a wide variety of products in different growth rates, and market shares, search for investment strategies to allocate resources among them to optimise company's long-run profits.

At the heart of strategic portfolio theory is the growth-share matrix shown below.

	Matrix for Strategic Portfolio Analysis	
High Market Growth Rate	Question Marks Must decide whether to try for a star-hold as is - or divest.	Stars Hold and build, even though additional investment may be required.
Low	Dogs Divestiture is often advisable. Turn-around prospects are low.	Cash Cows Hold and harvest; invest the returns elsewhere.
	Low High Relative Market Share	

The above matrix provides a scheme for broadly classifying a company's businesses according to their strategic needs (including cash requirements). The horizontal axis shows the relative market share held by the various SBUs, expressed as a ratio of each SBU's share held by the leading competitor in its particular market. The vertical axis depicts the growth rate of the various markets in which the businesses compete.

A corporation, at any given time, may be comprised of several SBUs that fit into each of the four categories shown in the above matrix. Since the STARS are growing rapidly and have the advantage of already having achieved a high share of the market, they provide the firm's best profit and growth opportunities. The BCG believes that the only two viable strategies exist for QUESTION MARK SBU: growing the SBU into a star or divesting (getting rid of it). Since DOGS hold little promise for the future and may not even pay their own way, they are prime candidates for divestiture. In contrast, because of their high share positions in a low growth area CASH COWS are ideal for providing the funds needed to pay dividends and debts, recover overheads, and supply the funds for investment in other growth areas.

Comments : The matrix above illustrates how companies in two well-known industries might be classified using, the growth-share approach. In practice, however portfolio matrices are used to classify various businesses for resource-allocation purposes.

Classifying businesses into a portfolio is often a very difficult task. Yet proper classification is essential in order to compete successfully in its industry. Again, for optimising resource-allocation, the development of a sound portfolio typically requires considerable analysis and negotiation by managers and staff at both the corporate and business level.

For a balanced portfolio, the cash needed by question marks must roughly equal the cash generated by cows. This equilibrium places a limit on the number of question marks a portfolio should contain.

Strategic portfolio analysis has many variants other than BCG matrix. These are profit impact on market strategy (PIMS), Experience or Learning Curve, Nine-cell General Electric matrix, Life Cycle Portfolio matrix, McKinsey's Framework, Directional Policy matrix (DPM), Risk matrix, DPM and Risk matrix (combined three-dimensional matrix, portfolio plus risk), etc.

Strategic portfolio planning is useful in establishing performance objectives for different business units. The theory suggests that the four kinds of businesses in the growth-share matrix should be evaluated quite differently with respect to growth and profitability. It helps guide the selection of managers to head up the businesses in a company's portfolio.

4.4 GROWTH SHARE MATRIX – BCG, GE AND ARTHUR D. LITTLE

According to Ansoff and Stewart, 'a growth strategy is one that an enterprise pursues when it increases its level of objectives upward in a significant increment, much higher than an extrapolation of its past achievement level. The most frequent increase indicating a growth strategy is to raise the market share and/or sales objective upward significantly'. They are of the view that at least three reasons are dominant in the pursuit of a growth strategy :

1. In volatile industries, growth is a necessity for survival;
2. To many executives, growth is equated with effective performance; and
3. As an objective, growth is the most important one.

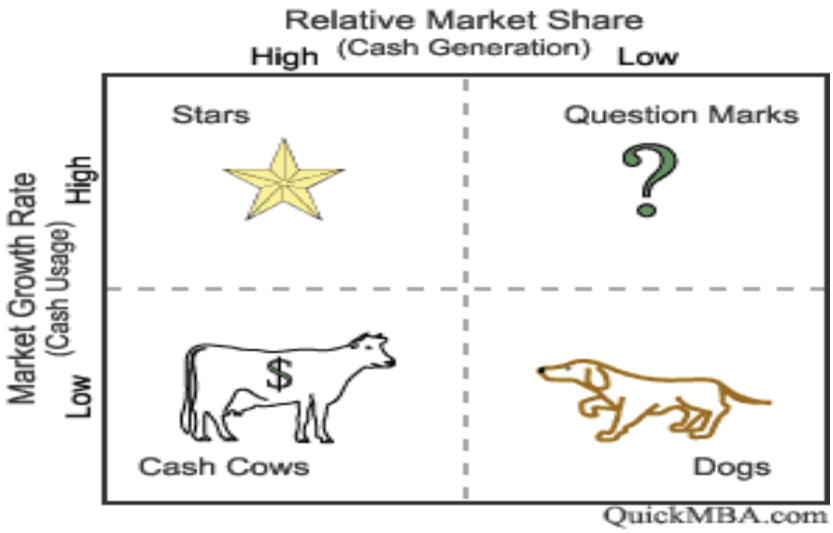
A company pursuing a growth strategy will always strive for better results every year than the previous year in the areas of production, sales, and profits.

In terms of corporate planning and policy, growth strategy is considered as a business decision, an investment decision, and a management challenge. A company following a growth strategy, in most cases, has certain strengths in its internal organisational set up.

BCG Model (Boston Consulting Group's Growth Share Matrix)

The BCG matrix is a chart that had been created by Bruce Henderson for Boston Consulting Group in 1970 to help corporations to analyze their business units or product lines. In general, for large companies, there is always a problem of allocating resources amongst its business units in some logical/rational ways. To overcome such problems, Boston Consulting Group (BCG) has developed a model, which has been termed as 'BCG matrix'. BCG matrix is also called as 'Growth-share matrix', is based on two variables, viz., the rate of growth of the product-market and the market share in that market held by the firm relative to its competitors. This model aims at systematically identifying the main underlying strategic characteristics of specific business segments. This model is developed to analyze the problem of resource deployment among the business units or products of multi-business firms. BCG matrix is based on empirical research, which analyzes products and business by market share and market growth.

BCG Growth-Share Matrix



Resources are allocated to business units according to where they are situated on the grid as follows:

High Growth-High Market Share : Stars

Star represents those products, which have successfully passed the introduction stage and are on the path of growth. They are self sufficient for cash requirements i.e. cash generated is almost equal to cash used. Stars are the products that are rapidly growing with large market share. They earn high profits but they require substantial investment to maintain their dominant position in a growing market. Stars are usually profitable and would be the future cash cows. Since the stars are growing rapidly and have the advantage of already having achieved a high share of the market, they provide the firms best profit and growth opportunities. Successful resource deployment beyond cash requirements could lead to a superior market share when industry growth potential falls off. Resources should be allocated to these units to grow faster than the competition in sales and profits. Stars are leaders in the business and generate large amounts of cash. The stars will entail huge cash outflows to maintain the market share and to ward off competition. The firm will start feeling the experience curve effect. Overtime, all growth slows. Therefore, stars eventually become cash cows if they hold their market share. If they fail to hold market share, they become dogs. The star generally pursues a growth strategy to establish a strong competitive position. Stars reinvest large amounts of revenues to further refine and improve the product. Stars hold prices down to capture a larger share of the market and to discourage the entry of competitors. Since the stars are growing rapidly and have the advantage of already having achieved a high share of the market, they provide the firms best profit and growth opportunities.

Low Growth-High Market Share : Cash Cows

A cash cow produces a lot of cash for the company. The company does not have to finance for capacity expansion as the market's growth rate has slowed down. Since, a cash cow is a market leader, it enjoys economies of scale and higher profit margins. When a market's annual growth rate falls, a star becomes a cash cow if it still has the largest relative market share.

The important strategic feature of cash cows is that they are generating high cash returns, which can be used to finance the stars or for use elsewhere in the business. Cash cows have a strong market position in the industry that have matured. In comparison with the position of the star performer, cash cows can expect little serious competition because of their relatively low expected industry growth rate. Competitors will not expect to launch any offensive competitive strategy program in the absence of significant industry potential. Cash cows are units with high market share in a slow-growing industry. Cash cows are ideal for providing the funds needed to pay dividends and debts, recover overheads and supply of funds for investment in other growth areas. Cash cows are established, successful and need less investment to maintain their market share.

The cash cows are in the declining stage of their life cycle, the surplus cash generated by them will be invested in new question marks. Cash cows are more valuable in a portfolio because they can be 'milked' to provide cash for other riskier and struggling businesses. The strategy employed in respect of cash cows without having long-term prospects is to harvest i.e. to increase short-term cash flow without considering the long-term effects.

High Growth-Low Market Share : Question Marks

The question mark is also called as 'problem child' or 'wildcat'. Question marks are the products/ businesses whose relative market share is low but have high growth potential. The question mark identifies as those products which are at introduction stage in the market and the cash generated is less than cash used for these products. Their competitive position is weak but they work for long-term profit and growth. These products require additional funds to improve their market share so that the question mark becomes a star. This strategy may even necessitate foregoing short-term profits. If the firm is unsuccessful in uplifting a question mark to a star position, divestment strategy can be appropriate.

If no improvement is made in market share, question marks will absorb large amount of cash and later, as the growth stops, turn into dogs. If the question mark business becomes successful, it becomes a star. A question mark denotes a new entrant into the market and growth prospects will be tremendous but will have a very low market share and its success or failure cannot be judged easily. If question marks are left unattended, they are capable of becoming cash traps. Question marks are yet to establish their competitive viability although they usually operate in a rapidly growing market. Therefore, they require huge cash outflow. Strategy must be evolved whether to try for a star or hold the current position or divest. Question marks must be analyzed carefully in order to determine whether they are worth the investment required to achieve market share. A decision needs to be taken about whether the product justifies considerable expenditure in the hope of increasing its market share, or whether it should be allowed to die quietly. Most businesses start off as a question mark in that the company tries to enter a high-growth market in which there is already a market leader. A question mark require a lot of cash for setting up additional plant and equipment and hire more personnel to keep up with the fast-growing market to overtake the market leader.

Low Growth-Low Market Share : Dogs

Dogs describe company business that have weak market shares in low-growth markets. Products with low market share and limited growth potential are referred to as dogs. The prospects for such products are bleak. It is better to phase them out rather than continue with them. Dogs should be allowed to die or should be killed off. Although they will show only a modest net cash outflow or even a modest cash inflow, they are cash traps. They provide a poor return on investment and not enough to achieve the organization's target rate of return. These units are typically 'break-even', generating barely enough

cash to maintain the market share. Though owning a break-even unit provides the social benefit of providing jobs and possible synergies that assist other business units, from financial point of view such a unit is worthless, not generating cash for the company. They depress the company's overall 'return on assets ratio', used by the investors, financial institutions and banks in judging how well the company is being managed. Since Dogs hold little promise for the future and may not even pay their own way, they are prime candidates for divestiture. The only way for dog is to increase its rate of sales growth by taking sales away from competitors.

Question marks unable to obtain a dominant market share by the time the industry growth rate inevitably slows become dog. The feasible strategies are:

(a) Invest more money to see whether the market share can be increased.

(b) Harvest whatever can be extracted and then close down.

(c) Divest by selling or hiving off the business unit.

(d) Minimize the number of dogs in a company.

(e) As soon as they stop delivering, they should be phased out or otherwise liquidated.

(f) Expensive turnaround plans should be avoided.

In some industries, dogs provide a platform for the development of future stars, act as loss leaders or help to complete a product range, to kill competition, for tax planning etc.

Other Classification of SBUs

Infants - Products in an early stage of development.

Warhorse - Products that have been cash cows in the past and still making acceptable sales and profits even now.

Dodos - Products with low share, negative growth and negative cash flow.

Strategic Alternatives

For a Strategic Business Unit (SBU), there are four strategic alternatives are suggested:

(a) Build - To increase the SBU's market share, even foregoing short-term earnings to achieve this.

(b) Hold - To preserve the SBU's market share.

(c) Harvest - To increase the SBU's short-term cash flow regardless of the long-term effect.

(d) Divest - To sell or liquidate the business because resources can be better used elsewhere.

Problems in using BCG Matrix

The BCG matrix is criticized for the following reasons:

(a) It does not talk about profitability at all.

(b) It fails to correctly define market share and market growth.

(c) It ignores competition factors and trends in markets.

(d) It considers only two factors viz., market growth rate and market share, ignoring all other factors.

(e) It does not say how long a product will continue in each phase.

(f) It fails to consider globalization factor, where markets are not limited to a particular area or place.

(g) It encourages strategy development for general use rather than specific criteria.

(h) It implies assumptions about mechanism of corporate financing and market behaviour that are either unnecessary or false.

(i) It overlooks other important strategic factors that are a function of the external competitive environment.

(j) It does not provide direct assistance in company with different businesses in terms of investment opportunities,

(k) Its focus is on cash flow, whereas organizations may be more interested in ROI.

(l) It does not depict the position of business that are about to emerge as winner because the product is entering the takeoff stage.

(m) It neglects small competitors that have fast growing market shares,

(n) It fails to consider that, a business with a low market share can be profitable too.

(o) A high market share does not necessarily lead to profitability all the time,

(p) Market growth is not the only indicator for attractiveness of a market,

(q) It does not offer guidance for inter unit comparisons.

(r) An SBUs profitability, cash flow and industry attractiveness not always be closely related to market share and growth rate.

The BCG matrix cannot be used in isolation. It is a rough model, and the originators of the matrix modified it over time to include, for example, the concept of a 'cash dog' which has a low share of a low growth market bur still earns a nice profit. The BCG matrix is not a tool for increasing profits. It is an analytical model suggesting guidelines for cross subsidization. BCG matrix does not talk about profits at all; it is useful in increasing cash flow situation: The application of BCG matrix to strategic decision making is in the manner or the diagnostic rather than a prescriptive aid. BCG model evaluates a firm's products, business and/or profit centres as separate entities. Decisions are made for each entity pertaining to its market share and existing or potential growth rate of the industry. The BCG matrix helps in forecasting cash flow situations. It also helps to make product mix decisions. An ideal business portfolio (mix of businesses) as envisaged by the BCG matrix would be one with largest number of cash cows and stars and only a few question marks and dogs. The matrix combines market growth rate and market share, and thus directly relates to the experience curve. BCG matrix provides analysis in determining the competitive position and this can be translated into strategy. It helps the managers balance the flow of cash resources among their various businesses. This sort of analysis enables a company to assess its competitive standing and enables to decide future resources allocation for its product portfolio.

The BCG matrix provides a framework for allocating resources among different business units and allows one to compare many business units at a glance. However, the approach has received some negative criticism for the following reasons:

- The link between market share and profitability is questionable since increasing market share can be very expensive.
- The approach may overemphasize high growth, since it ignores the potential of declining markets.
- The model considers market growth rate to be a given. In practice the firm may be able to grow the market.

These issues are addressed by the GE / McKinsey Matrix, which considers market growth rate to be only one of many factors that make an industry attractive, and which considers relative market share to be only one of many factors describing the competitive strength of the business unit.

GE Nine Cell Matrix

This matrix was developed in 1970s by the General Electric Company with the assistance of the consulting firm, McKinsey & Co, USA. This is also called GE multifactor portfolio matrix. The GE matrix has been developed to overcome the obvious limitations of BCG matrix. This matrix consists of nine cells (3X3) based on two key variables: i) business strength ii) industry attractiveness.

The vertical axis indicates industry attractiveness and the horizontal axis shown the business strength in the industry. The factors that affect market attractiveness are called 'drivers'. The industry attractiveness is measured by a number of factors like:

- size of market
- market growth rate
- industry profitability
- competitive intensity
- economies of scale
- technological requirements
- pricing trends
- overall risk of returns in the industry
- opportunity for differentiation of products and services
- demand variability
- segmentation
- distribution structure etc.

Business strength is measured by considering the typical drivers like:

- market share
- market share growth rate
- profit margin
- distribution efficiency
- brand image
- ability to compete on price and quality
- knowledge of customer
- customer loyalty
- production capacity
- access to financial resources
- technological capability
- management calibre etc.

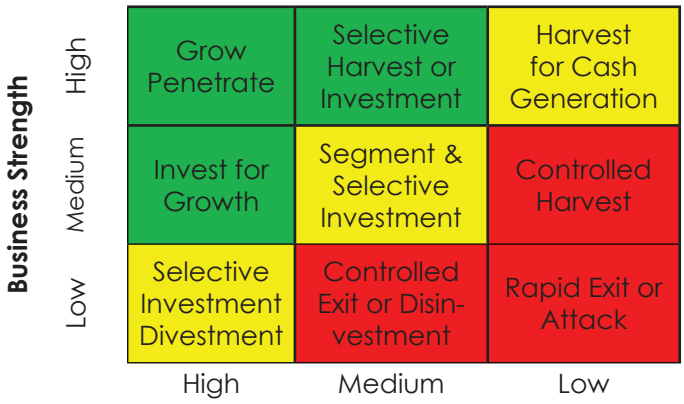
The nine cells of the GE matrix represent various degrees of industry attractiveness (high, medium or low) and business strength (strong, average and weak). After plotting each product line or business unit on the nine cell matrix, strategic choices are made depending on their position in the matrix.

GE matrix is also called "Stoplight" strategy matrix because the three zones are like green, yellow and red of traffic lights.

1) Green indicates invest/expand – if the product falls in green zone, the business strength is strong and industry is at least medium in attractiveness, the strategic decision should be to expand, to invest and to grow.

2) Yellow indicates select/earn – if the product falls in yellow zone, the business strength is low but industry attractiveness is high, it needs caution and managerial discretion for making the strategic choice.

3) Red indicates harvest/divest – if the product falls in the red zone, the business strength is average or weak and attractiveness is also low or medium, the appropriate strategy should be divestment.



1. The three cells at the top left hand side of the matrix are the most attractive in which to operate and require a policy of investment for growth – these are usually coloured green.

2. The three cells running diagonally from left to right have a medium attractiveness, are coloured yellow and the management of businesses within this category should be more cautious and with a greater emphasis being placed on selective investment and earning retention.

3. The three cells at the bottom right hand side are the least attractive, therefore coloured red and management should follow a policy of harvesting and / or divesting unless the relative strengths can be improved.

Channon and McCosh devised a set of generic investment strategies for the GE McKinsey matrix as labelled in the previous diagram. A. T. Kearney also put forward guidelines for strategies in the different boxes and where these have not been incorporated they are mentioned below. (ATK = A.T. Kearny)

Grow / Penetrate – These businesses are a target for investment, they have strong business strengths, are in attractive markets and they should therefore have high returns on investment and competitive advantage. They should receive financial and managerial support to maintain their strong position and to continue contributing to long-term profitability.

ATK – Seek dominance

Grow

Maximise investment

Invest for Growth – Businesses here are in very attractive industries but have average business strength. They should be invested in to improve their long-term competitive position.

ATK – Evaluate potential for leadership via segmentation

Identify weaknesses

Build strengths

Selective Investment or Divestment - These businesses are in very attractive markets but their business strength is weak. Investment must be aimed at improving the business strengths. These businesses will probably have to be funded by other businesses in the group as they are not self-funding. Only businesses that can improve their strengths should be retained – if not they should be divested.

ATK – Specialise

Seek niches

Consider acquisitions

Selective Harvest or Investment – Businesses in this box have good business strength in an industry that is losing its attractiveness. They should be supported if necessary but they may be self-supporting in cash flow terms. Selective harvesting is an option to extract cash flow but this should be done with caution so as not to run down the business prematurely.

ATK – Identify growth segments

Invest strongly

Maintain position elsewhere

Segment and Selective Investment – Businesses with average business strengths and in average industries can improve their positions by creative segmentation to create profitable segments and by selective investment to support the segmentation strategy. The business needs to create superior returns by concentrating on building segment barriers to differentiate themselves.

ATK – Identify growth segments

Specialise

Invest selectively

Controlled Exit or Harvest – Businesses with weak business strengths in moderately attractive industries are candidates for a controlled exit or divestment. Attempts to gain market share by increasing business strengths could prove to be very expensive and must be done with caution.

ATK – Specialise

Seek niches

Consider exit

Harvest for Cash Generation – Strong businesses in unattractive markets should be net cash generators and could provide funds for use throughout the rest of the portfolio. Investment should be aimed at keeping these businesses in a dominant position of strength but over investment can be disastrous especially in a mature market. Be aware of competitors trying to revitalise mature industries.

ATK – Maintain overall position

Seek cash flow

Invest at maintenance level

Controlled Harvest – They have average business strengths in an unattractive market and the strategy should be to harvest the business in a controlled way to prevent a defeat or the business could be used to upset a competitor.

ATK – Minimise investment

Position to divest

Rapid Exit or Attack Business – These businesses have neither strengths nor an attractive industry and should be exited. Investments made should only be done to fund the exit.

ATK – Trust leaders statesmanship

Go after competitors cash generators

Time exit and divest

Difference between BCG and GE matrices –

BCG Matrix	GE Matrix
1. BCG matrix consists of four cells	1. GE matrix consists of nine cells
2. The business unit is rated against relative market share and industry growth rate	2. The business unit is rated against business strength and industry attractiveness
3. The matrix uses single measure to assess growth and market share	3. The matrix used multiple measures to assess business strength and industry attractiveness
4. The matrix uses two types of classification i.e high and low	4. The matrix uses three ypes of classification i.e high/medium/low and strong/average/weak
5. Has many limitations	5. Overcomes many limitations of BCG and is an improvement over it

The following steps are taken to plot SBUs on the GE/Mckinsey portfolio matrix.

Step 1 Specify the typical factors that determine the industry attractiveness. For each product line or SBU, overall industry attractiveness is assessed and rated in a 5-point scale ranging from 5 (very attractive) to 1 (very unattractive).

Step 2 The typical factors that characterize business strength of each product line or SBU are assessed and measured on a 5-point scale ranging from 1 (very week) to 5 (very strong).

Step 3 Determine weight of each driver. The company must assign relative importance weights to the drivers.

Step 4 Multiply the weights with scores of each factor of industry attractiveness and ascertain the overall weighted score of industry attractiveness.

Step 5 Multiply the weights with scores of each factor of business strength and ascertain the overall weighted score of business strength.

Step 6 Plot each product line or SBU current position on the matrix.

Step 7 View resulting graph and interpret it.

Step 8 Perform a review analysis using adjusted weights and scores (sensitivity analysis).

Industry attractiveness/Business strength

= Factor value$_1$ x Factor weighting$_1$ +.....+ Factor value$_n$ x Factor weighting$_n$

Advantages –

1) It used 9 cells instead of 4 cells of BCG

2) It considers many variables and does not lead to simplistic conclusions

3) High/medium/low and strong/average/low classification enables a finer distinction among business portfolio

4) It uses multiple factors to assess industry attractiveness and business strength, which allow users to select criteria appropriate to their situation.

Limitations of GE/Mckinsey Matrix

While the GE approach overcomes some of the problems identified earlier for the BCG model, both have further limitations:

(a) It is complicated and cumbersome.

(b) Aggregation of the indicators is difficult.

(c) Core competencies are not represented.

(d) Interactions between SBUs are not considered.

(e) It does not depict the position of new products or business units in developing industries.

(f) It does not provide specific strategy to use or how to implement that strategy.

(g) Trying to fit all business units in nine cells may prove difficult for some businesses.

(h) The process of selecting factors, assigning weights, rating and computing values, in reality is based on subjective judgments.

This model is an improvement over the BCG Matrix in the sense that while BCG Matrix bases industry attractiveness on a single variable (industry growth rate) in this model industry attractiveness is measured by a number of factors like size of the market, growth rate, industry profitability, competitive intensity, technological requirements, etc. Similarly, while the BCG matrix bases business strength entirely on relative market share, in this model, the business strength is rated considering a number of factors such as market share, market share growth rate, profitability, distribution efficiency, brand image, etc. Also, this 9-cell model is a refinement of the 4-cell BCG Matrix (only high and low) which is too simplistic and in which the link between market share and profitability is not necessarily strong. Low share business can be profitable and -vice versa.

ARTHUR D. LITTLE PORTFOLIO MATRIX

The ADL portfolio matrix suggested by Arthur D. Little (ADL) consists of 20 cells, identified by competitive position and its stage of industry maturity. In this matrix, the stage of industry maturity is identified in four stages viz., embryonic, growth, maturity and ageing. The competitive position is categorized into five classes viz., dominant, strong, favourable, tenable and weak. The purpose of the matrix is to establish the appropriateness of a particular strategy in relation to these two dimensions.

The position within the life cycle and of the company is determined in relation to eight external factors (or disciplines) of the evolutionary stage of the industry. These are:

(a) market growth rate

(b) growth potential

(c) breadth of product line

(d) number of competitors

(e) spread of market share among the competitors

(f) customer loyalty

(g) entry barriers

(h) technology

It is the balance of these factors which determines the life cycle. The competitiveness of the organization can be established by looking at the characteristics of each category. The weights must be defined to calculate the matrix position of a particular business. The matrix location of each unit can be used to formulate a natural strategy to accomplish the business goals of the firm.

Competitive position	Stage of Industry Maturity			
	Embryonic	Growth	Mature	Ageing
Dominant	- Startup - Fast growth - Build barriers	- Fast growth - Attain cost leadership - Renew - Defend position - Act offensive	- Defend position - Attain cost leadership - Renew - Fast growth - Act offensive	- Defend position - Cost focus - Renew - Harvest or divest
Strong	- Start up - Differentiate - Fast growth	- Fast growth - Renew - Differentiate - Cost focus - Act offensive	- Attain cost leadership - Renew - Differentiate - Grow with industry	- Find niche - Hold niche - Hang on - Grow with industry - Harvest
Favourable	- Start up - Differentiate - Fast growth	- Differentiate - Cost focus - Catch up - Grow with industry	- Harvest - Find niche - Hold niche - Hang on - Renew - Turnaround - Cost focus - Differentiation focus - Grow with industry	- Harvest - Divest
Tenable	- Start up - Grow with industry - Cost focus - Differentiation focus	- Hold niche - Find niche - Hang on - Harvest - Catch up - Turnaround - Cost focus - Differentiation focus - Grow with industry	- Harvest - Turnaround - Find niche - Retrench - Hold niche	- Divest - Retrench
Weak	- Find niche - Catch up - Grow with industry	- Turnaround - Retrench - Withdraw	- Withdraw - Divest	- Withdraw

The competitive position of a company's SBU or product line can be classified as:

Dominant - It is comparatively a rare situation where the SBU enjoys monopoly position or very strong market ability of its products. This may be due to high level of entry barriers or protected technology leadership.

Strong - When an SBU enjoys strong competitive position, it can afford to chalk out its own strategies without too much concern for the competitors.

Favourable - In this competitive position, no firm will enjoy dominant market share and the competition will be intense. The strategy formulation much depends on the competitors moves. The market leader will have a reasonable degree of freedom. Analysis of their product portfolio and learning from them would help others while framing their own strategies.

Tenable - The tenable competitive position implies that a firm can survive through specialization and focus. These firms are vulnerable to stiff competition in the market. They can withstand with cost focus and differentiation focus strategies.

Weak - The weak firms will generally show poor performance. They can withstand with niche strategy and can become strong players in their area. The consistent weak performance may need to divest or withdraw from the product line.

4.5 BUSINESS LEVEL STRATEGY

Just like a human being functions through his limbs, corporations or companies operate through their businesses. While strategies at the corporate-level provide the broad direction to the organisation, it is '.....at the level of the individual business or industry where most competitive interaction occurs and where competitive advantage is ultimate won or lost. Business-level strategies, therefore, are an important level at which companies set their strategies.

Business strategies are the courses of action adopted by an organisation for each of its businesses separately, to serve identified customer groups and provide value to the customer by satisfaction of their needs. In the process, the organisation uses its competencies to gain, sustain and enhance its strategic or competitive advantage.

The source of competitive advantage for any business operating in an industry arises from the skilful use of its core competencies. These competencies are used to gain competitive advantage against rivals in an industry. Competitive advantage results in above-average returns to the company. Businesses need a set of strategies to secure its competitive advantage.

Michael E. Porter is credited with extensive pioneering work in the area of business strategies or, what he calls, competitive strategies. His writings in the form of books, research papers and articles have deeply influenced contemporary thinking in the area of industry analysis, competitive dynamics and competitive strategies.

The dynamic factors that determine the choice of a competitive strategy, according to Porter, are two, namely the industry structure and the positioning of a firm in the industry.

Industry Structure

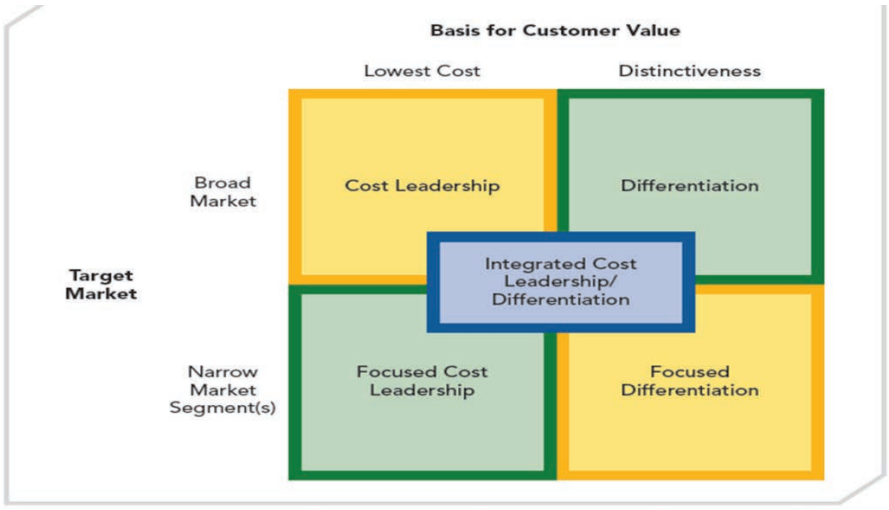
According to Porter, industry structure is determined by the competitive forces. These forces are five in number: the threat of new entrants; the threat of substitute products or services; the bargaining power of suppliers; the bargaining power of buyers; and the rivalry among the existing competitors in an industry. These five forces vary from industry to industry, i.e., every industry has a unique structure and these factors determine the long-term profitability of organisations in that industry.

Positioning of Firm in Industry

The second factor that determines the choice of a competitive strategy of a firm is its positioning within the industry. Porter considers positioning as the overall approach of the firm towards competing. It is designed to gain a sustainable competitive advantage and is based on two variables: the competitive advantage and the competitive scope. Competitive advantage can arise due to two factors: lower cost and differentiation. Competitive scope can be in terms of two factors: broad target and narrow target.

Porter's Generic Business Level Strategy

Business level strategies are popularly known as generic or competitive strategies. Michael Porter classified these strategies into overall cost leadership, differentiation and focus. The first two strategies are broader in concept as their competitive scope is wide enough whereas the third strategy i.e. the focus strategy has a narrower competitive scope.



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So according to Porter, business strategies are of three types:- Cost leadership, differentiation, focus.

Cost Leadership Business Strategy

When the competitive advantage of an organisation lies in its lower cost of products or services relative to what the competitors have to offer, it is termed as cost leadership. The organisation outperforms its competitors by offering products or services at a lower cost than they can. Customers prefer a lower cost product, particularly if it offers the same utility to them as comparable products available in the market do. When all organisations offer products at a comparable price, the cost leader organisation earns higher profit owing to the low cost of its products. Cost leadership offers a margin of flexibility to the organisation to lower the price if the competition becomes stiff and yet earn more or less the same level of profit.

Observe how the following organisations use cost leadership business strategies.

- Gujarat Cooperative Milk Marketing Federation (GCMMF), the country's largest cooperative, probably known better by its brand name Amul, operates in the branded ice cream market on the lower-cost platform. It has the backing of a large cooperative dairy network, whose constituents are located across the country and an efficient supply-chain in place for procurement of high-quality milk. Besides these, it has developed a cold chain of supplying its refrigerated products through an efficient distribution network. In this way, Amul ice-cream can be found just about everywhere, including STD booths, kirana shops, chemists and bakers, who stock the ice-cream in deep freezers.
- Moser Baer India—a Noida, Uttar Pradesh-based world-class manufacturing company—manufactures compact disks, known as CD-Recordables (CD-Rs), for a one-time recording of data. Its platinum range of CD-Rs claims to store data for 200 years. The global market is dominated heavily by Taiwanese companies, who are acknowledged low-cost manufacturers of CD-Rs. Moser Baer is rated among the top three global companies in the data storage business. Its business strategy is a low-cost one, focussed on achieving economies of scale and leveraging the competitive advantages it has due to the lower raw material and labour costs.

Condition under which cost-leadership is used :-

Every condition under which markets operate is not conducive to using the cost leadership business strategies. Some conditions under which it is useful are mentioned below :

(i) The markets for the product operate in such a way that price-based competition is vigorous, making costs an important factor.

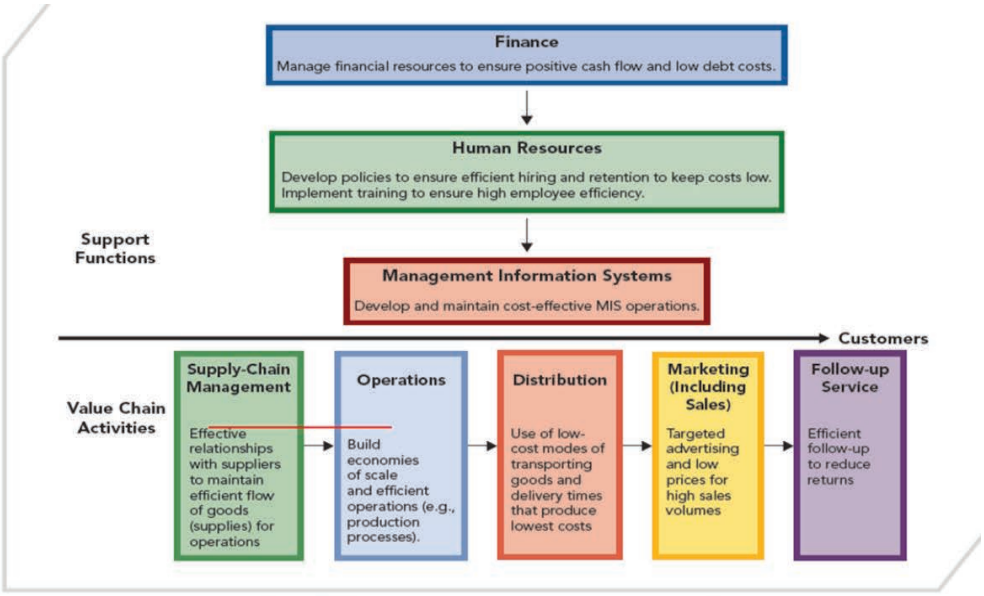
(ii) The product is standardised and its consumption takes place in such a manner that differentiation is not required.

(iii) The bargaining power of buyer to negotiate a price reduction is high from the supplying firm.

(iv) There is lesser customer loyalty and the cost of switching from one seller to another is low.

Cost leadership strategies work best when the product/service features are such that buyers are price-sensitive and base their purchase decision primarily on it.

Examples of Value-Creating Activities Associated with the Cost Leadership Strategy



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If cost is lower then following benefits are available :-

(i) compete on price,

(ii) generated profits can be reinvested in product differentiation,

(iii) can deal the threat from buyer,

(iv) can deal the threat of substitute product and competitors,

(v) protect the entry of new firm.

There are some risk with cost leadership strategy :-

(a) Over emphasis on efficiency can lead to the firm loosing touch with the changing requirements of the customer.

(b) Upgradation in technology can result in the loss of cost advantage that was once enjoyed.

(c) Many routes to a low cost position can be easily copied by other firms.

(d) Cost push inflation.

Another point to remember is that lower cost is always relative to what the competitors have to offer. Low cost by itself is not absolute. The cost advantage has to come essentially by operational effectiveness. Such cost advantage should also be sustainable, meaning thereby that it should not be easily duplicated by the rivals.

Differentiation Business Strategy

When the competitive advantage of an organisation lies in special features incorporated into the product/ service which is demanded by the customers, who are willing to pay for it, then the strategy adopted is the differentiation business strategy. The organisation outperforms its competitors who are not able or willing to offer the special features that it can and does. Customers prefer a differentiated product/service when it offers them utility that they value and thus are willing to pay more for getting such a utility. A differentiated product or service stands apart in the market and is distinguishable by the customers for its special features and attributes.

A differentiator organisation can charge a premium price for its products/services, gain additional customers who value the differentiation and command customer loyalty. Profits for the differentiator organisation come from the difference in the premium price charged and the additional cost incurred in providing the differentiation. To the extent the organisation is able to offer differentiation by maintaining a balance between its price and costs, it succeeds. But it may fail if the customers are no longer interested in the differentiated features or are not willing to pay extra for such features.

Observe how the following organisations use differentiation business strategies:

- Orient Fans, a company within the Calcutta-based C. K. Birla group, offers premium ceiling fans based on superior technology and product innovation and is a major exporter to many global buyers including Wal-Mart of the USA. The technology differentiators are the core benefits of air delivery, reach of air and electricity consumption. The product attributes for differentiation are extra-wide blades, heavy duty motor, low wattage, high velocity and maximum area coverage. Rivals in the fan market include market leader Crompton and other like Usha, Khaitan and Bajaj. A large proportion of the fan market is dominated by fragmented, low cost suppliers in the unorganised sector and cheap imports from China.
- In an interesting case, packaging became the differentiator for Parle Agro when, in 1985, it launched Frooti, a non-aerated natural fruit-based drink, in tetrapack. The customer perceived glass bottled drinks to be synthetic. Frooti went on to become generic to the category of tetrapacked fruit drinks, especially since it maintained price parity with the popular aerated drinks.

What each of these organisations does is to rely on its inherent strengths to offer special product/service features and attributes that are valued by the customers and for which she is willing to pay a premium price. This differentiation creation capability is then leveraged to achieve competitive advantage.

Condition under which differentiation is used –

(i) The firm knows who are its competitors and knows all the marketing mix.

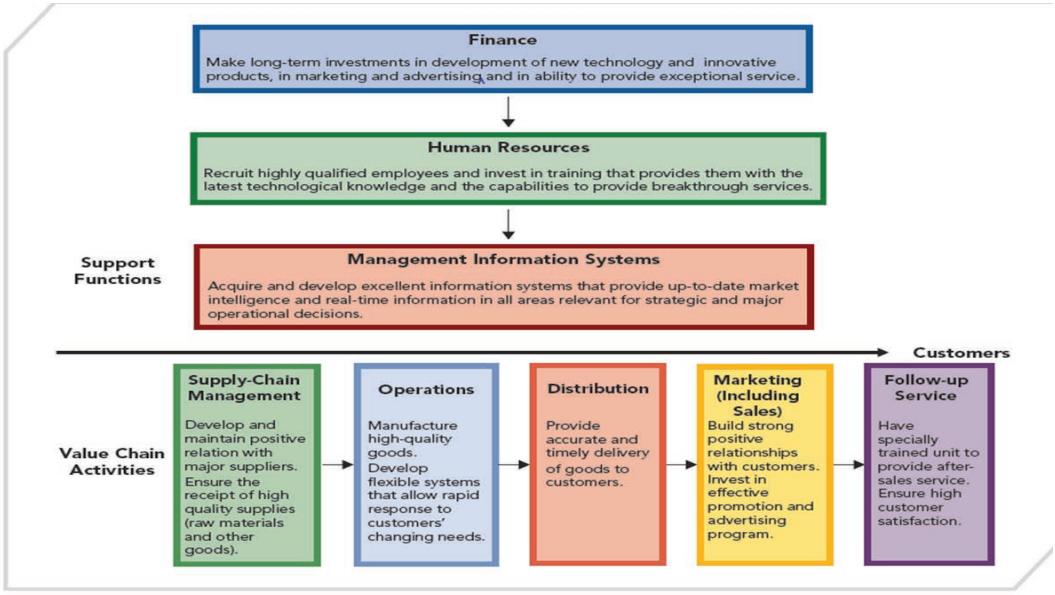
(ii) The market is too large and a few firms offering a standardised product.

(iii) The customers' needs and preferences are too diversified.

(iv) It is possible for the firm to charge a premium price for differentiation that is valued by the customer.

(v) The nature of the product is such that brand loyalty is possible to generate and sustain.

Examples of Value-Creating Activities Associated with the Differentiation Strategy



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From differentiation the following benefits are available –

(i) it reduces the head to head rivalry,

(ii) can avoid the threat of suppliers,

(iii) can deal the threat from buyer,

(iv) can deal the threat of substitute product and competitors,

(v) protect the entry of new firm.

This strategy has following risk :-

(i) if other cost leader firm used differentiation strategy then rivalry is high,

(ii) sources of differentiation may be copied by other firms,

(iii) customer's needs and preferences may be changed over time,

(iv) continuous innovation and technological changes can affect the differentiation strategy,

(v) If the firm ignores the costs of differentiating then the premium prices charged may not lead to superior profits.

The ultimate success of a differentiation strategy lies in its ability to identify a tangible basis for customers to launch on to the product/service an organistaion offers. Yet, there is a paradox here that the more tangible the basis, the greater are the chances that a competitor is able to copy it. So, an organization has to rely on its core or distinctive competencies to offer a not-so-tangible differentiation, which a customer could easily relate to and that could be sustained at a price that she is willing to pay.

Focus Business Strategy

Focus business strategies essentially rely on either cost leadership or differentiation, but cater to a narrow segment of the total market. In terms of the market, therefore, focus strategies are niche strategies. The more commonly used bases for identifying customer groups are the demographic characteristics (age, gender, income, occupation, etc.), geographic segmentation (rural/urban or Northern India/Southern

India) or lifestyle (traditional/modern). For the identified market segment, a focussed organisation uses either the lower-cost or differentiation strategy.

Observe how these organisations adopt the focus strategies either on the basis of lower-cost or differentiation.

- The branded jewellery business of Titan Industries operates in a highly fragmented industry. India typically, has had a tradition of highly skilled craftsmen in the jewellery trade. Designs of jewellery vary across regions. Jewellery is considered as an investment in gold. Tanishq, the jewellery brand of Titan, adopts a differentiation strategy offering a range of gold, pearl and diamond jewellery for women and men treating jewellery as fashionable items rather than an investment. Designs are made on the basis of continual feedback from its extensive retail network of showrooms. New designs are introduced every quarter. The brand projects itself as a reputed (Titan is a Tata group company) organisation with a guarantee of purity.
- Philips India Ltd. launched the flat TV with the plasma technology that enables distortion-free pictures, and bright, accurate colours, fitted with an integrated Dolby pro-logic sound system. The premium-priced TV with differentiation on technology basis was targeted at the niche market of selective, sophisticated, technology-driven audience.

Condition under which focus strategies are used –

(i) There are specialised requirement for using the products or services that the common customers cannot be expected to fulfill.

(ii) The market is big enough to be profitable for the focused firm.

(iii) There is a promising potential for growth in the market segment.

(iv) The focusing organization has the necessary skill and expertise to serve the niche segment.

From focused strategy the following benefits are available –

(i) Provides products/services that the other organizations cannot provide or would not find it profitable to provide.

(ii) Buy in small quantities so powerful suppliers may not evince much interest.

(iii) Powerful buyers are less likely to shift loyalties as they might not find others willing to cater to the niche markets as the focuses organizations do.

(iv) can deal the threat from buyer,

(v) can deal the threat of substitute product and competitors,

The risk involved in focus strategy are as follows :-

(i) target segment may disappear for some reason,

(ii) it is difficult to identify which segments the firms should choose.

(iii) Development of distinctive competencies required to serve the niche market may be along-drawn and difficult process.

(iv) May be difficult to move to other segments of the market.

(v) Niches may sometimes become attractive enough for the bigger players to shift attention to them.

Focused cost leadership is the first of two focus strategies. A firm that follows this strategy does not necessarily charge the lowest prices in the industry. Instead, it charges low prices relative to other firms that compete within the target market. Another important point is that the nature of the narrow target

market varies across firms that use a focused cost leadership strategy. In some cases, the target market is defined by demographics.

Focused differentiation is the second of two focus strategies. A focused differentiation strategy requires offering unique features that fulfill the demands of a narrow market. As with a focused low-cost strategy, narrow markets are defined in different ways in different settings. Some firms using a focused differentiation strategy concentrate their efforts on a particular sales channel, such as selling over the Internet only. Others target particular demographic groups. While a differentiation strategy involves offering unique features that appeal to a variety of customers, the need to satisfy the desires of a narrow market means that the pursuit of uniqueness is often taken to the proverbial "next level" by firms using a focused differentiation strategy. Thus the unique features provided by firms following a focused differentiation strategy are often specialized.

The risk involved in focus strategy are as follows :-

(a) target segment may disappear for some reason,

(b) it is difficult to identify which segments the firms should choose.

Hybrid Strategy

Most textbooks on strategic management adopt Porter's vision that the company has to adopt a "pure strategy" choosing between:

1) A price domination strategy which relies on low price resulting from economies of scale obtained through mass production

2) A differentiation strategy which relies on the supply of products specially designed for a market segment accepting to pay higher price.

In the first option, profit is generated by high volumes even if the profit per unit is low, in the second option profit is generated by high unit margin even is the volume is limited.

Basically the question is the possibility to serve both mass market and several market segments with standardized and low cost production to generate higher profit.

Let us define Hybrid strategies as strategies which enable to associate low cost production and differentiation. According to this definition we can identify the following situation in which the company can associate low cost and differentiation.

1) Process innovation and value analysis.

   In this case the low cost does not result only from mass production but mainly from innovation. It enables to be competitive even with a large range of products. Swatch and Ikea are example of companies which have been successful in reducing the cost of production while maintaining high differentiation and value on their products.

2) Low cost differentiation

   The reason why "pure" low cost or differentiation strategies are generally recommended is because there are cost involved in differentiation and there is consequently a risk for the company to be "stuck in the middle" with average price and average quality. However there are cases when it is possible to maintain high economies of scale and differentiation.

   - Modular design enables in many case to offer a large range of possibilities with high economies of scale. The automobile industry is an example, Dell computer is another example of what is often defined as mass customization.
   - Terminal differentiation is a differentiation which appears at the last stage of production. For example one of the strength of Benetton has been to develop a process to taint sweaters after they were manufactured instead of manufacturing sweaters with tainted wool.

- Added services or various packages can be offered to better fit the needs of specific targets without involving extra cost. This will be the case in industries like insurance for example.

3) Price discrimination

One of the limits of low cost / low price mass market is the fact that it does not enable the company to charge higher prices to the customers who are ready to pay higher prices. Price discrimination with changes in the product design, the brand name or the service offered enable to maximize revenue.

Porter's Generic strategies model has criticised on the following grounds –

(a) There is no clear-cut demarcation of the industry definition.

(b) This model is static in nature.

(c) The third problem relates to low cost differentiation axis where products/services do not fall perfectly under a single category.

Factors influencing Business Strategy

Businesses are affected by an external environment as much as they are affected by the competitors. Global factors influencing business are legal, political, social, technological and economic. Understanding of these factors is important while developing a business strategy.

a. Social factors - These factors are related to changes in social structures. These factors provide insights into behaviour, tastes, and lifestyles patterns of a population. Buying patterns are greatly influenced by the changes in the structure of the population, and in consumer lifestyles. Age, gender, etc all determine the buying patterns and understanding of such changes is critical for developing strategies which are in line with the market situations. In a global environment it is important that business strategies are designed keeping in mind the social and cultural differences that vary from country to country. Consumer religion, language, lifestyle patterns are all important information for successful business management.

b. Legal factors - These factors that influence business strategies are related to changes in government laws and regulations. For a successful business operation it is important that the businesses consider the legal issues involved in a particular situation and should have the capability to anticipate ways in which changes in laws will affect the way they must behave. Laws keep changing over a period of time. From the point of view of business it is important that they are aware of these changes in the areas of consumer protection legislation, environmental legislation, health & safety and employment law, etc.

c. Economic factors - These factors involve changes in the global economy. A rise in living standards would ultimately imply an increase in demand for products thereby, providing greater opportunities for businesses to make profits. An economy witnesses fluctuations in economic activities. This would imply that in case of a rise in economic activity the demand of the product will increase and hence the price will increase. In case of reduction in demand the prices will go down. Business strategies should be developed keeping in mind these fluctuations. Other economic changes that affect business include changes in the interest rate, wage rates, and the rate of inflation. Incase of low interest rates and increase in demand Businesses will be encouraged to expand and take risks. Therefore, business strategies should have room for such fluctuations.

d. Political factors - This refers to the changes in government and government policies. Political factors greatly influence the operation of business. This has gained significant importance off late. For example: companies operating in the European Union have to adopt directives and regulations created by the EU. The political arena has a huge influence upon the regulation of businesses, and the spending power of consumers and other businesses. Business must consider the stability of the political environment, government's policy on the economy etc.

e. **Technological factors** - These factors greatly influence business strategies as they provide opportunities for businesses to adopt new innovations, and inventions. This helps the business to reduce costs and develop new products. With the advent of modern communication technologies, technological factors have gained great impetus in the business arena. Huge volumes of information can be securely shared by means of databases thereby enabling vast cost reductions, and improvements in service. Organisations need to consider the latest relevant technological advancements for their business and to stay competitive. Technology helps business to gain competitive advantage, and is a major driver of globalization. While designing the business strategies firms must consider if use of technology will allow the firm to manufacture products and services at a lower cost. Firms can select new modes of distributions with the help of technology. It has become easier for companies to communicate with their customer in any part of the world.

SOME OTHER BUSINESS LEVEL STRATEGIES

Pricing Based Strategies

There are three main approaches a business takes to setting price:

Cost-based pricing: price is determined by adding a profit element on top of the cost of making the product.

Customer-based pricing: where prices are determined by what a firm believes customers will be prepared to pay.

Competitor-based pricing: where competitor prices are the main influence on the price set.

Let's take a brief look at each of these approaches;

Cost based pricing

This involves setting a price by adding a fixed amount or percentage to the cost of making or buying the product. In some ways this is quite an old-fashioned and somewhat discredited pricing strategy, although it is still widely used.

After all, customers are not too bothered what it cost to make the product – they are interested in what value the product provides them.

Cost-plus (or "mark-up") pricing is widely used in retailing, where the retailer wants to know with some certainty what the gross profit margin of each sale will be. An advantage of this approach is that the business will know that its costs are being covered. The main disadvantage is that cost-plus pricing may lead to products that are priced un-competitively.

How high should the mark-up percentage be? That largely depends on the normal competitive practice in a market and also whether the resulting price is acceptable to customers.

The main advantage of cost-based pricing is that selling prices are relatively easy to calculate. If the mark-up percentage is applied consistently across product ranges, then the business can also predict more reliably what the overall profit margin will be.

While cost-based pricing strategies are operationally efficient, they do have their disadvantages. For instance, since profits increase along with costs (and hence, prices) it is easy for firms to lose incentive in the development of cost controls. Also, if all pricing decisions are based on costs, and not market conditions, perceived value or any other conditions, it is possible for a company to price a product too low.

Customer-based pricing

Penetration pricing

You often see the tagline "special introductory offer" – the classic sign of penetration pricing. The aim of penetration pricing is usually to increase market share of a product, providing the opportunity to increase price once this objective has been achieved.

Penetration pricing is the pricing technique of setting a relatively low initial entry price, usually lower than the intended established price, to attract new customers. The strategy aims to encourage customers to switch to the new product because of the lower price.

In the short term, penetration pricing is likely to result in lower profits than would be the case if price were set higher. However, there are some significant benefits to long-term profitability of having a higher market share, so the pricing strategy can often be justified.

Penetration pricing is often used to support the launch of a new product, and works best when a product enters a market with relatively little product differentiation and where demand is price elastic – so a lower price than rival products is a competitive weapon.

Price skimming

Skimming involves **setting a high price before other competitors come into the market**. This is often used for the launch of a new product which faces little or no competition – usually due to some technological features. Such products are often bought by **"early adopters"** who are prepared to pay a higher price to have the latest or best product in the market.

Good examples of price skimming include innovative electronic products, such as the Apple iPad and Sony Play Station 3.

There are some other problems and challenges with this approach:

Price skimming as a strategy cannot last for long, as competitors soon launch rival products which put pressure on the price (e.g. the launch of rival products to the iPhone or iPod).

Distribution (place) can also be a challenge for an innovative new product. It may be necessary to give retailers higher margins to convince them to stock the product, reducing the improved margins that can be delivered by price skimming.

A final problem is that by price skimming, a firm may slow down the volume growth of demand for the product. This can give competitors more time to develop alternative products ready for the time when market demand (measured in volume) is strongest.

Loss leaders

The use of loss leaders is a method of sales promotion. A loss leader is a product priced below cost-price in order to attract consumers into a shop or online store. The purpose of making a product a loss leader is to encourage customers to make further purchases of profitable goods while they are in the shop. But does this strategy work?

Pricing is a key competitive weapon and a very flexible part of the marketing mix.

If a business undercuts its competitors on price, new customers may be attracted and existing customers may become more loyal. So, using a loss leader can help drive customer loyalty.

One risk of using a loss leader is that customers may take the opportunity to "bulk-buy". If the price discount is sufficiently deep, then it makes sense for customers to buy as much as they can (assuming the product is not perishable).

Using a loss leader is essentially a short-term pricing tactic for any one product. Customers will soon get used to the tactic, so it makes sense to change the loss leader or its merchandising every so often.

Predatory pricing (note: this is illegal)

With predatory pricing, prices are deliberately set very low by a dominant competitor in the market in order to **restrict or prevent competition**. The price set might even be free, or lead to losses by the predator. Whatever the approach, predatory pricing is illegal under competition law.

Psychological pricing

Sometimes prices are set at what seem to be unusual price points. For example, a price tag of ₹99.99 or ₹199.99 The answer is the perceived price barriers that customers may have. They will buy something for ₹ 99.99, but think that ₹ 100.00 is a little too much.

The aim of psychological pricing is to make the customer believe the product is cheaper than it really is. Pricing in this way is intended to attract customers who are looking for "value".

Competitor-based pricing

Competitor-based pricing involves the setting of prices based on what rivals are charging.

If there is strong competition in a market, customers are faced with a wide choice of who to buy from. They may buy from the cheapest provider or perhaps from the one which offers the best customer service. But customers will certainly be mindful of what is a reasonable or normal price in the market.

Most firms in a **competitive market** do not have sufficient power to be able to set prices above their competitors. They tend to use **"going-rate**" pricing – i.e. setting a price that is in line with the prices charged by direct competitors. In effect such businesses are **"price-takers**" – they must accept the going market price as determined by the forces of demand and supply.

An advantage of using competitive pricing is that selling prices should be line with rivals, so price should not be a competitive disadvantage.

The main disadvantage is that the business needs some other way to attract customers. It has to use non-price methods to compete – e.g. providing distinct customer service or better availability.

4.6 COMPETITIVE ADVANTAGE

When a firm sustains profits that exceed the average for its industry, the firm is said to possess a **competitive advantage** over its rivals. The goal of much of business strategy is to achieve a sustainable competitive advantage.

A competitive advantage exists when the firm is able to deliver the same benefits as competitors but at a lower cost (cost advantage), or deliver benefits that exceed those of competing products (differentiation advantage). Thus, a competitive advantage enables the firm to create superior value for its customers and superior profits for itself.

Competitive Advantage Analysis:

Competitive advantage, also called strategic advantage, is essentially a position of superiority of an organization in relation to its competitors. A more formal definition of competitive advantage is:

'Competitive advantage exists when there is a match between the distinctive competences of a firm and the factors critical for success within its industry that permits the firms to outperform competitors.'

The definition shows that superiority of a company over its competitors exists because the company has developed some unique competence—core competence or distinctive competence— which matches the environmental factors or success factors in the industry in a better way than the capabilities of competitors. South (1981) has given a definition of competitive advantage which also gives a good perspective:

The process of strategic management is coming to be defined, in fact, as the management of competitive advantage, that is, a process of identifying, developing and taking advantage of enclaves in which a tangible and preservable business advantage can be achieved.

The resources and capabilities lead to competitive advantage when they are:

(a) Valuable - Allow the firm to exploit opportunities or neutralize the threats.

(b) Rare - Possessed by few, if any, current or potential competitors.

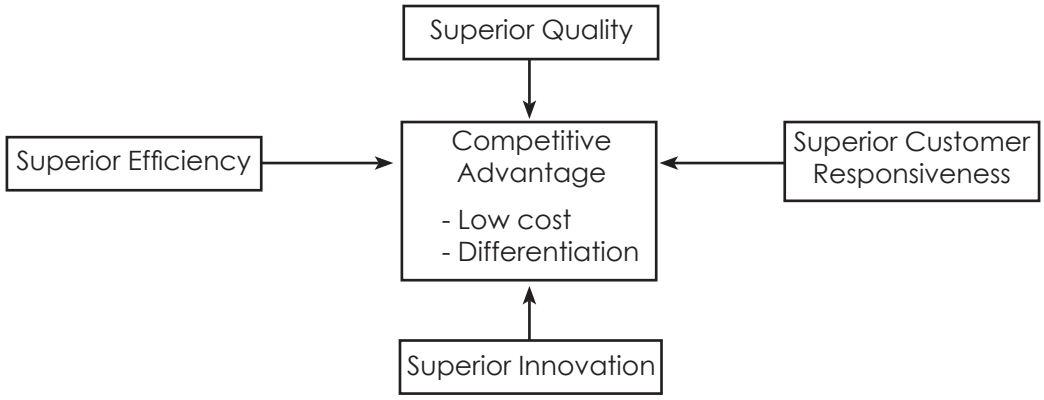
(c) Cost to imitate - when other firms either cannot obtain them or must obtain them at much higher cost.

(d) Non-substitutable - The firm must be organized appropriately to obtain the full benefits of the resources in order to realize the competitive advantage.

GENERIC BUILDING BLOCKS OF COMPETITIVE ADVANTAGE

The company can attain competitive advantage through low cost and product differentiation. Efficiency, quality, innovation and customer responsiveness, as shown in the following figure, are four basic ways for lowering costs and achieving product differentiation.

Generic Building Blocks of Competitive Advantage



Superior efficiency : The objective of a business firm is to provide value satisfaction to the customers at a profit. Business firms always attempt to maximize profit. But in order to maximize profit, a business firm has to be efficient. Efficiency is measured by the capacity of a business firm to raise the productivity of existing resources so that cost per unit is reduced. Efficiency is the ratio of a system's outputs to inputs. Economic efficiency arises when the cost of inputs is minimized for a given level and mix of inputs and technical efficiency arises when the output is maximized for a given volume and mix of inputs. Effectiveness denotes accomplishment of objectives and efficiency denotes fulfillment of objectives with minimum sacrifice of available scarce resources.

Superior Quality: The success of many companies is rooted in their commitment to the improvement of quality. Profit is the prime measure of success of a business enterprise. This results from the sale of goods and services of an acceptable quality at a price that exceeds cost. Quality is the most important factor which provides the competitive edge to an organization. The quality improvement results in greater satisfaction to customers and also firms gain considerable reduction in the overall operation costs. It is clear that management must consider very carefully the level of quality' that is to be offered by its products as well as their price and cost levels. This need for careful balancing of these dimensions.

Superior Innovation: The term innovation can be classified into two viz., process innovation and product innovation. Process innovation is the creating new processes for producing products or providing services and delivering them to the customers. The factory automation through flexible manufacturing systems, computer aided design/manufacturing, office automation and other process innovation need to be adopted, which reduce overall cost of production per unit, increase quality and meet shortages in skilled workers. Process innovation through automation is used to improve the efficiency of current operations without increasing output. The other aspects like rationalization, standardization, modularization, variety reduction, improved material handling systems etc. will cause to achieve greater competitive edge over rivals. Product innovation involves development of new products. Here new product refers any product that comes with new attributes which are new to the target customers. Only by developing innovative products and services creates greater value for customers.

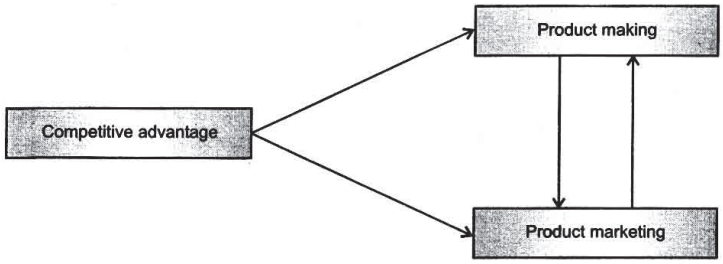
Superior Customer Responsiveness: The term 'customer responsiveness' refers to the company's ability in providing customized superior and innovative products at reasonable cost. The business firms are

expected to provide customers what exactly they desire to be served. Achieving superior customer responsiveness involves giving customers value for money. Customer responsiveness is analyzed from the view point of providing suitable products to the different groups of customers, quick delivery time, maintenance of quality for price, suitable and aesthetic design, after sales service, customer response time etc. A company can gain competitive edge over rivals only when its customer responsiveness is superior to its competitors.

Therefore, a company can gain competitive advantage when all the above four attributes are well attended to stay ahead in competition.

DEVELOPING COMPETITIVE ADVANTAGE

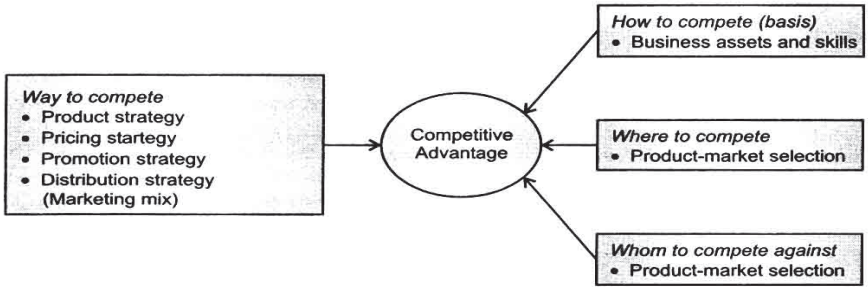
Competitive advantage can be secured through two primary routes: product manufacturing and marketing route. The product manufacturing route reflects core competences, special capabilities, superior product design, etc. The marketing route reflects marketing mix application, positioning, offering a bundle of benefits or value to the customer, etc. The product-making route and the marketing route are obviously not exclusive to each other; they are, in fact, complementary to or supporting or reinforcing each other.



A corporate strategy can consist of various individual strategies like product strategy, pricing strategy, promotion strategy, distribution strategy, competition strategy, etc. Many forms of competition exist. But these strategies or the way a company competes is not the only key to, or the complete course for success. There are at least three other strategic factors which are essential for creation of a competitive advantage which can be sustained over time. These three factors are: how to compete (basics), i.e., business assets and skills, where to compete, i.e., product-market selection, and whom to compete against, i.e., competitor position.

For securing competitive advantage, corporate strategy should be based on appropriate assets, skills and capabilities. Important business assets are customer base, quality reputation, good management or company image, proper engineering or skilled staff, etc. For example, a product strategy for an industrial good without proper design, manufacturing and quality control capabilities will not deliver the results or any sustainability to the product or quality.

Special assets and skills of a company can also be termed as core competence or distinctive competence of the company. According to Hamel and Prahalad (1990), advantages of companies and businesses are based on core competence of these companies, and therefore, developing and managing core competence are the keys to strategic success. Core competences, however, are not the only sources of competitive advantage.



The next important factor is the choice of the target product-market. A well-planned strategy duly supported by assets and skills may not succeed because it does not work in a particular market. Procter and Gamble's Pringle potato chips had many assets like consistent quality, long shelf life and national distribution. But, these assets adversely affected the taste perception which was considered to be the most important factor in the market.

The third important factor for competitive advantage is competitor position. The objective or goal here is to employ a strategy to thwart competitors who may lack strength in relevant assets and skills or is weak in some other strategic applications. For example, flight safety is important to airline passengers: so, if an airline is perceived to be strong on safety, then a competitive advantage can exist in terms of provision of flight safety or better flight security.

Sustainable Competitive Advantage

A sustainable competitive advantage occurs when an organization acquires or develops an attribute or combination of attributes that allows it to outperform its competitors. These attributes can include access to natural resources or access to highly trained and skilled personnel human resources. It is an advantage (over the competition), and must have some life; the competition must not be able to do it right away, or it is not sustainable. It is an advantage that is not easily copied and, thus, can be maintained over a long period of time. Competitive advantage is a key determinant of superior performance, and ensures survival and prominent placing in the market. Superior performance is the ultimate, desired goal of a firm; competitive advantage becomes the foundation. It gives firms the ability to stay ahead of present or potential competition and ensure market leadership.

Sustainable competitive advantages are company assets, attributes, or abilities that are difficult to duplicate or exceed; and provide a superior or favorable long term position over competitors.

Just because a company is the market leader now, doesn't mean it has a sustainable competitive advantage. A company can temporarily cut its prices to gain market share, but its competitive lead will disappear when it restores those prices to a profitable level. A company must create clear goals, strategies, and operations to sustain its competitive advantage over time. The corporate culture and values of the employees must be in alignment with those goals, as well. It's difficult to do all those things well, which is why very few companies can create a sustainable competitive advantage.

Types and Examples of Sustainable Competitive Advantages

Low Cost Provider/ Low pricing

Economies of scale and efficient operations can help a company keep competition out by being the low cost provider. Being the low cost provider can be a significant barrier to entry. In addition, low pricing done consistently can build brand loyalty be a huge competitive advantage (i.e. Wal-Mart).

Market or Pricing Power

A company that has the ability to increase prices without losing market share is said to have pricing power. Companies that have pricing power are usually taking advantage of high barriers to entry or have earned the dominant position in their market.

Powerful Brands

It takes a large investment in time and money to build a brand. It takes very little to destroy it. A good brand is invaluable because it causes customers to prefer the brand over competitors. Being the market leader and having a great corporate reputation can be part of a powerful brand and a competitive advantage.

Strategic assets

Patents, trademarks, copy rights, domain names, and long term contracts would be examples of strategic assets that provide sustainable competitive advantages. Companies with excellent research and development might have valuable strategic assets.

Barriers To Entry

Cost advantages of an existing company over a new company is the most common barrier to entry. High investment costs (i.e. new factories) and government regulations are common impediments to companies trying to enter new markets. High barriers to entry sometimes create monopolies or near monopolies (i.e. utility companies).

Adapting Product Line

A product that never changes is ripe for competition. A product line that can evolve allows for improved or complementary follow up products that keeps customers coming back for the "new" and improved version (i.e. Apple iPhone) and possibly some accessories to go with it.

Product Differentiation

A unique product or service builds customer loyalty and is less likely to lose market share to a competitor than an advantage based on cost. The quality, number of models, flexibility in ordering (i.e. custom orders), and customer service are all aspects that can positively differentiate a product or service.

Strong Balance Sheet / Cash

Companies with low debt and/or lots of cash have the flexibility to make opportune investments and never have a problem with access to working capital, liquidity, or solvency. The balance sheet is the foundation of the company.

Outstanding Management / People

There is always the intangible of outstanding management. This is hard to quantify, but there are winners and losers. Winners seem to make the right decisions at the right time. Winners somehow motivate and get the most out of their employees, particularly when facing challenges. Management that has been successful for a number of years is a competitive advantage.

Developing Sustainable Competitive Advantages

Developing a sustainable, competitive advantage requires customer loyalty, a great location, unique merchandise, proper distribution channels, good vendor relations, a reputation for customer service, and multiple sources of advantage.

1. **Customer Loyalty**: Customers must be committed to buying merchandise and services from a particular retailer. This can be accomplished through retail branding, positioning, and loyalty programs. A loyalty program is like a "Target card." Now, when the customer uses the card as a credit card, Target can track all of their transactions and store it in their data warehouse, which keeps track of the customer's needs and wants outside of Target. This will entice Target to offer products that they do not have in stock. Target tracks all sales done on their cards. So, Target can track customers who use their card at other retailers and compete by providing that merchandise as well.
2. **Location**: Location is a critical factor in a consumer's selection of a store. Starbucks coffee is an example. They will conquer one area of a city at a time and then expand in the region. They

open stores close to one another to let the storefront promote the company; they do little media advertising due to their location strategy.

3. **Distribution and Information Systems**: Walmart has killed this part of the retailing strategy. Retailers try to have the most effective and efficient way to get their products at a cheap price and sell them for a reasonable price. Distributing is extremely expensive and timely.

4. **Unique Merchandise**: Private label brands are products developed and marketed by a retailer and available only from the retailer. For example, if you want Craftsman tools, you must go to Sears to purchase them.

5. **Vendor Relations**: Developing strong relations with vendors may gain exclusive rights to sell merchandise to a specific region and receive popular merchandise in short supply.

6. **Customer Service**: This takes time to establish but once it's established, it will be hard for a competitor to develop a comparable reputation.

7. **Multiple Source Advantage:** Having an advantage over multiple sources is important. For example, McDonald's is known for fast, clean, and hot food. They have cheap meals, nice facilities, and good customer service with a strong reputation for always providing fast, hot food.

How to make competitive advantage more sustainable?

Market researchers and consultants [Day (1984) among others] have suggested ways or conditions to make a company's competitive advantage sustainable or its assets or capability a source of sustainable advantage. Six major guidelines or conditions are mentioned below:

1. Durability: The advantages should be 'lumpy' or durable and, not mere incremental or marginal. This means that the advantage should not be vulnerable to quick obsolescence because of technological change, shift in customer requirement or preference, change in competitive conditions, etc.

2. Valuable contribution: The asset, capability or the advantage should make a significant contribution to customer value. It is not enough to possess a capability or advantage; it should transform itself into superior customer value.

3. Visibility: The uniqueness of the capability or advantage should be clearly focussed to ensure high visibility. Sometimes, an attribute like reliability is not visible enough unless it is made so through suitable product design or advertising.

4. Causal ambiguity: It should not be clear to competitors how the capability or the source of advantage actually works. The objective should be to keep the competitors guessing, contemplating or conjecturing.

5. Duplicability: The capability or advantage should be difficult to duplicate. Even if the competitors understand the advantage, it should be difficult to duplicate it because they cannot acquire the necessary capability or master the required resources.

6. Retaliation: Companies or businesses—particularly early movers—should be able to create barriers or counter the efforts of competitors. The best way to do this is to retaliate. It should either be a threat or actual retaliation to prolong the competitive advantage cycle.

7. All this suggests that, to make competitive advantage really sustainable, companies should possess the ability to adopt and pursue new bases of advantage, that is, continuously innovate. Dell computer did this. Dell lived through several swings in the PC market, and continually adapted its strategy to sustain its competitive advantage. As CEO, Michael Dell puts it: 'We are constantly reinventing ourselves'. This should be the ideal. How close a company or business can stick to the ideal would determine the relative sustainability of its competitive position or advantage.

Hypercompetition and Competitive Advantage

Fast competitive advantage cycles imply hyper competition. Hyper competition takes place when the frequency, boldness and aggressiveness of moves by competitors accelerate to create a condition of constant disequilibrium and change. Hypercompetitive market conditions indicate that companies should recognize that competitive advantages will be temporary. Competition also is to be understood in a new way; competition should actually mean 'disrupting the status quo' so that an organization can try to sustain competitive advantage on changing bases. This implies that longer term competitive advantage is secured through a sequence or series of short-lived moves.

Hypercompetitive market conditions are becoming more common. In such situations, companies need to re-think their approach to competitive strategies. It may not be possible to plan sustainable positions of competitive advantage for long. In fact, some feel that planning for long-term sustainability will destroy competitive advantage because it will slow down the speed of response. In this connection, Johnson and Scholes (2005) have mentioned certain principles of competitive advantage in hypercompetitive market conditions:

- Disruption of status quo in strategic behaviour is not a sign of instability. The ability to constantly 'disrupt for change' can be a core competence.
- Every competitive advantage can be a deterrent to development of new advantages. To secure new advantages, organizations must be prepared to destroy the bases of their own competitive advantage. A leader's willingness to cannibalize the basis of their own success can be crucial for strategic competence.
- Unpredictability can be at times logical and useful. If competitors notice a pattern in the behaviour of another competitor, then they can predict the next moves and quickly learn how to imitate or outplay. So, unpredictability and surprise maybe required for success.
- Competing is necessary but makes winning more difficult. Although, it is absolutely necessary to compete in the hyper competition markets, this also accelerates the speed of hyper competition and makes winning more difficult. But, there is no alternative. Companies have to learn to do things better and faster than competitors.
- Instead of a 'grand plan' in the form of a one-off change in strategy, smaller strategic initiatives, which may appear incremental, but, develop into a longer-term shift in overall strategy, have definite advantages. In such cases, the longer-term impact is not easily discernible by competitors, and, this also allows flexibility in the management of strategy.

Successful Hypercompetitive Strategies

Hypercompetition– The world is changing very fast… big will not beat small anymore… it will be the fast beating the slow. ~Rupert Murdoch

Hypercompetition is a key feature of the new global digital economy. Not only is there more competition, there is also tougher and smarter competition. Hypercompetition is a state in which the rate of change in the competitive rules of the game are in such flux that only the most adaptive, fleet, and nimble organizations will survive. Customers want it quicker, cheaper, and they want it their way. The fundamental quantitative and qualitative shift in competition requires organizational change on an unprecedented scale, and the competitive advantages must constantly be reinvented.

Hypercompetition results from the strategic maneuvering and rapid escalation of competition based on changing dynamics of: price-quality-positioning, protect or invade established product and geographic markets, deep pockets (financial capital), and creation of even deeper pocketed alliances. In order to compete, and irrespective of the size and scope of your competitive advantage, companies must implement their strategies based on finding and building temporary advantages through market disruption, rather than trying to sustain an unsustainable advantage. The term hypercompetition was originated by Richard D'Aveni in his book 'Waking up to New Era of Hypercompetition', in 1997. The hypercompetitiveness concept was originated by Karen Horney,

psychoanalyst, in her theories on neurosis, specifically; highly aggressive personality type who needs to compete and win at any cost as a means of maintaining their self-worth. According to Ms. Horney's theories, these individuals are likely to turn any activity into a competition, and feel threatened if they find themselves losing. Hypercompetitive individuals generally believe that 'winning isn't everything; it's the only thing'…

In the article The Art of Hypercompetition by Glenn Rifkin writes: Is the idea of sustained competitive advantage dead? Richard D'Aveni, Dartmouth College, believes it is; and he says; business has entered a new era of hypercompetition, shifting dramatically from slow-moving stable oligopolies to an environment characterized by a quick-strike mentality on the part of companies aimed specifically at disrupting the competitive advantage of market leaders. Also, he says; traditional strategic concepts are making companies weaker, not stronger, and argues that the old competitive advantages are no longer sustainable over the long haul. Instead, advantages are continually being created, eroded, destroyed and recreated through strategic maneuvering. The old goal, Mr. D'Aveni says, was to increase profitability by legally restraining the level of competition in an industry, segmenting the market, avoiding head-to-head competition, and raise the barriers of entry around their markets. Today, he points out, this strategy is literally impossible. He says four driving forces are contributing to new era of hypercompetition: customer changes, including fragmenting tastes; rapid technological change; falling geographic and industry boundaries as markets globalize, and deep pockets among competitors due to the rise of giant global alliances in a raft of industries. The way to win in today's market is to obsolete the advantages of the market leaders. The barriers for entry to most markets are weak, and the unconventional player can attack suddenly from outside the market with unexpected methods, often with devastating effect. Despite these new parameters, Mr. D'Aveni suggests that long-term dominance of an industry is still possible even though sustainable advantage has gone by the boards. It is possible to win in hypercompetition by mastering the art of dynamically repositioning oneself in four key arenas: price/quality, know-how/timing, stronghold creation/ invasion, and deep pockets. For a company to sustain its success in the hypercompetitive era, Mr. D'Aveni says, it must be willing to take more risks than ever before. The old business model that focused on, such issues as; culture, human resources, structure and infrastructure, objectives, and strategy may now be outmoded, he says. Instead, what is needed is a new set of guidelines that provides a vision for generating the next market disruption. Mr. D'Aveni labels these as; stakeholder satisfaction, strategic soothsaying, speed, surprise, signals, shifting the rules, and simultaneous or sequential strategic thrusts.

In the article Winner Takes It All: Why We're Competitive by Kathryn Williams and Divine Caroline write: We're all hardwired to compete. Evolutionarily speaking, that's why we're here– because we've competed over resources and mates, and we've won. At least our genes have. It's a dog-eat-dog world, kill or be killed, survival of the fittest, the fight in 'fight or flight'. But the fact that you have to run faster than the person on the treadmill next to you is not all inborn. As is becoming increasingly clear in the nature-nurture debate, most personality traits are an organic product of both genetic inheritance and learned behavior. Perhaps our genes are telling us to earn more and produce faster, but competitiveness is also instilled by our individual upbringings and society as a whole. Competition is healthy when it's an incentive for improvement. We see this in business all the time. Competition for customers creates healthier, more efficient, more responsive, and more innovative companies. In evolution, competition for resources creates stronger, more robust and smarter species. When winning 'is at all costs'; it's hypercompetitiveness. Karen Horney, psychoanalyst, theorized hypercompetitiveness as a form of neurosis in 1937 and linked the trait to self-worth. Today we see it played out by professional athletes who run their bodies into the ground in the name of the game, or in girls or boys who suffer from eating disorders. The repercussions of hypercompetitiveness are not only economic or emotional, but also social. Hypercompetitiveness can be interpreted by others as aggression or uncooperativeness, resulting in a loss in trust. Sometimes there are reputation benefits to 'taking one for the team'. By opting out of competition in the short run, you may benefit in the long. Roughly speaking, you lose the battle to win the war. The next time the inner voice urges you to 'go, fight, win'; consider what you stand to win and lose.

In the article Winning at All Costs by Rob Spiegel writes: 'Winning at all costs' may sound like good business advice, but it's not. Maybe your business idea just isn't going to fly and you'd be better off

trying something else. Or, maybe lower your prices to beat competition will cut into your profits more than your business can stand. Vince Lombardi, football coach, famously said, 'winning is the only thing that matters in sport'. Like many sports clichés, the quote gets applied in business as well. Business is competitive like sports, so clichés about winning transfer naturally to cutthroat entrepreneurialism. Similar quotes about competition take Lombardi's thoughts even further: 'Do whatever it takes to win', and the horrifying; 'If you're not willing to cheat, than you don't want to win bad enough'. While Lombardi's quote is morally challenging– it may be offensive to the new breed of education experts who shy from playground competition on the grounds that some kids have to lose– when it comes to sports, Lombardi is indeed correct. But the idea that 'winning is everything' is not correct in business. 'Win at all costs' is not good business advice. There are some products and services in business that deserve a quick and tidy death, and the 'win at all costs' mentality can keep a hearty entrepreneur hanging on to an idea that isn't worth the dogged determination implicit in the clichés about winning. Sometimes the entrepreneur needs to let go of a bad idea, and instead consider; 'If at first you don't succeed, try and try again.'

In the article HyperCompetition and Differentiation it is written: For a company to stay competitive it must innovative: delivering novel and advanced products and services for which there is little or no equal in the marketplace. But is that enough in our global economy? Absolutely not: Innovations can and do get copied, imitated, and downright stolen; if you create something that you consider truly innovative, it would be wise to keep the champagne bottles corked and the cigars unlit because chances are, you're not the only one and you can bet you life that you won't be for long, if you happen to be… So, what is the true differentiator that enables one company to win over another? One very simple word: Agility. Agility simply means; the ability to create and deliver value faster than the competition. Notice I didn't say– 'create and deliver innovation faster than competition', since innovation does not necessarily equal value. There is a lot of focus in companies to do more with less, to lower the cost of development, factor TCO, ROI… Sometimes the focus on cost is so myopic, regardless of how much less it costs to develop innovation, if competition delivers first and can continually improve and advance faster than you, then cost savings don't hold as much relevance. The true mission of any player in a competitive environment is agility. It is a basic characteristic of life; the agile of the species survive, the less-than-agile die.

Essence of strategy is building competitive advantage, but in a world of hypercompetition, no competitive advantage is sustainable. Hypercompetition is 'an environment in which advantages are rapidly created or eroded', says Richard D'Aveni. If you're the market leader, then in a few years you could become a 'has-been'. If you're a challenger facing an entrenched competitor, then there is hope that you can match and overtake your rival. While a traditional approach to strategy emphases the creation of competitive advantage: Richard D'Aveni takes an alternative view, he says; strategy is about creative destruction of the opponent's advantage. The presence of one hypercompetitive business in the market is enough to tip the entire industry into hypercompetition because competitors are forced to react to the threats. According to Paul Simister; much of what Richard D'Aveni proposes can be seen as a direct challenge to the ideas of Michael Porter on competitive strategy. However, there is a place for both strategies, for example; some industries go through periods of radical change in a very short time-scale– think technology products; e.g., laptops, smartphones, iPads… Other industries slowly evolve; e.g., Coca Cola and Pepsi date back to late 19th century but still dominate the soft drinks industry, globally. Clearly, the same theory of strategy and competition will struggle to fit both market conditions: Hypercompetition challenges conventional strategic thinking and requires a dramatic shift in traditional strategic planning. To develop a hypercompetition business strategy, a company uses counter-intuitive paradoxical logic. There are two basic types of strategic paradox in hypercompetition business situations; 'coming together of opposites' and 'reversal of opposites'. Hypercompetition changes the traditional strategic thinking paradigm, requiring a company to act in ways that appear to be in opposition to its own self-interest. The golden rule of hypercompetition would be; do it unto yourself before the competitors do it to you…

4.7 COMPETITION ANALYSIS

The real significance of competition or competitor analysis has been shown by the Japanese companies. There are many reasons why Japanese automobile companies were able to penetrate the US market successfully in the 1970s. But, one of the most important reasons is that they were much better at doing competitor analysis than US companies. Halberstam (1986) has aptly described the Japanese efforts at competitor analysis in the US market. They came in groups... They measured, they photographed, they sketched, and, they tape-recorded everything they could. Their questions were precise. They were surprised how open the Americans were. The Japanese similarly studied the European market, particularly the design and engineering of the automobile manufacturers. In contrast, the Americans were late even at recognizing the competitive threat from Japan and were never so good in analysing the competitive environment they were going to face.

Competition analysis can be divided into two main parts: one, identifying the existing and potential competitors, and two, understanding and evaluating competitors. To properly structure competitor analysis, one can start with a set of questions on identifying competitors and understanding and evaluating them.

COMPETITOR ANALYSIS.

A thorough analysis of the competitive environment can provide a strategist with many insights into current and future characteristics of the competitors and their strategic moves. The competitor analysis deals with the actions and reactions of individual firms within an industry or strategic group.

According to Porter, the purpose of conducting a competitor analysis is to:

(a) determine each competitor's probable reaction to the industry and environmental changes;

(b) anticipate the response of each competitor to the likely strategic moves by the other firms; and

(c) develop a profile of the nature and success of the possible strategic changes each competitor might undertake.

The competitor analysis is carried by firms competing in an industry with just a few firms possessing relatively equal capabilities. Competitor analysis is conducted by the firms operating in oligopolistic industries, to closely monitor and analyze the strategies, actions and moves of each competitor in the industry, to withstand to competition by making counter strategies and plans.

The competitor analysis tries to gather information on the following aspects:

(a) List of competitors of the firm.

(b) Competitors' current strategies and moves.

(c) Competitors' future goals and likely strategies.

(d) Objectives and intentions of the competitor.

(e) Strengths and weaknesses of the competitors.

(f) Likely response or retaliation of the competitors for firm's actions and strategies.

Knowledge of competitors' goals and objectives may help to predict its reactions to strategic moves and enable the firm to deal with environmental or industry events that occur.

SOURCES OF INFORMATION ABOUT COMPETITORS

For effective competitive intelligence and, also for sending and receiving market signals, companies should try to have access to information about competitors—what they say about their plans, policies and strategies and, also about other competitors. The starting point for this is to have good knowledge about various sources of information about competitors—primary as well as secondary. Six major sources exist for information about competitors:

- Public sources
- Trade and professional sources

- Channel members
- Customers
- Investors, bankers and shareholders
- Government (central/state)

Public sources include advertising, promotional materials and press releases by companies/ competitors. Newspaper articles and reports provide a good source of information about what competitors have to say about themselves. Companies, however, should scan such information because these may be biased or, sometimes, even distorted.

Trade and professional sources include annual reports, seminar papers, technical articles and manuals prepared by companies/competitors. Such sources may give useful information on future plans, growth prospects, technology/technical innovations, production processes, capacity utilization, etc. Ratings (change in rating) by credit rating agencies provide a critical market barometer or index of company/ competitor information.

Channel members include distributors, wholesalers and retailers and are good source of primary information about competitors. From time to time, retailers can give very useful information about which products/brands are moving fast or slow and why, which companies/competitors are giving special incentives to retailers for pushing their products/brands, etc.

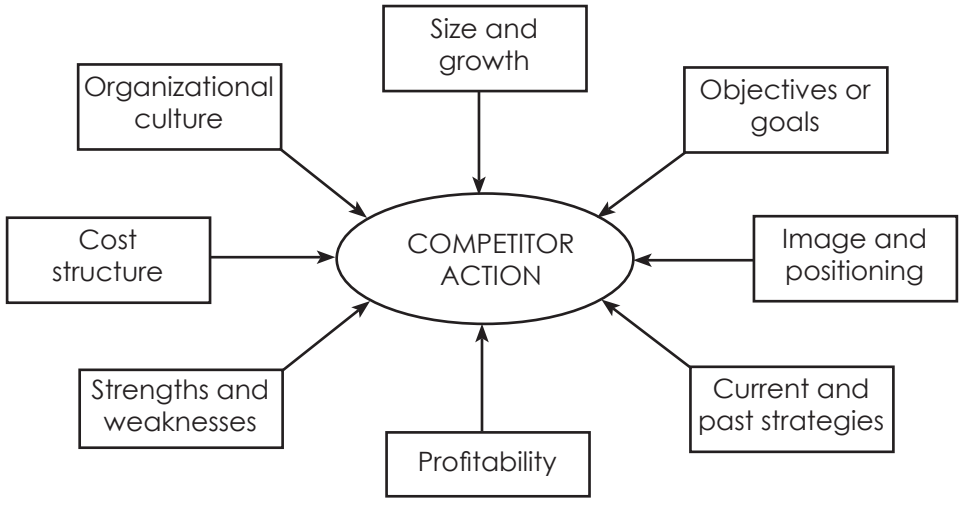
Customers are the most primary source of information on competitors' products/brands, perceived value, price structure and discount policies, special payment schemes, etc. Such information can be particularly useful and effective for industrial products and consumer durables.

Investors, bankers and shareholders express their opinion about companies in annual meetings (AGMs) and investors (non-equity or debt) meetings. AGM is a good forum where shareholders publicly express their views/complaints about functioning and performance of companies. Companies' bankers can give vital information about their financial health—strong or weak and developing financial symptoms.

Government (central/state) sources include offices/departments of excise, customs, income tax, sales tax, registrar of companies, company secretaries, etc. All companies/competitors have to submit periodic reports/returns to these departments. Effective company intelligence can make these useful sources of information about competitors.

UNDERSTANDING COMPETITORS

Competitor actions are governed by many factors. More important factors are objectives or goals, size and growth, organizational culture, strengths and weaknesses, cost structure, profitability, image and positioning, and current and past strategies. Each of these factors are analysed in the following figure.



Factors governing competitor action

Objectives or goals: An understanding of competitor objectives or goals provides a basis for knowing or predicting whether a competitor's present performance is satisfactory or unsatisfactory, or, whether strategic changes are likely in competitor's move. The financial objectives of a competitor can indicate the competitor's willingness or otherwise to invest in the current business further. It is essential to know what are the competitor's objectives with respect to sales growth, market share and profitability. Non-financial objectives are also important. Does the competitor want to become a technological leader? Or, is it planning a general expansion or diversification or merger or acquisition? An analysis of the objectives or goals of a competitor provide a good indication of the competitor's possible future strategy.

Size and growth: A company's or a competitor's strategic actions are strongly influenced by its size and, also its growth process. In terms of size (measured in terms of sales or market share), a competitor can be the market leader, No.2, No. 3 or No. 4 player or the smallest or weakest competitor in the market or industry; and, the size would determine the competitor's relative dominance in the market. The weakest competitor's strategy or action has hardly any significance for others, but, the leader's strategy, most of the time, sets the tone or trend in the market.

Size is related to growth; without growth, size cannot be sustained. If a company is not growing or not even stable, that is, its sales or market share is declining, the company is following a losing strategy, and, therefore, it does not attract much attention from other competitors. When Maruti was fast growing in the Indian automobile market, Padmini was steadily losing market share, and, nobody was interested in knowing Padmini's marketing strategy because it was almost inconsequential.

Organizational culture: A company's/competitor's objectives or goals and also growth are generally influenced by its organizational culture. Organizational culture refers to the top management's approach to management and decision making—formal/informal approach, professional virtues, human values, etc. An organization's culture, along with structure and systems, has a strong influence on strategy. It is, therefore, useful to analyse a competitor's organizational culture to understand its strategic actions.

Strengths and weaknesses: Competitor's strengths and weaknesses provide the most critical inputs to a company's strategy-building process; because, as a standard strategy, a competitor's weakness should be exploited and strengths should be neutralized. It is also said that a competitor's weaknesses are your strengths and its strengths are your weaknesses. Therefore, understanding competitor's strengths and weaknesses is the key to securing competitive advantage in the market.

We give here an example of how correctly understanding a competitor's strength and neutralizing it gives competitive advantage to a company. Canon showed this in its battle with Xerox. Xerox's competitive advantage was built on its service and support network. Canon designed a copier which needed far less servicing, and, through this, made one of the strong competence areas of Xerox largely redundant. In the process, Canon also achieved cost efficiency by spending much less on its service network.

Cost structure: Cost structure of a company or competitor indicates its price competitiveness and its ability to withstand or enforce price competition. Objectives of a company should be to obtain information about a competitor's fixed cost and also variable cost. This would enable the company to ascertain the 'break-even' of the competitor, and, also, whether it is likely to enjoy some economies of scale or it is planning any cost efficiency measure. If a competitor becomes cost efficient, its competitiveness increases. We have just given the example of Canon above.

Profitability: Cost structure gives an indication of profitability, and, profitability has important implications for investment and future growth; A profit-making company has high credit rating in the market and easier access to capital, both internally and externally for new investment. New investment implies new strategy for growth and diversification, and, analysis of this is very important to know emerging competitor action. A loss-making company has hardly any market impact in term of strategy and action. It may, however, still have some usefulness. Some companies may like to analyse a losing or failure strategy to learn from it.

Image and positioning: A company's image is a major promotion by itself. Correct positioning makes a product stronger in the market, and this applies typically to consumer goods. A competitor's image and particularly, positioning information, can be obtained by closely observing and studying its products brands, packaging, advertising, etc. The objective is to ascertain how strong is the competitor's product/brand compared to the company offering. For example, the global strategy of Gillette is driven by 'the best a man can get', slogan. This is a very strong positioning.

Current and past strategies: Various factors mentioned above, directly or indirectly, influence strategy of a company or competitor. Both present and past strategies are important. If the past strategy was successful, the competitor is likely to persist with that. If the past strategy was unsuccessful, the competitor would be working on a new or modified strategy. In either case, it gives a useful insight into the competitor's strategic thinking. Current strategies, however, are more significant because these would affect others in the market more directly. If a competitor is launching a product or market expansion strategy, it will be an immediate threat to others.

A competitor might launch a price offensive to snatch market share as Times of India did against Hindustan Times in Delhi market during 1994. Other competitors have then to decide whether to retaliate by plunging into a price war or fall in line. In this case, Hindustan Times finally decided to match TOI/ price to prevent a price war.

All the eight factors mentioned above may not uniformly apply to all competitors or companies. Relative significance of the factors would depend on organizational situations. Even the relevance of some of the factors would depend on particular organizations. For example, 'growth' factor would not apply to competitors who are new entrants; same applies to organizational culture, profitability, past strategies and, also strengths and weaknesses to some extent. This, however, does not eliminate or minimize the need for analysing or understanding competitors who are new entrants.

STRENGTHENING COMPANY'S POSITION

Ohmae suggested four ways to strengthen the company's position relative to that of its competitors:

(a) Intensify functional differentiation (key factors of success)

(b) Exploit competitors weaknesses (relative superiority)

(c) Ask-why-why (aggressive initiatives)

(d) Maximize users benefits (strategic degree of freedom)

Focusing on Key Factors of Success: Key success factors are those variables that can affect significantly the overall competitive positions of all companies within any particular industry. They typically vary from industry to industry and are crucial to determining a company's ability to succeed within that industry. In order to strengthen position, where resources are limited, the firm should concentrate on key functional areas or operating areas to attain success. The key success factors are usually determined by the economic and technological characteristics of the industry and by the competitive weapons on which the firms in the industry have built their strategies. There are two approaches to identify the key factors of success. The first is to direct the market as imaginatively as possible to identify the key segments, the other is to discover what distinguishes successful companies from losers and then to analyze the differences between them. The key factors of success of different industries may lie in different functions, areas, distribution channels and so on.

Building on Relative Superiority: Competitive advantage is a special case of strategic advantage, where outperforming rivals in profitability or market standing is needed. A firm can compare its products with that of its competitors in order to identify the product superiority. In order to understand competitive positioning, we can visualize a situation in which a firm has to compete in a market with other rivals. What the firm does is to differentiate its products or services on some tangible basis from what its rivals have to offer so that the customer purchases the products even at a premium. Differentiation is the competence of the firm to provide unique and superior value to the buyer in terms of product quality, special features or after sales service.

Pursuing Aggressive Initiatives: A third alternative to gain competitive advantage to initiate an aggressive search for improvements is to relentlessly challenge the prevailing assumptions with a single question 'why'till major breakthroughs are achieved. In some business situations a statement appears when the older key factors of success no longer hold any competitive advantages. This approach has enabled excellent breakthroughs in products, processes and services. As Ohmae suggests, the results of this land of change in the direction of strategic thinking can be spectacular. The basis of such approach is always to confront what is taken for granted in an industry or business with the simple question 'why'.

Exploiting Strategic Degree of Freedom: This is the last route, suggested by Ohmae, to superior competitive performance. There can be situations when due to operational and resource constraints, there may be limited scope for improvements in a given key factor of success. The concept of strategic degree of freedom helps in tackling such situations to maintain the edge.

4.8 COMPETITION AND COLLABORATION

Collaboration is a strategic alliance typically between two firms with the goal of providing mutual benefit for each firm. Collaborating with your competitors is like a double-edged sword. Sharing between firms is a smart strategy as long as the relationship is give-and-take and is one that will benefit both parties without compromising each of the firm's competitive position in the industry. Firms must be careful in what information is shared across this delicate communication trail.

To borrow a line from the Godfather, "keep your friends close, but your enemies closer". Although are infinite possibilities arising from collaborations, be wary of the risk of sharing knowledge with the enemy when it is core to your firm's competitive competencies.

Types of competitive collaboration

1. Joint Ventures
2. Outsourcing agreements
3. Product Licensing
4. Cooperative research

Collaboration is competition in a different form. Companies have to enter collaborations knowing that competition still exists. They must **have clear strategic objectives**, and understand how their partners' objectives will affect their success.

Harmony is not the most important measure of success. Most successful alliances do not always have win-win scenarios. As competitive competencies develop**, conflict will arise** between the partners over who has the right to the rewards of the partnership.

Cooperation has limits. Companies must defend against competitive compromise. Companies need to make sure that employees at all levels understand **what corporate information is off limits** to the partner. Compromising too much information can make you vulnerable to losing market share to your partner.

Learning from partners is paramount. Remember that Asian companies focus on learning, while Western companies want to demonstrate their superiority and leadership. This provides partners with knowledge that will benefit them in the long-term. You cannot make a Western company want to learn. Western companies have certain arrogance after decades of leadership that detracts from their ability to learn.

Why collaborate?

1. Gain technological advancement at a relatively low cost.
2. Gain market access at a low cost.

3. Gain insights into the partner's business practices and strategies.
4. Strengthen competitive advantages or core competencies.
5. Develop benchmarks through examination of the practices of the alliance firm.

Three situations can result in mutual collaboration is most successful:

1. The partners' strategic goals converge while their competitive goals diverge.
2. The size and market power of both partners are modest compared with industry leaders.
3. Each partner believes it can learn from the other and at the same time limit access to proprietary skills.

Companies may think it devious to partner with a competitor to "steal" their secrets and use them to their advantage. However, forming a strategic alliance is usually beneficial to both parties, each contributing what they know and learning what they need to know from the other company to accomplish a goal that is not possible otherwise.

Risks of collaboration

Competitive Collaboration can strengthen both companies against outsiders, however it has triggered unease about the long-term consequences.

Western firms commonly exhibit a lack of strategic intent in collaborative efforts. Western firm's primary goal is often cost reductions when entering into a collaborative agreements. The strategic intent problem is amplified by the fact that Western firms generally place little or no emphasis on learning from the alliance partner. It is believed that Western firms often seek "quick and easy" fixes to organizational problems when they enter into a collaborative situation.

Western firms often take on the teacher role in a collaborative situation and are quick to

demonstrate and explain aspects of their business strategies and competitive advantage. The contribution of a Western firm in a collaboration effort is often in the form of technology and is relatively easy for the alliance firm to transfer. In many instances, Western firms are less skilled at limiting unintended competency transfer than their Japanese counterparts. As a result:

1. A firm's competitive position may weaken relative to the alliance firm through operations or strategic revelations.
2. Unintended competencies are transferred or compromised.
3. Dependence on the alliance firm often increases.
4. Employees "go native" while working on the alliance partner's turf.

One partner does not always have to give up more than it gains to ensure the survival of an alliance.

How to Build Secure Defenses

Companies that benefit most from these alliances usually adhere to a set of principles.

1. Collaboration is competition in a different form. Successful companies do not forget that there is a possibility for their partner to be out to harm them. They enter strategic alliances with clear strategic objectives, and in turn they understand how their partner's objectives will affect them.

2. Harmony is not the most important measure of success. Occasional conflict may be the best evidence of mutual benefit.

3. Cooperation has limits. Companies must defend against competitive compromise. Successful companies inform their employees at all levels about what skills, technology, and information can be shared with their partner and what is off-limits. These companies also monitor what their partner requests and receives.

4. Learning from partners is paramount. Successful companies view each alliance as a window on their partner's capabilities. They use these alliances to build skills in areas outside their formal agreement then diffuse these skills throughout their organization.

Alliances run smoothest when one partner is intent on learning and the other is intent on avoidance, or when one partner is willing to grow dependent on the other. Such positioning renders itself to the traditional methods of outsourcing, wherein a large firm gives a smaller firm the information necessary to produce a defined item for the parent firm. Examples of this include Siemens buying computers from Fujitsu, or Apple buying laser printer engines from Canon.

Mergers fail when distrust and conflict spoils the relationship. Japanese firms tend to collaborate for very different reasons than their Western counterparts. Western firms typically have a **technology** to transfer, whereas Asian companies most often have a **competence**, like manufacturing expertise. There have been very few mergers between Korean and Japanese firms, since both countries seek to improve their weaknesses without revealing much to the partner. An alliance in which one side avoids investment and the other side seeks to learn work out the best.

Principles to adhere to for successful collaboration

- Alliance should be a learning experience. Western firms tend not to expect to learn from Asian partners.
- The purpose and scope of an alliance must be understood by all employees in order to limit a partner's access to competitive information. Asian companies protect proprietary information from being shared with a partner. Western firms seldom limit the scope of information to be passed to the partner due to lack of communications. Top management and lawyers put together cooperative agreements, but technology transfer takes place within the organization.
- Skill complexity determines how easily each partner can internalize new skills. Asian companies often contribute manufacturing skill to an alliance, which tends to be a nontransferable competence. Production skills often result from a complex web of employee training, integration with suppliers, statistical process controls, employee involvement, value engineering and design for manufacture. Western firms tend to contribute a discrete, standalone technology that is more easily learned and mastered by Asian partner.

  The partners' strategic goals converge while their competitive goals diverge. By this, Chrysler and GM should never collaborate to build a truck or van, because both are strong players in that identical market. However, if Microsoft can become a stronger software firm through an alliance with a hardware firm, a partnership is reasonable.
- Size and market power of both are modest compared with industry leaders. For a smaller firm, it gets hard to leave the comfort of a large firm's nest, even after you could begin to fly on your own.
- Each partner believes it can learn from the other and at the same time limit access to proprietary skills. To be a leader in any endeavor, you must possess certain competitive advantages over competitors.

In order for a strategic alliance and collaboration to be successful is for both parties to be able to transfer something distinctive to the other party: basic research, product development skills, manufacturing capacity, access to distribution.

Remember that collaboration is competition in a different form; that harmony is not the most important measure of success; that cooperation must be limited to avoid against competitive compromise; and that learning from partners is paramount to success.

COMPETITIVE POSITION ANALYSIS

Competitive position has been highlighted by Simmonds as the basic determinant of future profits and of the business's value. Since competitive position can change over time, so can profits and value, but it should not be assumed that an improvement in competitive position will be associated with an improvement in short-run profits. In fact, the opposite is likely to be the case due to the cost of building up a competitive position, which depresses current profits in favour of future profits. This raises the question as to whether competitive position can be measured in accounting terms - not just for a given business but also for its main competitors, and not just at a point in time but also over time. Simmonds has attempted to do this by applying Strategic management accounting. He makes it clear, however, that it is not possible to express competitive position as a single figure. But it is possible to offer an array of indicators relating to the competitive situation which will give managers insights into a business's competitive position. Simmonds recommends that competitive data is built up for the market leader, close competitors and laggards rather than for all competitors.

Sales and Market Share Sales revenue of each firm relative to the total market is a cornerstone. Changes in market share should be closely monitored for the indicate changes in competitive position, with implications for future profits. Adding market share details to Management accounting reports enables managers to make more sense of what is happening.

Volume and Demand The incorporation of market share assessment into management accounting seems one of the most obvious steps in moving towards Strategic management accounting. A great deal of effort has also been expanded in trying to identify a standard product life cycle and relate strategy.

Price Experience Variation in costs from those of competitors are not the only indicators of strategic advantage or vulnerability. A competitor may use price policy to gain market share or to gain higher profits. Under inflation, most real price reduction takes place through firms holding prices while costs escalate or raising prices less than the cost inflation. Moreover the timing of price setting and hence strategy review-is forced upon management by the rate of inflation rather than chosen as part of the strategy. External reconstruction of competitor costs requires skill and imagination, collection of competitor prices is much more straight forward. Of course, few competitors sell just one product at one price, but it should not be difficult for strategists to build a weighted price index for a competitor. Where competitor revenues are also available, these may be used as to check the accuracy of such an index or as an alternative in the calculation.

Return on Competitive Position The capital expenditure decisions of a firm are, perhaps, its most important decisions. The scarce resources of capital is allocated to investments from which benefits or returns are expected over a period of time. Consequently the future success and profitability of the firm are dependent upon investment decisions made previously. Return from investment in competitive position will differ according to the future demand pattern. In a high growth market, for example, the doubling of accumulated experience is rapid and the opportunity for correspondingly high cost reduction is equally great. A firm that can increase its market share in high growth market stands to gain considerably it is also possible that the cost of doing so will be low because the gain is achieved from the market growth without taking business away from competitors. In many situations, competitors are only aware of competitive attack when their sales fall.

Resources, Cash Flow and Portfolios Any decision should reflect on assessment of the effect on competitors' profits and market share extended to forecast the pattern of conflict over the longer term. This pattern of conflict will, in turn, depend on competitors resources and liquidity as well as their profits. Sometimes, competitors will lack of resources to retaliate; at other times some competitors will be protected with in a profitable market segment and will remain unaffected by competitive attack. More than any other business function, Strategic management has the skill for such competitor assessments. The skill needed amounts to accounting for competitors, from outside, and projected a head to suitable horizon.

4.9 VALUE CHAIN ANALYSIS

With highly competitive environment, the organizations are aiming to be 'customer driven' i.e. customer satisfaction is priority one. One of the key tools in the hands of the management to achieve above aim is 'value chain analysis'. The term '-value' refers to the usefulness of the product or service and as a result its value to the customer. Value engineering aims to reduce non-value added costs by reducing the quantity of cost drivers of non-value added activities. The value of an organization depends upon the activities of the organization. Value is the amount buyers are willing to pay for what a firm provides them. The total revenue reflects the value. Creating value for buyers exceeds the cost of doing so is the goal of any generic strategy.

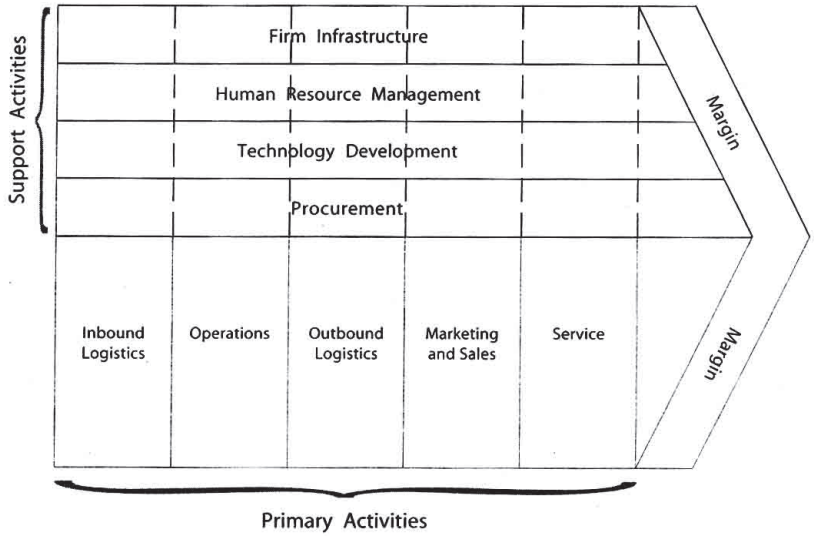
Value chain is defined as "the linked set of value-creating activities all the way from basic raw material sources for component suppliers to the ultimate end-use product or service delivered to the customer."

Value chain analysis is defined as "a means of segregating various activities of a business and identify them with respect to their contribution towards value generation by identifying the cost i.e. inputs consumed by that activity and output generated by that activity."

The value chain approach was developed by Michael Porter in the 1980s in his book "Competitive Advantage: Creating and Sustaining Superior Performance."

'Value chain analysis' is a strategic managerial tool to assess and review the various business functions in which utility is added to the products or services. The various business functions include research and development, design of products, services or process, production, marketing, distribution, customer service and strategy and administration. Value chain analysis not only describes these as an essential and valued contributor but also integrates and coordinate the efforts of all these business functions in addition to developing the capabilities of each individual business function. By this way value chain analysis helps the management towards proper planning, operation, performance evaluation and decision making.

PORTER'S VALUE CHAIN



Value Chain Activities

Porter depicts the value chain, comprising the above interrelated primary and secondary activities, shown in the above figure. Porter classified the full value chain into nine interrelated primary and support activities. Primary activities can be related to actions which the organization performs to satisfy external demands while secondary activities are performed to serve the needs of internal 'customers'.

(i) Primary activities are the fundamental activities performed by an organization in order to be operative. They are: (a) Inbound logistics, (b) Operations, (c) Outbound logistics, (d) Marketing and sales and (e) Service.

(ii) Secondary activities are support activities, i.e. those activities required to ensure the efficient performance of the primary activities. Support activities are: (a) Infrastructure, (b) Human resources management, (c) Technology development, and (d) Procurement.

In contrast, the customary functional divisions within businesses are principally: warehousing, production, marketing, distribution, and administration.

This view is normally reflected in the hierarchical structures along which organizations are organized. It fails, however, to reflect the processes which the organization executes to service its customers and represents a more vertical perspective of an organization.

The different value chain activities can be briefly described as follows:

Primary Activities

Inbound Logistics - Inbound logistics cover all the activities performed to have goods and services available for the operational processes as and when they will be required. This may include buying, transport, receiving, inspection, storage, etc.

Operations - These are the operations the organization performs to convert its raw materials or products into a state for resale. In the case of a manufacturing concern these may be various production-related activities such as production control, machining, finishing, etc. For a retail business these maybe the merchandising and display activities used to offer goods to customers for sale.

Outbound Logistics - These are the activities performed to move merchandise between the seller and the purchaser. They may include selection, scheduling, transport, etc. of deliveries. Some businesses such as cash-and-carry wholesalers may not have such activities as these tasks are performed by the customer.

Marketing - This includes all the activities performed to create demand for the organization's products and services and includes advertising, sales, market research, etc.

Service - It pertains to the services rendered to the customer. These include financing services such as financing the outstanding balance, or after-sales service to products, or services to handle customer queries and complaints, etc.

Support Activities

Infrastructure - This consists of the management structure which services the whole organization as well as structures such as reception, general postal services, messengers, financial accounting and other general activities. An attempt to trace these costs to any specific cost object will result in an inordinate amount of work. The total amount of such cost should be relatively small in comparison with total cost and this cost is usually considered to be untraceable. The cost of the physical infrastructure (plant, equipment, etc.) is considered part of the cost of activities where the infrastructure is used.

Human Resources Management- This is the basic activity of overseeing the acquisition, maintenance and severance of staff and principally services the primary activities. Personnel departments, in-house medical services and even sports clubs may be part of this major activity.

Technology Development - The development of technology today may require large sums of money, take place over a lengthy period of time and ultimately benefit a multitude of users in the organization. This cost must thus be seen as any capital project which cannot be charged to users before the project is operative. Technology development cost could thus be capitalised and expensed to users over the useful life of the project. Cost of operating technology must, however, be traced to users on a usage basis. An example may be a large computer project which may take several years to complete. Users will only benefit from the project once it is operative and there is no point in charging this cost before such time.

Procurement - The procurement activity services the organization as a whole by acquiring all necessary goods and services which the organization may require. If the activity is specifically related to the acquisition of, say, raw materials it could be seen as part of the inbound logistics process, i.e. a primary activity. If, however, the procurement activity cannot be linked to purchases for primary activities, it will be considered a secondary (support) activity.

The above value chain activities can, to a greater or lesser extent, be found in most businesses. The value chain serves as a useful mechanism to analyze an organization in order to determine what activities it performs to convert inputs .to outputs. It also helps to develop a good understanding of the primary and support activities.

Value chain analysis is a powerful tool for managers to identify the key activities within the firm which form the value chain for that organization, and have the potential of a sustainable competitive advantage for a company. There in, competitive advantage of an organization lies in its ability to perform crucial activities along the value chain better than its competitors. The value chain framework of Porter is an interdependent system or network of activities, connected by linkages. The linkages and relationships such between various activities are often the basis on which competitive advantage is achieved. This also applies to linkages of the value chain of an organization with those of its suppliers, channels and customers. Resource analysis is an important means of assessing an organization's strategic capacity. Traditionally, much of the discussion on resource analysis has centered on the idea of strengths and weaknesses. The concept of 'value chain is particularly useful in understanding an organization's capability. Since it concentrates on value activities and the linkage between activities, rather than simply resources per se. An organization can be viewed as a flow of activities performed to provide products or services to the customer.

The concept of value chain concentrates on value activities and the linkage between activities for understanding an organization's strategic capability, rather than simple resource analysis. Firms competing into the same industry sector are likely to have similarly configured value chains. Linkages between activities would be vital in creating competitive advantage. Linkages exists within the firm, both horizontally and vertically and outside the firm with suppliers and customers. Identification of core or key competencies should help an organization to decide about which products and services, it should produce or perform in-house and which it should source from outside. Analysis of costs through the value chain is an important aspect of value chain analysis and design to provide essential data to search the competitive advantage and strategic capability.

Firms create value for their customers through performing activities mentioned in the value chain. To gain competitive advantage over its rivals, a firm must either provide comparable buyer value by performing the activities more efficiently than its competitors (cost leadership) or perform activities in a unique way that creates greater buyer value and command a premium price (differentiation). A firm's value chain is an interdependent system of network of activities, connected by linkages. Gaining competitive advantage requires that a firm's value chain is managed as system rather than a collection of separate parts. A firm should strive to understand not only its own value chain activities but also of the competitors, distributors and suppliers.

The value chain concept highlights four profit improvement areas:

(a) Linkages with suppliers

(b) Linkages with customers

(c) Process linkages within the value chain of a business unit

(d) Linkages across business unit value chain within the firm.

The concept has been extended beyond individual organizations and can also apply to whole supply chains and distribution networks. The industrywide synchronized interactions of those local value chains create an extended value chain, sometimes global in extent.

An enterprise's activities convert inputs into outputs; value is added to inputs in order to convert them into outputs (products and/or services) which are purchased and used or consumed by customers. The chain of activities that is performed to add value to inputs in order to arrive at the final outputs is referred to as the 'value chain'. This concept was originally identified and defined by Porter. If an enterprise wishes to enjoy a competitive advantage it must carry out its activities in a more cost-effective way than its competitors do. It is therefore clear that such an enterprise needs to have a value chain in which:

(i) there are a minimum number of activities,

(ii) all activities are effective, and

(iii) all activities are performed at a relatively low cost.

Methodology

Steps in value chain analysis can be broken down into three sequential steps:

(a) Breakdown the organization into its key activities under each of the major headings in the model.

(b) Assess the potential for adding value via cost advantage or differentiation or identify current activities where a business appears to be at a competitive advantage.

(c) Determine strategies built around focusing on activities where competitive advantage can be sustained.

The ability of a company to understand its own capabilities and the needs of the customers is crucial for a competitive strategy to be successful. The profitability of a firm depends to a large extent on how effectively it manages the various activities in the value chain. The value chain framework is a handy tool for analyzing the activities in which the firm can pursue it's distinctive core competencies, in the form of a low cost strategy or a differentiation strategy.

The nature of value chain activities differ greatly in accordance with the types of companies and industries. The concept of value chain concentrates on value activities and the linkage between activities for understanding an organization's strategic capability, rather than simple resource analysis based only on strengths and weaknesses.

As per Porter, a value chain is a chain of activities. Products pass through all activities of the chain in order and at each activity the product gains some value. The chain of activities gives a product more added value than the sum of added values of all activities. The costs and value drivers are identified for each value activity. The value chain framework is a powerful analytical tool for strategic planning. Its ultimate goal is to maximize value creation while minimizing costs.

Limitations of Value Chain Analysis

The important drawbacks of value chain analysis are as follows:

(a) Finding the costs, revenues and assets for each value chain activity poses/gives rise to serious difficulties. There is no scientific approach and much depends upon trial and error and experimentation methods.

(b) Value chain analysis is not easily understandable to all employees and hence may face resistance from employees as well as managers.

(c) Internal data on costs, revenues and assets used for value chain analysis are derived from financial information of a single period. For long-term strategic decision-making changes in cost structures, market prices and capital investments etc. may not be readily available.

(d) Isolating cost drivers for each value creating activity, identifying value chain linkage across activities and computing supplier and customer profit margins present serious challenges.

(e) Identifying stages in an industry's value chain are limited by the ability to locate at least one firm

that particulars in a specific stage.

(f) Value chain analysis is not an exact science. It is more an 'art' than preparing precise accounting reports. Certain judgment and factors of analysis are purely subjective and differ from person to person.

4.10 GAME THEORY

Game theory becomes relevant to the analysis of business decision making when there are relatively few firms playing a game. Where there are many competing firms, your firm is not affected in any significant way by the actions of any other single firm, and your actions have no significant impact on others. In these circumstances, it is reasonable for firms to act in ways that ignore the possible responses that others might make to their actions.

The existence of interdependence does not, of course, necessarily imply that firms will behave in ways that take that interdependence into account. They may simply ignore it, assuming that whatever they do will not elicit responses from others. Or put another way, in selecting from the options open to them, firms may not consider what option choices their competitors are making.

Game theory introduced

Origins of game theory

Game theory has its antecedents in military theory, and can be found – implicitly, at least – in many treatises on warfare strategies from early civilisations onwards. What has become known as game theory was given a formal structure in developments in mathematics in the twentieth century. Its use and development accelerated during and after the Second World War as international politics became increasingly preoccupied with the Cold War and nuclear weapons proliferation, with many leading Russian and American mathematicians recruited to provide an intellectual basis for Cold War military strategy.

1. Game theory: some notation

Players, strategies, payoffs

A game consists of three components:

- a set of players
- a set of available strategies for each player
- a set of payoffs to each player for each possible configuration of strategies

For example, a game of chess involves two *players*. The *available strategies* consist of the set of moves that a player can make at each point in the game, defined by the rules of chess. *Payoffs* consist of the outcomes {Win, Lose}, {Lose, Win} and {Draw, Draw}, where in each brace is a result of the game for player number 1 followed by the associated result for player 2. The outcomes are determined – again via the rules of chess – by the sequences of strategy choices (moves) made by the two players throughout the entire game.

Simultaneous and sequential games

A game can either be one in which moves (or choices) take place sequentially (as in chess) or one in which choices are made simultaneously, as in the children's game rock-paper-scissors. As we shall see, the distinction between simultaneous and sequential games is not so much about the timing of the moves (whether moves are made at the same time or at different times) but rather about the information available to players when a move is made. In a sequential game, a player knows which particular choice her opponent has made from all those available to her, whereas simultaneous games involve players making choices prior to information becoming available about the choice made by the other.

Business games are rarely, if ever, ones in which decisions are made exactly at the same point in time by all relevant firms. However, because it is often the case that companies must select from options before knowing what options rivals have selected,

many business choices are best analysed as taking place within the framework of simultaneous games. In other words, we think of matters ***as if*** all players must select a strategy at the same time.

Most actual games probably combine elements of both simultaneous and sequential move games.

There are several other concepts that will be necessary for an understanding of game theory, but we shall introduce these as we go along.

The game specified

The players in the game we examine here are two firms, TopValue and PriceRite. Each firm must make a choice about the price at which it sells its product. To keep things as simple as possible, we suppose each firm has a simple binary choice: it can either cut its price (*Cut*) or leave it unchanged (*Stick*). The game is played just once.

As each of the two firms has two strategies available to it, there are four possible configurations of strategy, shown by the intersections of the row and column strategy choices in the matrix. The pair of numbers in each cell of the matrix denotes the 'payoff' (profit in this case) that each firm receives for a particular choice of option by Top Value and PriceRite. The first number denotes the payoff to Top Value, the second the payoff to PriceRite.

A two-player price choice game.

PriceRite Top Value	*Cut*	*Stick*
Cut	**2, 2**	4, 1
Stick	1, 4	3, 3

A two-player price choice game.

If both firms *Stick* (neither cuts price), we suppose that each firm's profit (payoff) is 3. If both *Cut*, they each suffer a fall in profits to 2. If Top Value chooses *Cut* and PriceRite *Stick* the payoffs are 4 to Top Value and 1 to PriceRite; and, symmetrically, If X chooses *Stick* and Y *Cut* the payoffs are 1 to X and 4 to Y.

MODES OF PLAY: NON CO-OPERATIVE VERSUS CO-OPERATIVE GAMES

Non co-operative

Co-operative

To predict the outcome of this game, it is necessary to consider how the firms handle their strategic interdependence. Let us investigate the consequences of two different ways in which that interdependence may be handled. The first approach is to assume that each firm maximises its own profit, conditional on some expectation about how the other will act, and without collaboration taking place between the countries. We describe this kind of behaviour as 'non-cooperative'. If this leads to an equilibrium outcome, that outcome is called a non-cooperative solution to the game. Alternatively, 'cooperative behaviour' takes place when the firms collaborate and make agreements about their strategic choices. If an equilibrium outcome exists, it is called a cooperative solution to that game. We begin by looking at non-cooperative behaviour.

THE NON CO-OPERATIVE SOLUTION

Dominant strategies

One important concept that is widely used in looking for solutions to non-cooperative games is the idea of dominant strategy. A player has a dominant strategy when it has one strategy that offers a

higher payoff than any other irrespective of the choice made by the other player. A widely accepted tenet of non-cooperative game theory is that dominant strategies are selected where they exist. Alternatively, we might follow Dixit and Nalebuff and state this tenet as "

If you have a dominant strategy, use it."

Let us examine the payoff matrix to see whether either firm has a dominant strategy. First, look at the game from Y's point of view. If X chooses *Cut*, Y's preferred choice is *Cut*, as the payoff of 2 from cutting her price exceeds the payoff of 1 from sticking. Conversely, if X chooses *Stick*, Y's preferred option is *Cut*. We see that whatever X chooses, *Cut* is best for Y, and so is Y's **dominant strategy**. You should confirm that the dominant strategy for X is also *Cut*. Game theory analysis leads us to the conclusion that the equilibrium solution to this game consists of both firms cutting price.

Nash Equilibrium

It is worth remarking on two characteristics of this solution. First, the solution is a **Nash equilibrium**. A set of strategic options is a Nash equilibrium if each player is doing the best possible given what the other is doing. Put another way, neither firm would benefit by deviating unilaterally from the outcome, and so would not unilaterally alter its strategy given the opportunity to do so.

Second, the outcome is inefficient. Both firms could do better if they had chosen *Stick* (in which case the profit to each would be three rather than two).

Why has this state of affairs come about? There are two facets to the answer. The first is that the game has been played non-cooperatively. We shall examine shortly how things might be different with cooperative behaviour. These payoffs determine the structure of incentives facing the firms. In this case, the incentives are not conducive to the choice of *Stick*.

Not surprisingly, the structure of incentives can be crucial to the outcome of a game. The payoff matrix is an example of a so-called *Prisoners' Dilemma* game. The Prisoners' Dilemma is the name given to all games in which the ***rankings*** of payoffs are shown.

In ***all*** Prisoners' Dilemma games, there is a single Nash equilibrium. This Nash equilibrium is also the dominant strategy for each player. Moreover the payoffs to both players in the dominant strategy Nash equilibrium are less good than those which would result from choosing their alternative (dominated) strategy. As we shall see in a moment, not all games have this structure of payoffs. However, many business problems do appear to be examples of Prisoner Dilemma games.

The co-operative solution and its sustainability

We could imagine this game being played as a profit maximising cartel.

Suppose that firms were to cooperate, making their choices jointly rather than separately. Would this alter the outcome of the game? Intuition would probably leads us to answer yes. If both firms agreed to *Stick* – and did what they agreed to do - payoffs to each would be 3 rather than 2. So in a Prisoners' Dilemma cooperation offers the prospect of greater rewards for both players.

But there is a problem: can these greater rewards be sustained? If self-interest governs behaviour, they probably cannot. To see why, note that the {*Stick, Stick*} outcome is not a Nash equilibrium. Each firm has an incentive to defect from the agreement – to unilaterally alter its strategy once the agreement has been reached. Imagine that the two firms had agreed to *Stick*, and then look at the incentives facing Y. Given that X has declared that it will not cut its price, Y can obtain an advantage by defecting from the agreement ('free-riding'), leaving X to *Stick* - as agreed - but cutting price itself. In this way, firm Y could obtain a profit of 4. Exactly the same argument applies to X, of course. There is a strong incentive operating on each player to attempt to obtain the benefits of free-riding on the other's pollution abatement. These incentives to defect from the agreement mean that the cooperative solution is, at best, an unstable solution.

Games in which one player does not have a dominant strategy

Example: An innovation game. Tell the story.

A two-firm innovation game.

Sonny Effort *Fillips effort*	Low	*High*
Low	8, 6	4, 8
High	6, 4	2, 2

A two-firm innovation game.

Co-operation revisited

Collusion: motives/ limits

- Collusion is a way in which rivals attempt to actively manage rivalry to boost industry profits. Methods include cartels, price leadership, and collusive tendering.
- The attractions are obvious. But not all oligopolies are collusive, and collusion isn't always successful. Why not?
- Some managers feel they can win without co-operation with rivals (hubris effect).
- It may be (is likely to be) illegal.
- Benefits must exceed costs involved.

Non co-operative outcomes can and do happen, even where it would be in the interest of all to behave cooperatively. It is for this reason that the game we have been discussing was called a dilemma. Players acting in an individually rational way end up in a bad state. If they attempt to collaborate, incentives on the other to cheat on the deal expose each to the risk of finishing up in the worst of all possible states.

Repetition

A repeated game: players interact repeatedly in the future (but an unknown, or infinite, number of times).

The outcome in a repeated game is much more likely to favour cooperation (here, price unchanged).

A "tit-for-tat" strategy is often a very good strategy in a repeated game.

Another mechanism that may enhance the extent of co-operation is repeated interaction among firms. Thus far in this chapter we have implicitly been assuming that choices are being made just once. But most business problems are long lasting and require that decisions be made repeatedly. To examine how this may alter outcomes, let us look first at Figure 10.8 that represents the payoffs in a one-shot game. Here we suppose that the payoffs have the ranking T>R>P>S and that S+T < 2R. The dominant strategy for each player in this game is P.

The chances of successful co-operation

Depend on:

- the temptation to cheat
- the chances of detection
- the chances of effective punishment
- whether game is repeated (and so whether retaliation can occur)

Of course, it must also be recognised that there may be 'additional' costs of cooperation too. These include transaction and enforcement costs, and perceived costs of interdependency itself (such as feelings about loss of sovereignty). The larger are these costs, the smaller are the possible net gains from cooperation.

CASE STUDIES

1. ***A Simple Game Designed to Teach the Concepts of Rational Decision-Making, Marginal Analysis, and Opportunity Costs***

Josh Davis is a first-year law school student and has found law school to be quite a change from his undergraduate program because his entire grade in any given course is based solely on his performance on the final exam. Knowing his strengths and weaknesses, Josh is sure that he cannot cram for an exam. Instead, he decides to set up a schedule with a constant allocation of time between studying and other activities. Unfortunately, law school is also expensive; to pay for school Josh works as a tutor at the university's Writing Center. It only pays the minimum wage, but jobs around the university are scarce, and this position allows him the flexibility to set the number of hours he works each week.

On the first day of classes, each of his professors distributes a course syllabus and explains that the final exam will be graded on a curve. As a result, performance on the final exam will be measured relative to the other students in the class. If Josh outperforms most of his peers, he will earn a "good" grade. If he studies about the same amount, he will get an "average" grade, and if he doesn't study much, he is sure that he will fail the course.

Josh considers himself about average relative to his peers. As a result, good grades will give him a strong sense of accomplishment and bolster his grade point average. However, Josh knows it will take a lot of studying to perform well in the course. On a 0 to 10 scale, Josh rates receiving an A in any course as a 10, an average grade as a 5, and a failing grade as a 0. On the other hand, the costs (in terms of lost wages and free time) of studying on the same 0-to-10 scale are 4 for studying a little and 7 for studying a lot. Finally, since Josh considers himself near the average of his law school class (all of whom are taking the same set of courses), he assumes that the rest of the class (at least on average) faces a similar set of decisions and has similar costs and benefits. If Josh's assumptions are correct and if Josh makes his decision without observing the choice of his classmates (and vice versa), how much should he study per week: a lot or a little?

Analysis

The case in normal form is set up as follows:

The "Average" Person in the Class

	Study a Little	**Study a Lot**
Study a Little	**(1; 1)**	**(-4; 3)**
JOSH Study a Lot	**(3; -4)**	**(-2; -2)**

There is a single pure strategy Nash equilibrium where everyone studies a lot and the payoffs are average grades with a lot of work, yielding net benefits of –2 for everyone.

This simple example allows instructors to illustrate several key economic concepts. For example, the concept of rational decision-making can be conveyed by defining the alternatives of each of the decision-makers as well as through the use of net benefit calculations as payoffs. The process of determining the Nash Equilibrium also requires students to evaluate opportunity costs and utilize marginal analysis. As an example, consider the scenario where the "average" person in the class studies a little, Josh must choose the option with the highest marginal benefit, which in this case is to study a lot, since the marginal net benefit of this alternative is 2 (or 3-1). But, by definition, marginal analysis also incorporates opportunity cost. In this scenario the opportunity cost of studying a lot is the net benefit of studying a little, which is 1.

2. Two suspects arrested for a crime

- Prisoners decide whether to confess or not to confess
- If both confess, both sentenced to 3 months of jail

- If both do not confess, then both will be sentenced to 1 month of jail
- If one confesses and the other does not, then the confessor gets freed (0 months of jail) and the non-confessor sentenced to 9 months of jail
- What should each prisoner do?

Prisoner 1/ prisoner 2	Confess	Not Confess
Confess	-3,-3	0,-9
Not Confess	-9,0	-1,-1

3. A Simultaneous Game in Strategic Form:

The Payoff Matrix

		Company A's Actions	
		High Price	Low Price
Company B's Actions	High Price	100_A,100_B	120_A, -20_B
	Low Price	-20_A,120_B	50_A,50_B

4. The prisoner's dilemma

The set up…

"Two men are arrested, but the police do not possess enough information for a conviction. Following the separation of the two men, the police offer both a similar deal – if one testifies against his partner (defects/betrays), and the other remains silent (co-operates/assists), the betrayer goes free and the co-operator receives the full one-year sentence."

"If both remain silent, both are sentenced to only one month in jail for a minor charge. If each 'rats out' the other, each receives a three-month sentence. Each prisoner must choose either to betray or remain silent; the decision of each is kept quiet. What should they do?"

	Prisoner B stays silent	Prisoner B confesses
Prisoner A stays silent	Each serves 1 month	Prisoner A: 1 year Prisoner B: Goes free
Prisoner A confesses	Prisoner A: Goes free Prisoner B: 1 year	Each serves 3 months

As can be seen, the correct solution is dependent on what someone else does independently, and I think we're seeing exactly that now in the petrol panic-buy situation.

5. The petrol buyer's dilemma

	You don't panic buy	**You panic buy**
Most don't panic buy	Fuel shortages unlikely	You're definitely sorted
Most others panic buy	You've higher risk of no fuel when you run out	You're likely to get some fuel due to earlier buying

Of course, as we're talking about the interaction of one individual with a mass, it's not quite the same as the classic dilemma. But the psychology is similar.

Had no-one started panic buying, there wouldn't be a problem

Yet if others are panic buying, taking the moral high ground and refusing to join in increases the risk, as there may be shortages.

Study Note - 5

STRATEGIC INTEGRATION

This Study Note includes

5.1 STRATEGIC INTEGRATION

All multibusiness corporations face the strategic imperative imposed by the stock market: maximizing the profitable growth of their businesses. Long-term success in meeting that imperative requires developing new strategy-making capabilities. During the early 1990s, many multibusiness companies focused on improving profitability through operational integration. They reengineered, focusing on the capabilities that would improve speed, quality and efficiency —and pruning business activities that no longer fit the value-creation logic of the corporate strategy. Then, starting in the late 1990s, senior managers began to focus on integrating strategies to add to revenue growth. Strategic integration involves more fully exploiting growth potential by combining resources and competencies from business units and directing those units toward new business opportunities that extend the existing corporate strategy.

Today leaders of multibusiness corporations are learning to identify the maximum-strategic-opportunity set — those opportunities that can let companies take the fullest advantage of their capabilities and their potential to pursue new strategies. But to exploit those opportunities, managers need to become accomplished at what we call complex strategic integration (CSI).

Strategic integration is the gradual combination and transformation of independent components of business organizations into cohesive and synergistic entities. Strategic integration is an important element in the process of improving organizational performance because it facilitates the continuous alignment of business strategies within the ever changing business environment. Firms use strategic integration to confront the consequences of both predictable transitions and unpredictable challenges that are bound to occur at different levels of business operations. Business strategies, corporate strategies, and functional strategies are the three main levels of strategies that organizations seeking systematic integration adopt for purposes of creating sustainable competitiveness.

Delineating Strategic Integration

Although strategic integration is closely related to strategic management, clear distinctions must be drawn between the two concepts of organizational strategy. Strategic integration aims at achieving synergy through creation of compatibility and interdependence across varied organizational groups, processes, and activities that are autonomous in nature. On the other hand, strategic management identifies long term goals and guides resource allocation and utilization for achieving sustainable competitive advantage either within independent organizational units or in the organization as a whole, without necessarily streamlining the variations across organizational groups, processes, and activities.

Therefore, strategic management can be perceived as a component of strategic integration.

The process of strategic integration involves crafting and implementing strategic objectives from an informed perspective of an organization's competitive environment.

Therefore, it is important to begin the integration process by analyzing how the current mission, objectives, and values affect the interests of all the stakeholders in the organization. The current mission identifies the current underlying strategies that define an organization's approach to resource utility. Values express the institutional identity through organizational culture and practices, whereas organizational objectives define the scope of results that organizations seek to accomplish (such as profitability, increased market share, innovation, or financial efficiency).

A conclusive review of organizational structures, resources capabilities, industry trends, and the external environment of a business organization marks the starting point for efforts geared towards determining the weaknesses and competitive advantages of the organization. Upon the successful review of core competencies of an organization, strategic integration can be implemented and evaluated through appropriate corporate governance systems, strategic management practices, strategic leadership, and strategic control. The process of strategic integration must always be accompanied by subsequent adjustments in the management and coordination of functions and roles both external and internal to the organization.

Implications of Strategic Integration

The perpetually dynamic environments under which businesses operate require a gradual approach toward strategic integration in order to determine and pursue the appropriate organizational priorities. It is imperative for managers to adopt broad-based strategic integration methods that are suitable to particular needs of their organizations. This calls for integration of strategies by improving the existing organizational structures and processes as well as creating new structures to accommodate new organizational order. The adoption of strategic integration portends the following implications to business organizations:

- Adjusting structures and relationships that affect functional groups and related processes in organizations. For example, this could take the form of bundling individual products that achieve greater profit margins through shared organizational processes.
- Adjusting targets, reward systems, and metrics to reflect changes in procedures and approach to production. It may be necessary to increase staff incentives while modifying metrics for tracking shared cross-functional activities.
- Creating budgetary plans and supplements to cover any extra cross-functional estimates that may arise from the integration processes.
- Automating and upgrading communication structures across functional groups and processes within the organization to achieve efficiency through effective flow and sharing of information.
- Standardizing of business processes and data versions to incorporate the interests of both internal and external stakeholders.

In a 2008 article titled "Integration as a Strategy," John Schmidt contends that strategic integration can be perfected through continuous adaptation to change and linkage of complex organizational responsibilities without underestimating the significance of innovation at different levels of the end-to-end chain processes. As such, organizational resources should be mobilized to reinforce successful accomplishment of strategic objectives and achievement of optimum performance and results.

Strategic integration is a tactical approach to management that involves high initial investments on resource acquisition and employee training programs. However, the process carries long-term advantages that minimize costs of increasing business flexibility over time. Managers can achieve knowledge-based strategic integration by investing in advanced IT systems. For example, Wal-Mart's success in retaining its position as the largest retailer in the United States is credited to the company's

successful strategic integration of IT in streamlining operations between the head office and Wal-Mart branches throughout the United States. Therefore, the significance of information technology can be realized fully if managers view information technology as a strategic function rather than simply a routine organizational function.

5.2 VERTICAL INTEGRATION

Vertical integration represents an expansion or extension of the firm by integrating preceding or successive productive processes. That is, the firm incorporates more processes toward the original source of raw materials (backward integration) or toward the ultimate consumer (forward integration). For example, an automobile manufacturer might supply its own parts or make its own engines to secure sources of supply. Or it might control its own system of dealerships to ensure retail outlets for its products. Similarly, an oil refinery might secure land leases and develop its own drilling capacity to ensure a constant supply of crude oil. Or it could expand into retail operations by owning or licensing gasoline stations to guarantee customers for its petroleum products. Clearly, vertical integration can be a viable strategy for many firms.

Vertical integration is the process in which several steps in the production and/or distribution of a product or service are controlled by a single company or entity, in order to increase that company's or entity's power in the marketplace.

Simply said, every single product that you can think of has a big life cycle. While you might recognize the product with the Brand name printed on it, many companies are involved in developing that product. These companies are necessarily not part of the brand you see.

While you are relaxing on the beach sipping chilled cold drink, the brand that you see on the bottle is the producer of the drink but not necessarily the maker of the bottles that carry these drinks. This task of creating bottles is outsourced to someone who can do it better and at a cheaper cost. But once the company achieves significant scale it might plan to produce the bottles itself as it might have its own advantages. This is what we call vertical integration. The company tries to get more things under their reign to gain more control over the profits the product / service delivers.

Whereas historically firms have vertically integrated in order to control access to scarce physical resources, modern firms are internally and externally disaggregated, participating in a variety of alliances and joint ventures and outsourcing even those activities normally regarded as core.

Some of the best known examples of vertical integration have been in the oil industry. In the 1970s and 1980s, many companies that were primarily engaged in exploration and the extraction of crude petroleum decided to acquire downstream refineries and distribution networks. Companies such as Shell and BP came to control every step involved in bringing a drop of oil from its North Sea or Alaskan origins to a vehicle's fuel tank.

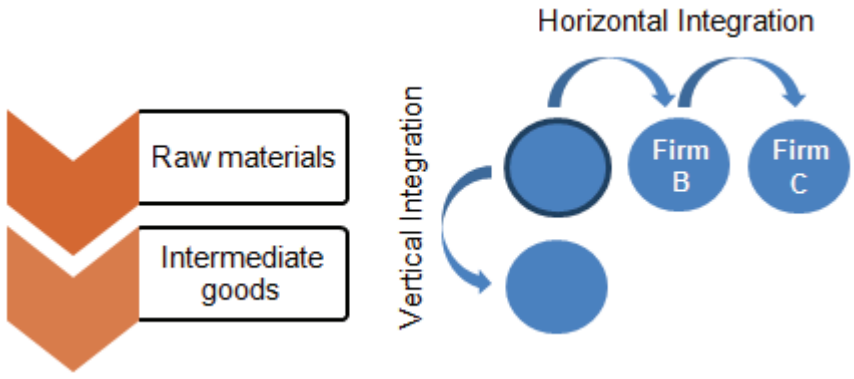
The idea of vertical integration was taken a step further by Dell Computer, one of the most successful companies of the 1990s. Michael Dell, its founder, said that he combined the traditional vertical integration of the supply chain with the special characteristics of the virtual organisation to create something that he called "virtual integration". Dell assembles computers from other firms' parts, but it has relationships with those firms that are more binding than the traditional links between buyer and supplier. It does not own them in the way of the vertically integrated firm, but through exchanges of information and a variety of loose associations it achieves much the same aim—what Michael Dell calls "a tightly co-ordinated supply chain".

Vertical integration is a difficult strategy for companies to implement successfully. It is often expensive and hard to reverse. Upstream producers frequently integrate with downstream distributors to secure a market for their output. This is fine when times are good. But many firms have found themselves cutting prices sharply to their downstream distributors when demand has fallen just so they can maintain targeted levels of plant utilisation.

The vertically integrated giants of the computer industry, firms such as IBM, Digital and Burroughs, were felled like young saplings when at the end of the 1970s Apple formed a network of independent specialists that produced machines far more efficiently than the do-it-all giants.

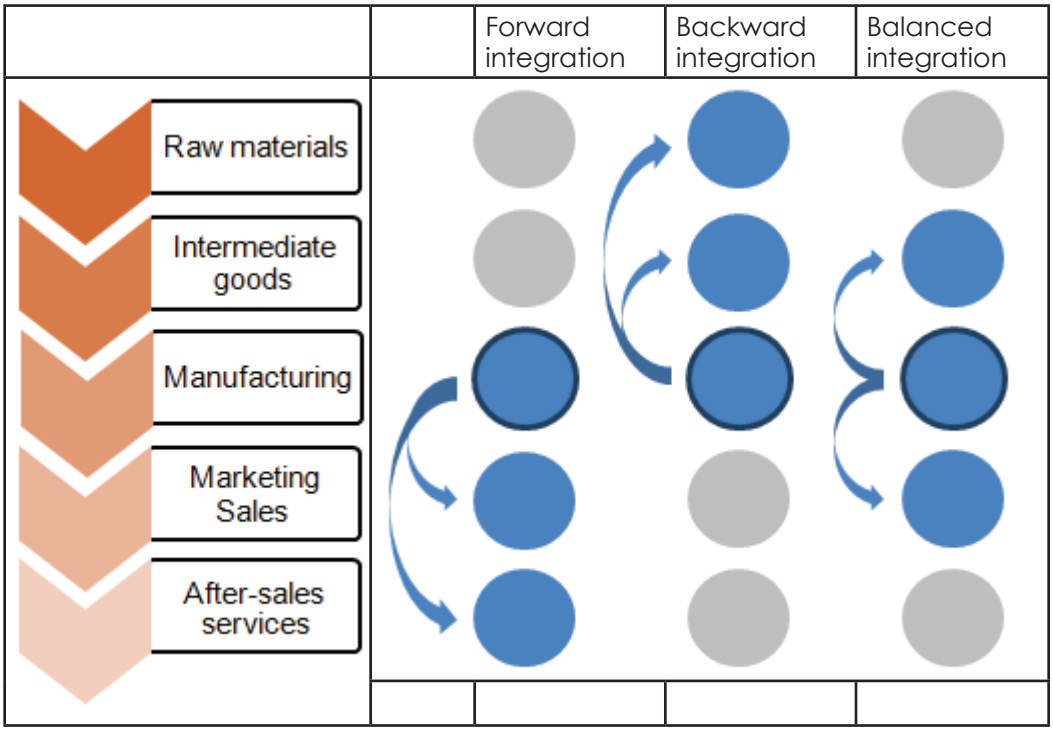
Difference between Vertical Integration and Horizontal Integration

Vertical Integration is different from horizontal integration, where a corporate usually acquires or mergers with a competitor in a same industry. An example of horizontal integration would be a company competing in raw materials industry and buying another company in the same industry rather than trying to expand to intermediate goods industry. Horizontal integration examples: Kraft Foods taking over Cadbury, HP acquiring Compaq or Lenovo buying personal computer division from IBM.



Types of Vertical Integration

There are three varieties: backward (upstream) vertical integration, forward (downstream) vertical integration, and balanced (both upstream and downstream) vertical integration.



- A company exhibits **backward vertical integration** when it controls subsidiaries that produce some of the inputs used in the production of its products. A form of vertical integration that involves the

purchase of suppliers. Companies will pursue backward integration when it will result in improved efficiency and cost savings. For example, backward integration might cut transportation costs, improve profit margins and make the firm more competitive.

For example, an automobile company may own a tire company, a glass company, and a metal company. Control of these three subsidiaries is intended to create a stable supply of inputs and ensure a consistent quality in their final product. It was the main business approach of Ford and other car companies in the 1920s, who sought to minimize costs by integrating the production of cars and car parts as exemplified in the Ford River Rouge Complex. Another simple example of backward vertical integration strategy is an ice cream company that buys a dairy farm. The company requires milk to make ice cream and either can buy milk from a dairy farm or other milk supplier or could own the dairy farm itself. This ensures that it will have a steady supply of milk at its disposal and that it will pay a reasonable price. This can protect the ice cream maker in the event that there are several other buyers vying for the same milk supply.

Backward integration strategy is most beneficial when:

- Firm's current suppliers are unreliable, expensive or cannot supply the required inputs.
- There are only few small suppliers but many competitors in the industry.
- The industry is expanding rapidly.
- The prices of inputs are unstable.
- Suppliers earn high profit margins.
- A company has necessary resources and capabilities to manage the new business.

- A company tends toward **forward vertical integration** when it controls distribution centers and retailers where its products are sold. An example of forward integration would be if the bakery sold its goods itself at local farmers markets or owned a chain of retail stores, through which it could sell its goods. If the bakery did not own a wheat farm, a wheat processor or a retail outlet, it would not be vertically integrated at all.

  This strategy is implemented when the company wants to achieve higher economies of scale and larger market share. Forward integration strategy became very popular with increasing internet appearance. Many manufacturing companies have built their online stores and started selling their products directly to consumers, bypassing retailers. Forward integration strategy is effective when:

  - Few quality distributors are available in the industry.
  - Distributors or retailers have high profit margins.
  - Distributors are very expensive, unreliable or unable to meet firm's distribution needs.
  - The industry is expected to grow significantly.
  - There are benefits of stable production and distribution.
  - The company has enough resources and capabilities to manage the new business.

- Let's assume XYZ Company, which manufactures frozen french fries, wants to *vertically integrate*. By purchasing a potato farm and a potato processing plant, XYZ could engage in upstream integration (also known as backward integration) and control the quantity, cost, and quality of the product's raw materials. Likewise, XYZ Company could engage in downstream integration (also known as forward integration) to control the distribution of the company's products by purchasing a packaging plant and a fleet of delivery trucks. Ultimately, XYZ could also use balanced integration, which incorporates both upstream and downstream integration, to control the cost and quality of the entire production and distribution process.

Benefits of Vertical Integration

Vertical integration potentially offers the following advantages:

- Reduce transportation costs if common ownership results in closer geographic proximity.
- Improve supply chain coordination.
- Provide more opportunities to differentiate by means of increased control over inputs.
- Capture upstream or downstream profit margins.
- Increase entry barriers to potential competitors, for example, if the firm can gain sole access to a scarce resource.
- Gain access to downstream distribution channels that otherwise would be inaccessible.
- Facilitate investment in highly specialized assets in which upstream or downstream players may be reluctant to invest.
- Lead to expansion of core competencies.

One of the biggest advantages of *vertical integration* is that it often creates economies of scale and lowers production costs because it eliminates many of the price markups in each production step. Vertically integrated companies also achieve cost efficiencies by controlling quality at each step, which reduces repair costs, returns, and downtime. In addition, vertically-integrated companies do not have to allocate resources to pricing, contracting, paying, and coordinating with third-party vendors.

Vertical integration can ultimately create barriers to entry for potential competitors, especially if the company controls access to some or all of a scare resource involved in production. This is why in some cases a company may control so much of the market or supply of raw materials that vertical integration can raise antitrust concerns.

Drawbacks of Vertical Integration

While some of the benefits of vertical integration can be quite attractive to the firm, the drawbacks may negate any potential gains. Vertical integration potentially has the following disadvantages:

- Capacity balancing issues. For example, the firm may need to build excess upstream capacity to ensure that its downstream operations have sufficient supply under all demand conditions.
- Potentially higher costs due to low efficiencies resulting from lack of supplier competition.
- Decreased flexibility due to previous upstream or downstream investments. (Note however, that flexibility to coordinate vertically-related activities may increase.)
- Decreased ability to increase product variety if significant in-house development is required.
- Developing new core competencies may compromise existing competencies.
- Increased bureaucratic costs.

In making decisions associated with vertical integration, four issues should be considered :

1. Is the company satisfied with the quality of the value that its present suppliers and distributors are providing? If the performance of organizations in the vertical chain—both suppliers and distributors—is satisfactory, it may not, in general, be appropriate for a company to perform these activities themselves. Firms in the athletic footwear industry such as Nike and Reebok have traditionally outsourced the manufacture of their shoes to countries such as China and Indonesia where labor costs are low. Since the strengths of these companies are typically in design and marketing, it would be advisable to continue to outsource production operations and continue to focus on where they can add the most value.

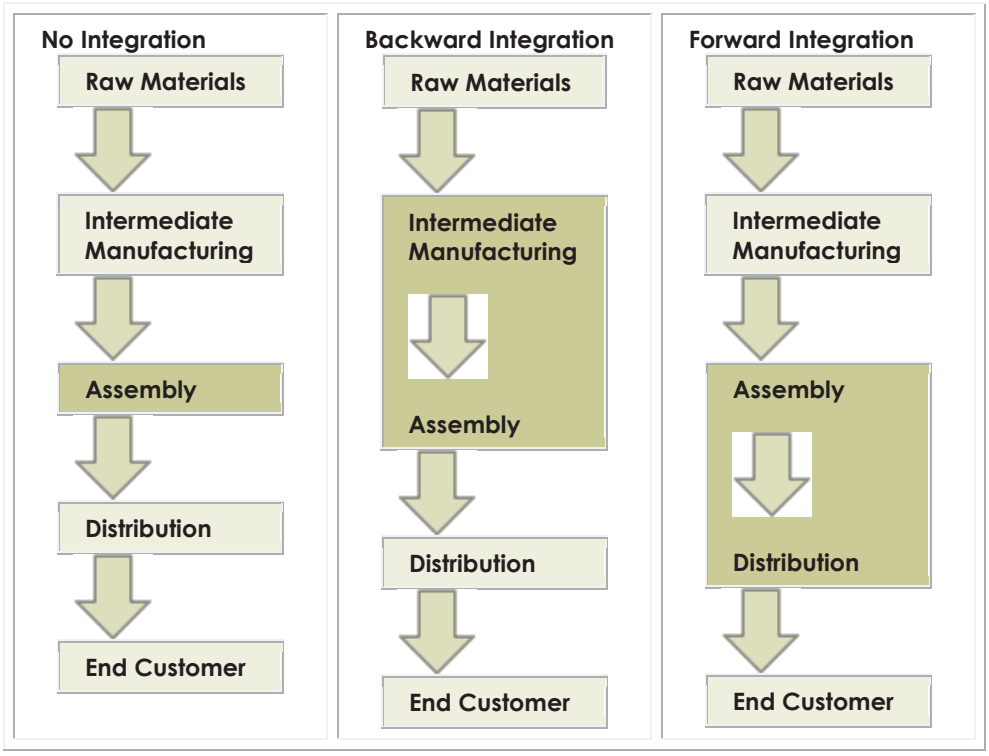
2. Are there activities in the industry value chain presently being outsourced or performed independently by others that are a viable source of future profits? Even if a firm is outsourcing value-chain activities to companies that are doing a credible job, it may be missing out on substantial profit opportunities. To illustrate, consider the automobile industry's profit pool. As; you may recall from Chapter 5, there is much more potential profit in many downstream activities (e.g., leasing, warranty, insurance, and service) than in the manufacture of automobiles. Not surprising, carmakers such as Ford and General Motors are undertaking forward integration strategies to become bigger players in these high-profit activities.

3. Is there a high level of stability in the demand for the organization's products? High demand or sales volatility would not be conducive to a vertical integration strategy. With the high level of fixed costs in plant and equipment as well as operating costs that accompany endeavours toward vertical integration, widely fluctuating sales demand can either strain resources (in times of high demand) or result in unused capacity (in times of low demand). The cycles of "boom and bust" in the automobile industry are a key reason why the manufacturers have increased the amount of outsourced inputs in recent years.

4. How high is the proportion of additional production capacity actually absorbed by existing products or by the prospects of new and similar products? The smaller the proportion of production capacity to be absorbed by existing or future products, the lower is the potential for achieving scale economies associated with the increased capacity—either in terms of backward integration (toward the supply of raw materials) or forward integration (toward the end user). Alternatively, if there is excess capacity in the near term, the strategy of vertical integration may be viable if there is the anticipation of future expansion of products.

The concept of vertical integration can be visualized using the value chain. Consider a firm whose products are made via an assembly process. Such a firm may consider backward integrating into intermediate manufacturing or forward integrating into distribution, as illustrated below:

Example of Backward and Forward Integration



Alternatives to Vertical Integration

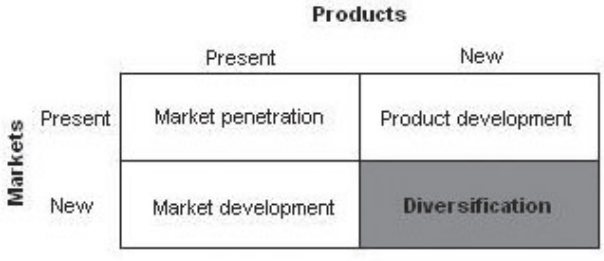
There are alternatives to vertical integration that may provide some of the same benefits with fewer drawbacks. The following are a few of these alternatives for relationships between vertically-related organizations:

- long-term explicit contracts
- franchise agreements
- joint ventures
- co-location of facilities
- implicit contracts (relying on firms' reputation)

5.3 DIVERSIFICATION

Diversification is a corporate strategy to increase sales volume from new products and new markets. Diversification can be expanding into a new segment of an industry that the business is already in, or investing in a promising business outside of the scope of the existing business.

Diversification is part of the four main growth strategies defined by the Product/Market Ansoff matrix:



Ansoff pointed out that a diversification strategy stands apart from the other three strategies. The first three strategies are usually pursued with the same technical, financial, and merchandising resources used for the original product line, whereas diversification usually requires a company to acquire new skills, new techniques and new facilities.

The notion of diversification depends on the subjective interpretation of "new" market and "new" product, which should reflect the perceptions of customers rather than managers. Indeed, products tend to create or stimulate new markets; new markets promote product innovation.

Companies may choose a diversification strategy for different reasons.

Firstly, companies might wish to create and exploit economics of scope, in which the company tries to utilize its exciting resources and capabilities in other markets. This can oftentimes be the case if companies have under-utilized resources or capabilities that cannot be easily disposed or closed. Using a diversification strategy, companies may therefore be able to utilize all its capabilities or resources, and above to attract new business from market segments not catered to earlier.

Secondly, managerial skills found within the company may be successfully used in other markets, where the dominant logic and managerial procedures of management can be successfully transferred to other markets.

Thirdly, companies pursuing a diversification strategy may be able to cross-subsidize one product with the surplus of another. This way, companies with a very diverse portfolio of products catering to different markets may potentially, grow in power, and be able to withstand a prolonged period of price competition etc. when have subsidized one product for a substantial period of time, the company might possibly be able to win a monopoly, making it the only supplier in the respective market.

Fourthly, companies may also want to use a diversification strategy to spread financial risk over different markets and products, so that the entire success of the company is not reliant on one market or product only.

There may however be other reasons for companies to use a diversification strategy than the four listed above, and companies may very well benefit from a diversification strategy for other reasons.

However, it is important for companies to realize the possible danger of diversifying its scope of operations too much. Companies might risk neglecting its core capabilities and become too diversified, where too many different products supplied to different markets might have negative effects on products and services, where e.g., product quality or uniqueness might suffer due to the shift in focus on different products and markets.

Risks of diversification

Of the four strategies presented in the Ansoff matrix, Diversification has the highest level of risk and requires the most careful investigation. Going into an unknown market with an unfamiliar product offering means a lack of experience in the new skills and techniques required. Therefore, the company puts itself in a great uncertainty. Moreover, diversification might necessitate significant expanding of human and financial resources, which may detract focus, commitment, and sustained investments in the core industries. Therefore, a firm should choose this option only when the current product or current market orientation does not offer further opportunities for growth. In order to measure the chances of success, different tests can be done:

- The attractiveness test: The industry chosen for diversification must be attractive enough to produce consistently good returns on investment. True industry attractiveness is defined by the presence of favorable competitive conditions and a market environment conducive to long-term profitability.
- The cost-of-entry test: The cost to enter the target industry must not be so high as to erode the potential for good profitability. The more attractive the industry, the more expensive it is to get into. Entry barriers for new start-up companies are nearly always high where barriers are low, a rush of new entrants would soon erode the potential for high profitability. And a buying company already in the business typically entails a high acquisition cost because of the industry's strong appeal. Costly entry undermines the potential for enhancing shareholder value.
- The better-off test: The diversifying company must bring some potential for competitive advantage to the company's other businesses. The opportunity to create sustainable competitive advantage where none existed before, means there is also opportunity for added profitability.

  Diversification moves that satisfy all three tests have the greatest potential to build shareholder value over the long-term. Diversification moves that can pass only one or two tests, are highly suspect.

Because of the high risks explained above, many companies attempting to diversify have led to failure. However, there are a few good examples of successful diversification:

- Virgin Group moved from music production to travel and mobile phones
- Walt Disney moved from producing animated movies to theme parks and vacation properties
- Canon diversified from a camera-making company into producing an entirely new range of office equipment.

The risk of a Single-Business Strategy

Arthur, Thompson and Strickland (1992) say that the big risk of single-business concentration is putting all firms' eggs in one industry basket. If the industry stagnates, declines or otherwise it becomes unattractive, a company's future outlook dims, its growth rate becomes tougher to sustain and superior profit performance is much harder to achieve.

Because of the above, most single-business companies turn their strategic attention to diversification when their business starts to show signs of peaking. Diversification is resorted to as a means of spreading business risk and transferring the skills the company has built up into closely related businesses.

The diversification strategy can be split into two different types :

1. Related Diversification
2. Unrelated Diversification

Related Diversification

Related Diversification is the most popular distinction between the different types of diversification and is made with regard to how close the field of diversification is to the field of the existing business activities.

Related Diversification occurs when the company adds to or expands its existing line of production or markets. In these cases, the company starts manufacturing a new product or penetrates a new market related to its business activity. Under related diversification the company makes easier the consumption of its products by producing complementing goods or offering complementing services. For example, a shoe producer starts a line of purses and other leather accessories; an electronics repair shop adds to its portfolio of services the renting of appliances to the customers for temporary use until their own are repaired.

Experts have formulated two basic fields in relation to:

- Opportunities for sharing resources: when all kinds of tangible and intangible resources can be shared or "copied" and the same trademark can be used.
- Opportunities for strategic integration: when the integration of marketing strategies of two businesses brings benefits and the integrated efforts provide additional competitive advantages.

This type of diversification is used mostly by small businesses because it is less risky. In the majority of cases it does not require big investments and owners feel more secure because they know the opportunities and threats in the field of their main business activities. However, sometimes this diversification does not bring the expected results and profits. Most often the reason for this is the underestimation of accompanying problems and the need of knowledge and skills in the field of change management, cultural differences, human resource management (layoffs, quitting, promoting, hiring) and so on. However, the reason for not meeting the results and expectations of the diversification may be the overestimation of the expected benefits and profits from the synergy, during the preliminary analysis.

Unrelated Diversification

Unrelated Diversification is a form of diversification when the business adds new or unrelated product lines and penetrates new markets. For example, if the shoe producer enters the business of clothing manufacturing. In this case there is no direct connection with the company´s existing business - this diversification is classified as unrelated.

The unrelated diversification is based on the concept that any new business or company, which can be acquired under favorable financial conditions and has the potential for high revenues, is suitable for diversification. This is essentially a financial approach; it is implemented when the research determines that this unrelated diversification in a completely new field would bring significantly higher revenues compared to the related diversification on the basis of similar products, services, markets or complementing strategies. A good example of this kind of diversification, that brought high profits for a certain period of time, is that during recent years of growth many companies entered the construction market despite their significantly different field of main business activity. In this case, however, the lack of expertise and experience, and the insufficient knowledge of the market can lead to serious problems.

Sometimes the unrelated diversification is based on the available expertise and experience of the human resources that can be utilized in completely unrelated fields. For example, if the owner of a trade company is competent in the field of computer design, they can open an internet store to sell goods and also expand activity by adding web page design services etc.

In this way the unrelated diversification can be accomplished using one of the following methods:

- Using the existing basic competences of the company and expanding from existing markets into new ones and starting new lines of production.
- Penetrating completely new markets. Usually such opportunity can be identified as a result of the main company business. For example a car dealer may start offering financial services by developing a car leasing scheme and selling cars through leasing.
- Developing new competences to use new market opportunities.

Other forms of Diversification

Concentric Diversification

Concentric diversification occurs when a firm adds related products or markets. The goal of such diversification is to achieve strategic fit. Strategic fit allows an organization to achieve synergy. In essence, synergy is the ability of two or more parts of an organization to achieve greater total effectiveness together than would be experienced if the efforts of the independent parts were summed. Synergy may be achieved by combining firms with complementary marketing, financial, operating, or management efforts. Breweries have been able to achieve marketing synergy through national advertising and distribution. By combining a number of regional breweries into a national network, beer producers have been able to produce and sell more beer than had independent regional breweries.

Financial synergy may be obtained by combining a firm with strong financial resources but limited growth opportunities with a company having great market potential but weak financial resources. For example, debt-ridden companies may seek to acquire firms that are relatively debt-free to increase the leveraged firm's borrowing capacity. Similarly, firms sometimes attempt to stabilize earnings by diversifying into businesses with different seasonal or cyclical sales patterns.

Strategic fit in operations could result in synergy by the combination of operating units to improve overall efficiency. Combining two units so that duplicate equipment or research and development are eliminated would improve overall efficiency. Quantity discounts through combined ordering would be another possible way to achieve operating synergy. Yet another way to improve efficiency is to diversify into an area that can use by-products from existing operations. For example, breweries have been able to convert grain, a by-product of the fermentation process, into feed for livestock.

Management synergy can be achieved when management experience and expertise is applied to different situations. Perhaps a manager's experience in working with unions in one company could be applied to labor management problems in another company. Caution must be exercised, however, in assuming that management experience is universally transferable. Situations that appear similar may require significantly different management strategies. Personality clashes and other situational differences may make management synergy difficult to achieve. Although managerial skills and experience can be transferred, individual managers may not be able to make the transfer effectively.

Conglomerate Diversification

Conglomerate diversification occurs when a firm diversifies into areas that are unrelated to its current line of business. Synergy may result through the application of management expertise or financial resources, but the primary purpose of conglomerate diversification is improved profitability of the acquiring firm. Little, if any, concern is given to achieving marketing or production synergy with conglomerate diversification.

One of the most common reasons for pursuing a conglomerate growth strategy is that opportunities in a firm's current line of business are limited. Finding an attractive investment opportunity requires the firm to consider alternatives in other types of business. Philip Morris's acquisition of Miller Brewing was a conglomerate move. Products, markets, and production technologies of the brewery were quite different from those required to produce cigarettes.

Firms may also pursue a conglomerate diversification strategy as a means of increasing the firm's growth rate. As discussed earlier, growth in sales may make the company more attractive to investors. Growth may also increase the power and prestige of the firm's executives. Conglomerate growth may be effective if the new area has growth opportunities greater than those available in the existing line of business.

Probably the biggest disadvantage of a conglomerate diversification strategy is the increase in administrative problems associated with operating unrelated businesses. Managers from different divisions may have different backgrounds and may be unable to work together effectively. Competition between strategic business units for resources may entail shifting resources away from one division to another. Such a move may create rivalry and administrative problems between the units.

Caution must also be exercised in entering businesses with seemingly promising opportunities, especially if the management team lacks experience or skill in the new line of business. Without some knowledge of the new industry, a firm may be unable to accurately evaluate the industry's potential. Even if the new business is initially successful, problems will eventually occur. Executives from the conglomerate will have to become involved in the operations of the new enterprise at some point. Without adequate experience or skills (Management Synergy) the new business may become a poor performer.

Without some form of strategic fit, the combined performance of the individual units will probably not exceed the performance of the units operating independently. In fact, combined performance may deteriorate because of controls placed on the individual units by the parent conglomerate. Decision-making may become slower due to longer review periods and complicated reporting systems.

Internal Diversification

One form of internal diversification is to market existing products in new markets. A firm may elect to broaden its geographic base to include new customers, either within its home country or in international markets. A business could also pursue an internal diversification strategy by finding new users for its current product. For example, Arm & Hammer marketed its baking soda as a refrigerator deodorizer. Finally, firms may attempt to change markets by increasing or decreasing the price of products to make them appeal to consumers of different income levels.

Another form of internal diversification is to market new products in existing markets. Generally this strategy involves using existing channels of distribution to market new products. Retailers often change product lines to include new items that appear to have good market potential. Johnson & Johnson added a line of baby toys to its existing line of items for infants. Packaged-food firms have added salt-free or low-calorie options to existing product lines.

It is also possible to have conglomerate growth through internal diversification. This strategy would entail marketing new and unrelated products to new markets. This strategy is the least used among the internal diversification strategies, as it is the most risky. It requires the company to enter a new market where it is not established. The firm is also developing and introducing a new product. Research and development costs, as well as advertising costs, will likely be higher than if existing products were marketed. In effect, the investment and the probability of failure are much greater when both the product and market are new.

External Diversification

External diversification occurs when a firm looks outside of its current operations and buys access to new products or markets. Mergers are one common form of external diversification. Mergers occur when two or more firms combine operations to form one corporation, perhaps with a new name. These

firms are usually of similar size. One goal of a merger is to achieve management synergy by creating a stronger management team. This can be achieved in a merger by combining the management teams from the merged firms.

Acquisitions, a second form of external growth, occur when the purchased corporation loses its identity. The acquiring company absorbs it. The acquired company and its assets may be absorbed into an existing business unit or remain intact as an independent subsidiary within the parent company. Acquisitions usually occur when a larger firm purchases a smaller company. Acquisitions are called friendly if the firm being purchased is receptive to the acquisition. (Mergers are usually "friendly.") Unfriendly mergers or hostile takeovers occur when the management of the firm targeted for acquisition resists being purchased.

Vertical Integration

The steps that a product goes through in being transformed from raw materials to a finished product in the possession of the customer constitute the various stages of production. When a firm diversifies closer to the sources of raw materials in the stages of production, it is following a backward vertical integration strategy. Avon's primary line of business has been the selling of cosmetics door-to-door. Avon pursued a backward form of vertical integration by entering into the production of some of its cosmetics. Forward diversification occurs when firms move closer to the consumer in terms of the production stages. Levi Strauss & Co., traditionally a manufacturer of clothing, has diversified forward by opening retail stores to market its textile products rather than producing them and selling them to another firm to retail.

Backward integration allows the diversifying firm to exercise more control over the quality of the supplies being purchased. Backward integration also may be undertaken to provide a more dependable source of needed raw materials. Forward integration allows a manufacturing company to assure itself of an outlet for its products. Forward integration also allows a firm more control over how its products are sold and serviced. Furthermore, a company may be better able to differentiate its products from those of its competitors by forward integration. By opening its own retail outlets, a firm is often better able to control and train the personnel selling and servicing its equipment.

Since servicing is an important part of many products, having an excellent service department may provide an integrated firm a competitive advantage over firms that are strictly manufacturers.

Some firms employ vertical integration strategies to eliminate the "profits of the middleman." Firms are sometimes able to efficiently execute the tasks being performed by the middleman (wholesalers, retailers) and receive additional profits. However, middlemen receive their income by being competent at providing a service. Unless a firm is equally efficient in providing that service, the firm will have a smaller profit margin than the middleman. If a firm is too inefficient, customers may refuse to work with the firm, resulting in lost sales.

Vertical integration strategies have one major disadvantage. A vertically integrated firm places "all of its eggs in one basket." If demand for the product falls, essential supplies are not available, or a substitute product displaces the product in the marketplace, the earnings of the entire organization may suffer.

Horizontal Diversification

Horizontal integration occurs when a firm enters a new business (either related or unrelated) at the same stage of production as its current operations. For example, Avon's move to market jewellery through its door-to-door sales force involved marketing new products through existing channels of distribution. An alternative form of horizontal integration that Avon has also undertaken is selling its products by mail order (e.g., clothing, plastic products) and through retail stores (e.g., Tiffany's). In both cases, Avon is still at the retail stage of the production process.

Diversification Objectives

If an analysis of trends and contingencies indicates that a company should diversify, where should it look for diversification opportunities?

Generally speaking, there are three types of opportunities:

(1) Each product manufactured by a company is made up of functional components, parts, and basic materials which go into the final assembly.

A manufacturing concern usually buys a large fraction of these from outside suppliers. One way to diversify, commonly known as vertical diversification, is to branch out into production of components, parts, and materials. Perhaps the most outstanding example of vertical diversification is the Ford empire in the days of Henry Ford, Sr.

At first glance, vertical diversification seems inconsistent with our definition of a diversification strategy. However, the respective missions which components, parts, and materials are designed to perform are distinct from the mission of the overall product. Furthermore, the technology in fabrication and manufacture of these parts and materials is likely to be very different from the technology of manufacturing the final product. Thus, vertical diversification does imply both catering to new missions and introduction of new products.

(2) Another possible way to go is horizontal diversification. This can be described as the introduction of new products which, while they do not contribute to the present product line in any way, cater to missions which lie within the company's know-how and experience in technology, finance, and marketing.

(3) It is also possible, by lateral diversification, to move beyond the confines of the industry to which a company belongs. This obviously opens a great many possibilities, from operating banana boats to building atomic reactors. While vertical and horizontal diversification are restrictive, in the sense that they delimit the field of interest, lateral diversification is "wide open." It is an announcement of the company's intent to range far afield from its present market structure.

Choice of Direction

How does a company choose among these diversification directions? In part the answer depends on the reasons which prompt diversification.

For example, in the light of the trends described for the industry, an aircraft company may make the following moves to meet long range sales objectives through diversification:

1. A vertical move to contribute to the technological progress of the present product line.
2. A horizontal move to improve the coverage of the military market.
3. A horizontal move to increase the percentage of commercial sales in the over-all sales program.
4. A lateral move to stabilize sales in case of a recession.
5. A lateral move to broaden the company's technological base.

Some of these diversification objectives apply to characteristics of the product, some to those of the product missions. Each objective is designed to improve some aspect of the balance between the over-all product-market strategy and the expected environment. The specific objectives derived for any given case can be grouped into three general categories: growth objectives, such as 1, 2, and 3 above, which are designed to improve the balance under favorable trend conditions; stability objectives, such as 3 and 4, designed as protection against unfavorable trends and foreseeable contingencies; and flexibility objectives, such as 5, to strengthen the company against unforeseeable contingencies.

A diversification direction which is highly desirable for one of the objectives is likely to be less desirable for others. For example:

If a company is diversifying because its sales trend shows a declining volume of demand, it would be unwise to consider vertical diversification, since this would be at best a temporary device to stave off an eventual decline of business.

If a company's industry shows every sign of healthy growth, then vertical and, in particular, horizontal diversification would be a desirable device for strengthening the position of the company in a field in which its knowledge and experience are concentrated.

If the major concern is stability under a contingent forecast, chances are that both horizontal and vertical diversification could not provide a sufficient stabilizing influence and that lateral action is called for.

If management's concern is with the narrowness of the technological base in the face of what we have called unforeseeable contingencies, then lateral diversification into new areas of technology would be clearly indicated.

Is Risk Reduction a Viable Goal of Diversification?

Analysts and academics have suggested that one of the purposes of diversification is to reduce the risk that is inherent in a firm's variability in revenues and profits over time. In essence, the argument is that if a firm enters new products or markets that are affected differently by seasonal or economic cycles, its performance over time will be more stable. For example, a firm manufacturing lawn mowers may diversify into snow blowers to even out its annual sales. Or a firm manufacturing a luxury line of household furniture may introduce a lower-priced line since affluent and lower-income customers are affected .differently by economic cycles.

At first glance the above reasoning may make sense, but there are some problems with it. First, a firm's stockholders can diversify their portfolios at a much lower cost than a corporation. Second, economic cycles as well as their impact on a given industry (or firm) are difficult to predict with any degree of accuracy.

Notwithstanding the above, some firms have benefited from diversification by lowering the variability (or risk) in their performance over time. Consider Emerson Electronic.

Emerson Electronic is a ₹16 billion manufacturer that has enjoyed an incredible run—43 consecutive years of earnings growth! It produces a wide variety of products, including measurement devices for heavy industry, temperature controls for heating and ventilation systems, and power tools sold at Home Depot. Recently, many analysts questioned Emerson's purchase of companies that sell power systems to the volatile telecommunications industry. Why? This industry is expected to experience, at best, minimal growth. However, CEO David Farr maintained that such assets could be acquired inexpensively because of the aggregate decline in demand in this industry. Additionally, he argued that the other business units, such as the sales of valves and regulators to the now-booming oil and natural gas companies, were able to pick up the slack. Therefore, while net profits in the electrical equipment sector (Emerson's core business) sharply decreased, Emerson's overall corporate profits increased 1.7 percent.

In summary, risk reduction in and of itself is rarely viable as a means to create shareholder value. It must be undertaken with a view of a firm's overall diversification strategy.

Diversification and Strategic Scope

Economies of Scope and Diversificatin

Penrose (1995, first edition published in 1959) lays out the foundation for the analysis of firm growth over time via continued diversification. Penrose identifies two forms of what we now term 'related' diversification: (1) entry into new product-markets based on the firm's existing resources; (2) introduction of new products in a firm's existing market (Penrose, 1995: 110). Rumelt (1974: 29) states that: 'businesses are related to one another when a common skill, resource, market or purpose applies to each.' As

these early works make clear, the sharing of firm resources between businesses underpins much of the logic of related diversification.

The concept of economies of scope, formalizes the logic that links shared resources to related diversification.

Economies of scope (Panzar and Willig, 1981) for two products at a point in time are defined as

$$C(Y1, Y2) < C(Y1, 0) + C(0, Y2) \qquad (1)$$

where C = total costs of production, $Y1$ = output of product 1, and $Y2$ = output of product 2.

Equation 1 states that the total cost of producing $Y1$ and $Y2$ together is less than the combined cost of producing each product separately. As Bailey and Friedlander (1982) explain, this reduction in costs due to joint production can arise for several reasons. These reasons include: (1) separate products that naturally arise from a shared input, such as wool and mutton produced from sheep; (2) the presence of a fixed factor of production (e.g., a manufacturing plant or distribution channel) that is not fully utilized in production of a single product; (3) economies of networking from joint production of networked products (e.g., use of an airline hub to facilitate transfer of passengers from one airline city-pair market to another); (4) reuse of an input in more than one product (e.g., journal article abstracts reused in multiple indexes of articles); (5) sharing of intangible assets between products (e.g., research and development that supports multiple products).

All of these reasons can help to explain diversification from one product ($Y1$) into another product ($Y2$) due to inputs (resources) shared in production of the products. In general, diversification can take place via merger and acquisition, or via internal growth. Diversification through merger and acquisition often generates economies of scope by allowing firms to share a fixed factor of production and cut redundant costs. For example, when a company that produces cheese acquires a company that produces crackers, the two businesses can share the fixed factor associated with grocery store distribution and sales. As a result, the distribution and sales resources of the acquired firm become redundant and their costs can be cut.

Firms also can diversify through internal growth and obtain economies of scope. A cracker manufacturer can enter the cheese business and share grocery store distribution and sales between the two businesses. This example of diversification through internal growth translates the shared cost logic of economies of scope into a motivation for market entry. An excess resource of some type provides the opportunity to reduce unit costs by diversifying and sharing that resource with another business.

Economies of scope also can justify simultaneous rather than sequential entry into related markets. Although by definition a diversification move implies a change in the businesses in which a firm participates, the economies of scope just described are static in the sense that they are intra-temporal. That is, once two businesses merge, the combined firm achieves intra-temporal economies of scope by sharing resources contemporaneously (intra temporally) between businesses and cutting redundant costs. Similarly, subsequent to market entry through internal growth, a firm achieves economies of scope by contemporaneous sharing of what previously were excess resources.

Although firms that diversify into related businesses may benefit from intra-temporal economies of scope, Teece (1980) points out that such joint ownership of resources is efficient only when the transaction costs of separate ownership (due to costs of contracting and opportunism) can be reduced through internal organization (Williamson, 1975). Since internalization of transactions also entails costs, diversification based on economies of scope should occur only if the costs of internal organization are lower than the transactions costs of using the market (i.e., production in separate organizations).

The logic of economies of scope formalizes the benefits of related diversification in terms of cost advantages. These benefits from economies of scope can also be formulated in terms of demand side benefits related to outputs (products and services) rather than costs. For example, when firms use excess resources to diversify into another market, the firm generates greater revenues per unit of input.

This is logically equivalent to Equation 1 for economies of scope, wherein the firm obtains lower costs per unit of output by spreading the cost of a set of inputs over a greater number of units of output. Our previous examples of economies of scope from internal growth reflect precisely this logic. Thus, intra-temporal economies of scope reflect both demand-side revenue enhancements from greater output and cost reductions from shared inputs.

5.4 MERGER AND ACQUISITION

An entrepreneur may grow its business either by internal expansion or by external expansion. In the case of internal expansion, a firm grows gradually over time in the normal course of the business, through acquisition of new assets, replacement of the technologically obsolete equipments and the establishment of new lines of products. But in external expansion, a firm acquires a running business and grows overnight through corporate combinations. These combinations are in the form of mergers, acquisitions, amalgamations and takeovers and have now become important features of corporate restructuring. They have been playing an important role in the external growth of a number of leading companies the world over. They have become popular because of the enhanced competition, breaking of trade barriers, free flow of capital across countries and globalisation of businesses. In the wake of economic reforms, Indian industries have also started restructuring their operations around their core business activities through acquisition and takeovers because of their increasing exposure to competition both domestically and internationally.

Mergers and acquisitions are strategic decisions taken for maximisation of a company's growth by enhancing its production and marketing operations. They are being used in a wide array of fields such as information technology, telecommunications, and business process outsourcing as well as in traditional businesses in order to gain strength, expand the customer base, cut competition or enter into a new market or product segment.

Mergers or Amalgamations

A merger is a combination of two or more businesses into one business. Laws in India use the term 'amalgamation' for merger. The **Income Tax Act,1961 [Section 2(1A)]** defines amalgamation as the merger of one or more companies with another or the merger of two or more companies to form a new company, in such a way that all assets and liabilities of the amalgamating companies become assets and liabilities of the amalgamated company and shareholders not less than nine-tenths in value of the shares in the amalgamating company or companies become shareholders of the amalgamated company.

Thus, mergers or amalgamations may take two forms:-

- **Merger through Absorption:** An absorption is a combination of two or more companies into an 'existing company'. All companies except one lose their identity in such a merger. For example, absorption of Tata Fertilisers Ltd (TFL) by Tata Chemicals Ltd. (TCL). TCL, an acquiring company (a buyer), survived after merger while TFL, an acquired company (a seller), ceased to exist. TFL transferred its assets, liabilities and shares to TCL.
- **Merger through Consolidation:** A consolidation is a combination of two or more companies into a 'new company'. In this form of merger, all companies are legally dissolved and a new entity is created. Here, the acquired company transfers its assets, liabilities and shares to the acquiring company for cash or exchange of shares. For example, merger of Hindustan Computers Ltd, Hindustan Instruments Ltd, Indian Software Company Ltd and Indian Reprographics Ltd into an entirely new company called HCL Ltd.

A fundamental characteristic of merger (either through absorption or consolidation) is that the acquiring company (existing or new) takes over the ownership of other companies and combines their operations with its own operations.

Besides, there are three major types of mergers:

- **Horizontal merger:** When two or more companies dealing in similar lines of activity, combine together then Horizontal Merger takes place. For example, merger of two textile firms. The purpose of Horizontal Merger is elimination or reduction in competition, economies of scale in production, research and development, marketing and management, etc. **Example:** Glaxo Wellcome Plc. and SmithKline Beecham Plc. Megamerger.

  Horizontal mergers are often a type of non-financial merger. In other words, a horizontal merger is undertaken for reason that have little to do with money, at least directly. Simply stated, a horizontal merger is usually the acquisition of a competitor who is in the same line of business as the acquiring business. By acquiring the competitor, the acquiring company is reducing the competition in the marketplace.

  Large horizontal mergers are often perceived as anticompetitive. If one company holding twenty percent of the market share combines with another company also holding twenty percent of the market share, their combined share holding will then increase to forty percent. This large horizontal merger has now given the new company an unfair market advantage over its competitors. The amalgamation of Daimler-Benz and Chrysler is a popular example of a horizontal merger.

- **Vertical merger:** This is a combination of two or more firms involved in different stages of production. For example, merger of cotton producing firm and textile firm. When a firm acquire its 'upstream' or 'down-stream' then Vertical Merger occurs. In the case of 'upstream' type of merger, it extends to the suppliers of raw materials and in the case of 'downstream' type of merger, it extends to those firms that sell to the consumer. The purpose of such merger is the lower buying cost of materials, lower distribution costs, assured supplies and market.

  Vertical mergers involve a manufacturer forming a partnership with a distributor. This makes it hard for competing companies to compete with the newly merged company because of the advantages that the merger brings. These benefits occur because the distributor no longer has to pay the supplier for material any longer because the supplier and distributor are now one entity. Formally, the distributor would have had to pay the supplier enough money to cover the cost of the material plus whatever the supplier charged in order to make a profit on the transaction. With the two companies merged, the distributor is free to get the material at base cost and does not have to pay any extra to another company that is looking to make a profit. This allows for the merged company to have less money tied up in production of a good.

  Just like horizontal mergers, vertical mergers can result in anti-trust problems in the marketplace by reducing competition. An example would be if an automobile manufacturing company were to buy up other businesses that exist along its supply chain. It takes many different types of businesses to support automobile manufacturing. If an automobile company bought a seat belt manufacturing company, companies that manufactured different parts of the engine block and the transmission, as well as sources of its raw materials, transportation, technology, and sales (dealerships), imagine the market power that would accrue to that automobile manufacturing company. It would effectively totally control the price for its vehicles without having to consider any other factors. That is the kind of market power that anti-trust laws are meant to control.

  Example : Usha Martin and Usha Beltron merged their businesses to enhance shareholder value, through business synergies. The merger will also enable both the companies to pool resources and streamline business and finance with operational efficiencies and cost reduction and also help in development of new products that require synergies.

- **Conglomerate merger:** is a combination of firms engaged in unrelated lines of business activity. For example, merging of different businesses like manufacturing of cement products, fertilizer products, electronic products, insurance investment and advertising agencies. L&T and Voltas Ltd are examples of such mergers.

Conglomerate mergers have been sub-divided into:

- Financial Conglomerates
- Managerial Conglomerates
- Concentric Companies

Financial Conglomerates

These conglomerates provide a flow of funds to every segment of their operations, exercise control and are the ultimate financial risk takers. They not only assume financial responsibility and control but also play a chief role in operating decisions. They also:

- Improve risk-return ratio
- Reduce risk
- Improve the quality of general and functional managerial performance
- Provide effective competitive process
- Provide distinction between performance based on underlying potentials in the product market area and results related to managerial performance.

Managerial Conglomerates

Managerial conglomerates provide managerial counsel and interaction on decisions thereby, increasing potential for improving performance. When two firms of unequal managerial competence combine, the performance of the combined firm will be greater than the sum of equal parts that provide large economic benefits.

Concentric Companies

The primary difference between managerial conglomerate and concentric company is its distinction between respective general and specific management functions. The merger is termed as concentric when there is a carry-over of specific management functions or any complementarities in relative strengths between management functions.

Acquisitions and Takeovers

An acquisition may be defined as an act of acquiring effective control by one company over assets or management of another company without any combination of companies. Thus, in an acquisition two or more companies may remain independent, separate legal entities, but there may be a change in control of the companies. When an acquisition is 'forced' or 'unwilling', it is called a takeover. In an unwilling acquisition, the management of 'target' company would oppose a move of being taken over. But, when managements of acquiring and target companies mutually and willingly agree for the takeover, it is called acquisition or friendly takeover.

Advantages of Mergers & Acquisitions

The most common motives and advantages of mergers and acquisitions are:-

- Accelerating a company's growth, particularly when its internal growth is constrained due to paucity of resources. Internal growth requires that a company should develop its operating facilities- manufacturing, research, marketing, etc. But, lack or inadequacy of resources and time needed for internal development may constrain a company's pace of growth. Hence, a company can acquire production facilities as well as other resources from outside through mergers and acquisitions. Specially, for entering in new products/markets, the company may lack technical skills and may require special marketing skills and a wide distribution network to access different segments of markets. The company can acquire existing company or companies with requisite infrastructure and skills and grow quickly.

- Enhancing profitability because a combination of two or more companies may result in more than average profitability due to cost reduction and efficient utilization of resources. This may happen because of:-
  - **Economies of scale:** arise when increase in the volume of production leads to a reduction in the cost of production per unit. This is because, with merger, fixed costs are distributed over a large volume of production causing the unit cost of production to decline. Economies of scale may also arise from other indivisibilities such as production facilities, management functions and management resources and systems. This is because a given function, facility or resource is utilized for a large scale of operations by the combined firm.
  - **Operating economies:** arise because, a combination of two or more firms may result in cost reduction due to operating economies. In other words, a combined firm may avoid or reduce over-lapping functions and consolidate its management functions such as manufacturing, marketing, R&D and thus reduce operating costs. For example, a combined firm may eliminate duplicate channels of distribution, or crate a centralized training center, or introduce an integrated planning and control system.
  - **Synergy:** implies a situation where the combined firm is more valuable than the sum of the individual combining firms. It refers to benefits other than those related to economies of scale. Operating economies are one form of synergy benefits. But apart from operating economies, synergy may also arise from enhanced managerial capabilities, creativity, innovativeness, R&D and market coverage capacity due to the complementarity of resources and skills and a widened horizon of opportunities.
- Diversifying the risks of the company, particularly when it acquires those businesses whose income streams are not correlated. Diversification implies growth through the combination of firms in unrelated businesses. It results in reduction of total risks through substantial reduction of cyclicality of operations. The combination of management and other systems strengthen the capacity of the combined firm to withstand the severity of the unforeseen economic factors which could otherwise endanger the survival of the individual companies.
- A merger may result in financial synergy and benefits for the firm in many ways:-
  - By eliminating financial constraints
  - By enhancing debt capacity. This is because a merger of two companies can bring stability of cash flows which in turn reduces the risk of insolvency and enhances the capacity of the new entity to service a larger amount of debt
  - By lowering the financial costs. This is because due to financial stability, the merged firm is able to borrow at a lower rate of interest.
- Limiting the severity of competition by increasing the company's market power. A merger can increase the market share of the merged firm. This improves the profitability of the firm due to economies of scale. The bargaining power of the firm vis-à-vis labour, suppliers and buyers is also enhanced. The merged firm can exploit technological breakthroughs against obsolescence and price wars.

Procedure for evaluating the decision for mergers and acquisitions

The three important steps involved in the analysis of mergers and acquisitions are:-

- **Planning:** of acquisition will require the analysis of industry-specific and firm-specific information. The acquiring firm should review its objective of acquisition in the context of its strengths and weaknesses and corporate goals. It will need industry data on market growth, nature of competition, ease of entry, capital and labour intensity, degree of regulation, etc. This will help in indicating the product-market strategies that are appropriate for the company. It will also help the firm in identifying the business units that should be dropped or added. On the other hand, the

target firm will need information about quality of management, market share and size, capital structure, profitability, production and marketing capabilities, etc.

- **Search and Screening:** Search focuses on how and where to look for suitable candidates for acquisition. Screening process short-lists a few candidates from many available and obtains detailed information about each of them.
- **Financial Evaluation:** of a merger is needed to determine the earnings and cash flows, areas of risk, the maximum price payable to the target company and the best way to finance the merger. In a competitive market situation, the current market value is the correct and fair value of the share of the target firm. The target firm will not accept any offer below the current market value of its share. The target firm may, in fact, expect the offer price to be more than the current market value of its share since it may expect that merger benefits will accrue to the acquiring firm.

  A merger is said to be at a premium when the offer price is higher than the target firm's pre-merger market value. The acquiring firm may have to pay premium as an incentive to target firm's shareholders to induce them to sell their shares so that it (acquiring firm) is able to obtain the control of the target firm.

Arm's length mergers

An arm's length merger is a merger: 1. approved by disinterested directors and 2. approved by disinterested stockholders:

"The two elements are complementary and not substitutes. The first element is important because the directors have the capability to act as effective and active bargaining agents, which disaggregated stockholders do not. But, because bargaining agents are not always effective or faithful, the second element is critical, because it gives the minority stockholders the opportunity to reject their agents' work. Therefore, when a merger with a controlling stockholder was: 1) negotiated and approved by a special committee of independent directors; and 2) conditioned on an affirmative vote of a majority of the minority stockholders, the business judgment standard of review should presumptively apply, and any plaintiff ought to have to plead particularized facts that, if true, support an inference that, despite the facially fair process, the merger was tainted because of fiduciary wrongdoing."

Strategic Mergers

A Strategic merger usually refers to long term strategic holding of target (Acquired) firm. This type of M&A process aims at creating synergies in the long run by increased market share, broad customer base, and corporate strength of business. A strategic acquirer may also be willing to pay a premium offer to target firm in the outlook of the synergy value created after M&A process.

Financing Merger & Acquisition

Mergers are generally differentiated from acquisitions partly by the way in which they are financed and partly by the relative size of the companies. Various methods of financing an M&A deal exist:

Cash

Payment by cash. Such transactions are usually termed acquisitions rather than mergers because the shareholders of the target company are removed from the picture and the target comes under the (indirect) control of the bidder's shareholders.

Stock

Payment in the form of the acquiring company's stock, issued to the shareholders of the acquired company at a given ratio proportional to the valuation of the latter.

Financing options

There are some elements to think about when choosing the form of payment. When submitting an offer, the acquiring firm should consider other potential bidders and think strategically. The form of

payment might be decisive for the seller. With pure cash deals, there is no doubt on the real value of the bid (without considering an eventual earn out). The contingency of the share payment is indeed removed. Thus, a cash offer pre-empts competitors better than securities. Taxes are a second element to consider and should be evaluated with the counsel of competent tax and accounting advisers. Third, with a share deal the buyer's capital structure might be affected and the control of the buyer modified. If the issuance of shares is necessary, shareholders of the acquiring company might prevent such capital increase at the general meeting of shareholders. The risk is removed with a cash transaction. Then, the balance sheet of the buyer will be modified and the decision maker should take into account the effects on the reported financial results. For example, in a pure cash deal (financed from the company's current account), liquidity ratios might decrease. On the other hand, in a pure stock for stock transaction (financed from the issuance of new shares), the company might show lower profitability ratios (e.g. ROA). However, economic dilution must prevail towards accounting dilution when making the choice. The form of payment and financing options are tightly linked. If the buyer pays cash, there are three main financing options:

- Cash on hand: it consumes financial slack (excess cash or unused debt capacity) and may decrease debt rating. There are no major transaction costs.
- It consumes financial slack, may decrease debt rating and increase cost of debt. Transaction costs include underwriting or closing costs of 1% to 3% of the face value.
- Issue of stock: it increases financial slack, may improve debt rating and reduce cost of debt. Transaction costs include fees for preparation of a proxy statement, an extraordinary shareholder meeting and registration.

If the buyer pays with stock, the financing possibilities are:

- Issue of stock (same effects and transaction costs as described above).
- Shares in treasury: it increases financial slack (if they don't have to be repurchased on the market), may improve debt rating and reduce cost of debt. Transaction costs include brokerage fees if shares are repurchased in the market otherwise there are no major costs.

In general, stock will create financial flexibility. Transaction costs must also be considered but tend to have a greater impact on the payment decision for larger transactions. Finally, paying cash or with shares is a way to signal value to the other party, e.g.: buyers tend to offer stock when they believe their shares are overvalued and cash when undervalued.

Motives of Merger & Acquisition

Growth through mergers and acquisitions has played a critical role in the success of many corporations in a wide variety of high-technology and knowledge-intensive industries. Here, market and technology changes can occur very quickly arid unpredictably. Speed—speed to market, speed to positioning, and speed to becoming a viable company—is critical in such industries. For example, Alex Mandl, then AT&T's president, was responsible for the acquisition of McCaw Cellular. Although many industry experts felt the price was too steep, he believed that cellular technology was a critical asset for the telecommunications business and that it would have been extremely difficult to build that business from the ground up. Mandl claimed, "The plain fact is that acquiring is much faster than building.

The reasons or motives of merger can be classified under the following heads:-

A. Strategic Motives, B. Organisational Motives, and C. Financial Motives.

A. Strategic Motives

1. **Expansion and Growth :** With the change in Industrial Policy in 1991, the requirement of prior govt. approvals for merger was removed. Thus, if allowed by the government, expansion and growth through merger is less time consuming and more cost effective.

2. **Dealing with the entry of MNCs (multi national companies) :** Merger is a possible strategy for survival with the arrival of MNCs. It may be difficult to beat the MNCs without strategically combining with them.

3. **Economies of Scale:** The bigger is always thought to be better in the industry. Pooling of the resources will bring about the economies of scale. The merger helps the company to produce the goods more economically with the full utilisation of plant capacities.

4. **Synergy:** Synergy is simply defined as 2 + 2 = 5. If the resources of one company are capable of merging with the resources of another company, resulting in higher productivity in both the units, it is a case of synergy. For example, if the technical manpower in one unit can exploit the modern machineries in another organisation it will be fruitful to both the organisations.

5. **Backward / Forward Integration:** Where supply of raw material is critical, acquiring a company producing the raw material will be an added advantage. This is a case of Backward Integration. Similarly, if sale of goods is critical, acquiring a marketing firm is profitable. It is Forward Integration.

6. **New Product Entry :** Entering into a new product market is a time consuming effort. Companies will do well in new product market through merger.

7. **New Market Entry :** Merger may provide the advantage in advertisement and market promotion activities.

8. **Risk Reduction :** Merger helps to reduce the risk of the shareholders of the companies involved in portfolio. A company whose earnings are of different nature and negatively correlated will bring stability in the earnings of the combined firm and reduces the risk.

9. **Balancing Product Cycle :** Combining with a complementary industry to compensate for the boom and doom in a product cycle might be a good strategy. If the main product is seasonal – say Sugar – it will be beneficial to add another non-seasonal product, say Cement.

B. Organisational Motives

1. **Ego Satisfaction:** The size of the combined enterprise satisfies the ego of the owners and the senior managers.

2. **Retention of Managerial Talent:** To assure growth to the senior management personnel in order to retain the management talent, it may be required to attempt merger.

3. **Removal of Inefficient Management:** Merger is a quick remedy to replace inefficient management from an organisation which has high product strength.

C. Financial Motives

1. **Tax Planning:** Under IT act there is a provision for set off and carry forward of loss. A sick company with accumulated losses may like to merge with profitable company to take the advantage of tax benefit. The provisions of capital gain might subsidise the merger.

2. **Revival of Sick Unit:** If a viable unit has become sick, a healthy company may like to merge with it so as to obtain the benefit of the potential of the sick unit.

3. **Increases the P/E Ratio:** The growth rate as well as earnings of merged firm will increases due to various economies and it will help the company to enjoy higher P / E ratio.

4. **Rising of Capital:** After the merger due to increase in the size of the company and better credit worthiness and reputation, the company can easily raise the capital at any time.

Mergers and Acquisitions: The Strategic Role of the Management Accountant

Mergers and Acquisitions have been the focus of attention in the decade of the 1980's when such business activity was most prevalent. In the '90's, the approach of many businesses in considering Mergers and Acquisitions will be a more strategic and reasoned procedure with special consideration

of the ethical consequences on the many parties affected. The management accountant is in a position to contribute his expertise in the analysis of acquisition strategy. The need to determine whether acquisition or internal growth is more efficient in reaching long term goals requires accounting expertise and studied analysis of each company's situation. In certain instances, synergies may be obtained or developed which may result in creating an even more advantageous position for the acquiring company. The management accountant should be poised to provide insight into the determination of an appropriate strategy during the various stages of analysis from the defining of objectives to the integration of the companies, if a merger is consummated.

Mergers and acquisitions received a great deal of attention in the 1980's when mega deals such as the acquisition of RJR Nabisco by Kohlbert Kravis Roberts & Company sent shockwaves through the corporate world. While the great majority of activity prior to the 1990's took place within national boundaries, the last decade has seen a sharp increase in the rate of global merger activity. The international complexities require a more sophisticated analysis involving foreign exchange rates and social, political and economic environments.

Corporations participate in mergers and acquisitions for a variety of reasons, the most prevalent in recent years being growth through external rather than internal means. Such growth may benefit the acquirer by increasing capability for product diversification, expansion of existing product lines and increasing market share. Other quantifiable reasons for entering into mergers include achieving economies of scale for operations and obtaining tax advantages [Larsen, 1991].

An important aspect of merger and acquisition strategy focuses on strengths and goals before taking actions. Managers and management accountants, as partners in the strategic planning process, must take a cautious view of potential activity, to observe a basic compatibility between the two companies, to determine whether the product mix makes sense, and to determine if the companies' core beliefs are the same [Pouvot, 1991].

While quantitative factors provide the identifiable aspects that make the merger attractive, they do not portray the whole picture. Many qualitative factors must also be considered before the real value of a company can be estimated. Qualitative factors are based upon intangibles, such as a skilled labor force, favorable location or a strong management team. While these intangibles are harder to quantify, consideration of their value is essential.

Whatever the rationale or goals of the combining businesses, the success or failure of the merger is based largely upon financial considerations. Because success or failure is ultimately measured in dollars, the target company's financial position must be measured carefully so as to quantify as many expected benefits and costs as possible. This process provides the framework wherein a management accountant can make an important contribution [Allison, 1984]. The purpose of this article is to identify the manner in which the management accountant can utilize his or her expertise to analyze financial data relevant to the acquisition process and provide an informed opinion of valuation with due consideration to all of the qualitative factors and differing parties affected by the potential merger.

Ethical Considerations

All suggested analysis and procedures set forth herein must be guided by a consideration of ethical behavior and value judgments. An increased emphasis on the ethical behavior of the management accountant has developed in recent years. While CPA's involved in public accounting, particularly auditing, have been the focus of ethical standards for many years, the National Association of Accountants (NAA), now the Institute of Management Accountants (IMA), first issued its Standards of Ethical Conduct for Management Accountants in 1983. These standards address the management accountant's obligations concerning competence, confidentiality, integrity and objectivity as well as providing guidance for the resolution of ethical conflicts [Larson, 19]. Though Ethical Standards provide a value system for behavior that attempts to distinguish right from wrong, the development of a code of ethics from such framework that would apply for each of the many "players" in a business takeover and which would adjudicate and direct their behaviors proves to be very difficult. Mergers are complex transactions, and the participants' interests are often competing and conflicting [Drucker, 1981].

The basic ethical conflict usually concerns the specific interests of the "targeted stockholders". These stockholders should not only be protected against third parties who seek to take over their companies by unfair tactics, but also against unethical managers who favor their own interests over their stockholders. Such conflict creates a financial and emotional strain on the relationship among stockholders, corporate boards and management officers. In the past, the "business judgment rule" has governed the ethical code of the takeover process and as a result, the courts have permitted management itself to judge the overall fairness of the takeover [Fogg, 1985].

The interests of the company's stockholders are not the only relevant issue. It is also necessary for the management accountant to assess the effects of the proposed acquisition on each and every segment of society affected, including shareholders of both the acquired company and the acquiring company, employees, managers, communities, customers, suppliers, the industry, the general public and the overall economy.

The management accountant must consider utilizing basic ethical principles as they relate to the above-mentioned segments, when analyzing contemplated actions to effect a proposed merger. An important example of such analysis would be the application of utilitarianism, a consequentialist theory, which holds that ethical behavior produces the greatest balance of good over evil (i.e., the greatest good for the greatest number). Utilitarianism can be viewed as being similar to "cost- benefit analysis", with the key difference being that utilitarianism implies that the effect on affected groups must be evaluated before a decision can be made in the merger.

Another ethical tenet which may be applied, is the principle of universality, which suggests to the management accountant that a person only acts on those principles that he or she is willing to become "universal laws". Pursuant to such ethical principle, each person is viewed as having absolute worth and, therefore, should be treated as an end -not solely as a means to an end. Consequently, each person is deserving of consideration, regardless of whether he or she is a target manager, target shareholder, employee, supplier, customer or corporate raider.

Another measure for ethical behavior which may be applied is the classical theory of justice (i.e., give to each person/constituency what is due to that person or constituency). The determination of the true right for each constituency is not a simple process; however, current practice in mergers and takeovers often runs "roughshod" over the rights of any number of constituencies. Moreover, numerous injustices are, indeed, suffered by these various constituencies, often without legal recourse.

The management accountant is in a unique position with regard to evaluating the ethical consequences of a merger. While his or her primary consideration will be assessing the benefits for the acquiring company with respect to its goals and objectives, the overall effect on each related party or entity must also be considered. This awareness of the effects of mergers on a variety of constituents should, thus, serve as a basis for examining and judging the desirability of a merger and aid in the elimination of abusive merger practices.

5.5 INTERNAL DEVELOPMENT

Porter suggested four "generic" strategies that could be adopted in order to gain competitive advantage. The strategies relate to the extent to which the scope of a business' activities are narrow versus broad and the extent to which a business seeks to differentiate its products.

Ansoff's product/market growth matrix suggests that a business' attempts to grow depend on whether it markets new or existing products in new or existing markets. The output from the Ansoff matrix is a series of suggested growth strategies which set the direction for the business strategy.

For each of the directions suggested by the above models, there are different methods of development.

According to Johnson & Scholes, a **development method** is **the means by which a strategic direction is pursued.**

For example, when pursuing a growth strategy, a business is often faced with making a choice between three development methods

- **Internal development** (often called **"organic growth"** in business textbooks)
- **Acquisitions** (occasionally, and often incorrectly called "mergers")
- **Joint ventures and alliances**

Internal development is where strategies are developed that **build on the business' own capabilities and resources.**

For most businesses, this is the only development method used. Internal development involves approaches such as:

- Designing and developing new product ranges
- Implementing marketing plans to launch existing products directly into new markets (e.g. exporting)
- Opening new business locations – either in the domestic market or overseas
- Investing in research and development to support new product development
- Investing in additional production capacity or new technology to allow increased output and sales volumes
- Training employees to help the best acquire new skills and address new technology

Whilst these approaches are not easy, they are generally considered to be **lower risk** than the alternative – acquisitions or joint ventures. However, the major downside of focusing on internal development is that the speed of change or growth in the business may be too slow.

Organic growth is the process of business expansion due to increasing overall customer base, increased output per customer or representative, new sales, or any combination of the above, as opposed to mergers and acquisitions, which are examples of inorganic growth. Typically, the organic growth rate also excludes the impact of foreign exchange. Growth including foreign exchange, but excluding divestitures and acquisitions, is often referred to as core growth.

"Organic growth occurs when a business grows internally, using its own resources to increase the scale of its operations and sales revenue. Internal growth is typically financed through the profits of the business."

Organic growth is growth that comes from a company's existing businesses, as opposed to growth that comes from buying new businesses. It may be negative.

Organic growth figures are adjusted for the effects of acquisitions and disposals of businesses. Organic growth does include growth over a period that results from investment in businesses the company owned at the beginning of the period. What it excludes is the boost to growth from acquisitions, and the decline from sales and closures of whole businesses.

Organic Growth, also called Internal growth, is based on investing in what the business already does. This type of growth can be achieved by

- **Expanding product range** - once a product is established on the market, further related products can be introduced.
- **Targeting new markets** - this means selling your products to new market sectors, mobile phones were once just sold to business people, then the market become all adults, then teenagers were actively targeted.
- **Expanding the distribution network** - make your product available in more places.
- **Benefiting from economies of scale** - economies of scale reduce costs, meaning that prices can be reduced, which should gain new customers.

Organic growth is a good indicator of how well management has used its internal resources to expand profits. Organic growth also identifies whether managers have used their skills to improve the business. Many firms show how well they have performed by giving like-for-like comparisons, this represents an accurate measure of organic growth for the firm.

Most business enterprises are constantly faced with the challenge of ' prospering and growing their business'. Growth is generally measured in terms of increased revenue, profits or assets. Businesses can choose to build their in-house competencies, invest to create competitive advantages, differentiate and innovate in the product or service line (Organic Growth) or leverage upon the market, products and revenues of other companies (In-organic Growth). Simply put, business expansion with the help of the businesses' core-competencies and sales refers to Organic Growth and is in contrast with Inorganic growth approach where expansion objectives are met through Mergers and Acquisition (M&A).

Apple Inc. is probably an excellent example of Organic Growth. Growth@Apple is driven by trend-setting product innovation. Macintosh, iMac, iPod and the latest technological breakthrough pioneered by Apple is the iPhone. Steve Jobs, Founder, Apple Inc. comments - "Our belief was that if we kept putting great products in front of customers, they would continue to open their wallets." Microsoft, on the other hand is a clear case of In-Organic growth as it has successfully completed more than 100 acquisitions since 1986.

Firms can also diversify by means of corporate entrepreneurship and new venture development. In today's economy, internal development is an important means by which companies expand their businesses. Sony and the Minnesota Mining & Manufacturing Co. (3M), for example, are known for their dedication to innovation, R&D, and cutting-edge technologies. For example, 3M has developed its entire corporate culture to support its ongoing policy of generating at least 25 percent of total sales from products created within the most recent four-year period. During the 1990s, 3M exceeded this goal by achieving about 30 percent of sales per year from new internally developed products. Many companies use some form of internal development to extend their product lines or add to their service offerings. This approach to internal development is used by many large publicly held corporations as well as small firms.

The luxury hotel chain Ritz-Carlton has long been recognized for its exemplary service. In fact, it is the only service company ever to win two Malcolm Baldrige National Quality Awards. It has built on this capability by developing a highly successful internal venture to offer leadership development programs—both to its employees as well as to outside companies.

Compared to mergers and acquisitions, firms that engage in internal development are able to capture the value created by their own innovative activities without having to "share the wealth" with alliance partners or face the difficulties associated with combining activities across the value chains of several companies or merging corporate cultures. Another advantage is that firms can often develop new products or services at a relatively lower cost and thus rely on their own resources rather than turning to external funding. There are also potential disadvantages. Internal development may be time consuming; thus, firms may forfeit the benefits of speed that growth through mergers or acquisitions can provide. This may be especially important among high-tech or knowledge-based organizations in fast-paced environments where being an early mover is critical. Thus, firms that choose to diversify through internal development must develop capabilities that allow them to move quickly from initial opportunity recognition to market introduction.

Methods of Internal Development

- Changing price
    - If there are only a few substitutes for a firm's products, then the business will earn more sales revenue by raising prices.

- Advertising and promoting
  - If the customers are more informed, remained or persuaded about the information and benefits of products, people will buy more.
- Producing improved or better products
  - Such as innovation, new design of products, business can produce improved products.
- Selling in different location(placement)
  - If a product is widely available, customers are more likely to make a purchase
  - For example, Coca-Cola is widely available throughout the world in different places, such as supermarkets, restaurants and cinemas.
- Offering credit payment terms to customer
  - For the purchase of expensive products such as motor vehicles, allow customer to 'buy now but pay later'. However, the firms need to be careful about offering too much credit as this will affect their cash flow position.
- Increasing capital expenditure(investment)
  - It can be formed in expanding of business in new location and technologies to productivity
- Improving training and development(T&D)
  - It can help to make staff more confident and competent in their jobs, but it can also help to motivate the workforce as they feel more valued by the employer.

Benefits of Internal Development

- Better control & coordination
  - Organic growth methods allows firms to keep control, external methods may lead to loss of control or ownership
- Relatively inexpensive
  - Main source of growth from retained profits
  - May be a need to raise interest-bearing capital, but less risk with organic growth as amount of capital involved lower than needed for external
  - High cost of external growth makes organic growth only suitable method of business expansion
- Maintains corporate culture
  - Mergers & acquisitions often face problem of two different cultures join in a new company

Limitations of Internal Development

- Diseconomies of scale
- Higher unit costs of production may be due to internal & external growth. Internally, hierarchical structures may increase, cause communication problems & slow decision-making with growth of firm
- Overtrading
- Describes business "growing beyond its means"
- E.g. firm may take on too many orders, unable to control costs/manage HR as result
- Internal growth cancels this problem out → no culture clash

- A need to restructure
  - Firm grows → necessity to change management + personnel structure
  - E.g. sole trader may be able to control & coordinate business easily but if it grows to multinational company, organizational structure must change
  - Restructuring → time, effort, money
  - Also entails training, retraining, updating of skills.
  - Communication will require further care due to larger number of people in organization
- Dilution of control & ownership
  - If firm changes legal status to grow, original owners must share decision-making with new owners.
  - Process lengthened with more owners, conflict more likely between shareholders
  - Specialist managers hired as firm & workforce expands → requires delegation of decision-making powers to these managers → reduces original owners control.

5.6 STRATEGIC ALLIANCE

A **Strategic Alliance** is a relationship between two or more parties to pursue a set of agreed upon goals or to meet a critical business need while remaining independent organizations. This form of cooperation lies between M&A and organic growth.

Partners may provide the strategic alliance with resources such as products, distribution channels, manufacturing capability, project funding, capital equipment, knowledge, expertise, or intellectual property. The alliance is a cooperation or collaboration which aims for a synergy where each partner hopes that the benefits from the alliance will be greater than those from individual efforts. The alliance often involves technology transfer (access to knowledge and expertise), economic specialization, shared expenses and shared risk.

Strategic alliances usually have a unique value proposition that uses the specific competencies of each of the organizations to achieve competitive advantage. By sharing complementary resources and capabilities alliance partners achieve quicker and more efficient growth than they would if they developed the resources or capabilities within their own organization.

When companies want to quickly gain a new area of expertise or access to new technology or markets, they usually have two options: buy a smaller company with those assets or form a strategic alliance with another company that would benefit equally from the partnership. These agreements often have a limited scope and function, such as trading access to a strong brand for access to an emerging technology.

A Strategic Alliance is an arrangement between two companies that have decided to share resources to undertake a specific, mutually beneficial project. It is less involved and less permanent than a joint venture, in which two companies typically pool resources to create a separate business entity. In a strategic alliance, each company maintains its autonomy while gaining a new opportunity. A strategic alliance could help a company develop a more effective process, expand into a new market or develop an advantage over a competitor, among other possibilities.

For example, an oil and natural gas company might form a strategic alliance with a research laboratory to develop more commercially viable recovery processes. A clothing retailer might form a strategic alliance with a single clothing manufacturer to ensure consistent quality and sizing. A major website could form a strategic alliance with an analytics company to improve its marketing efforts.

In July 2011, Facebook announced a strategic alliance with Skype, which had been recently acquired by Microsoft. This allowed Microsoft to quickly move into the social networking space, Skype received access to a large number of new users and Facebook could leverage Skype's technology to enable video chat without making the investment in building it. By contrast, Dow Chemical formed a joint venture that same month with Japanese firm Ube to create a factory for a particular high-tech battery. They will share the technology and the risk of new product development.

A typical strategic alliance formation process involves these steps:

- **Strategy Development**: Strategy development involves studying the alliance's feasibility, objectives and rationale, focusing on the major issues and challenges and development of resource strategies for production, technology, and people. It requires aligning alliance objectives with the overall corporate strategy.
- **Partner Assessment**: Partner assessment involves analyzing a potential partner's strengths and weaknesses, creating strategies for accommodating all partners' management styles, preparing appropriate partner selection criteria, understanding a partner's motives for joining the alliance and addressing resource capability gaps that may exist for a partner.
- **Contract Negotiation**: Contract negotiations involves determining whether all parties have realistic objectives, forming high calibre negotiating teams, defining each partner's contributions and rewards as well as protect any proprietary information, addressing termination clauses, penalties for poor performance, and highlighting the degree to which arbitration procedures are clearly stated and understood.
- **Alliance Operation**: Alliance operations involves addressing senior management's commitment, finding the calibre of resources devoted to the alliance, linking of budgets and resources with strategic priorities, measuring and rewarding alliance performance, and assessing the performance and results of the alliance.
- **Alliance Termination**: Alliance termination involves winding down the alliance, for instance when its objectives have been met or cannot be met, or when a partner adjusts priorities or re-allocates resources elsewhere.

Reasons for Alliances

Slow Cycle Market

(i) Gain access to a restricted market

(ii) Establish franchise in a new market

Standard Cycle Market

(i) Gain market power

(ii) Gain access to complementary resources

(iii) Meet competitive challenge

(iv) Pool resources for large projects

(v) Learn new business techniques

Fast Cycle Market

(i) Increase speed of product, service or market entry

(ii) Maintain market leadership

(iii) Form an industry technology standard

(iv) Share risky R&D expenses

Benefits of Strategic Alliance

Nowadays, strategic alliance has become a common strategy to businesses. Two or more enterprises choose to form a partnership and work cooperatively to achieve their mutually beneficial objectives.

In a plain view, strategic alliance just reflects the desire of enterprises to achieve their independent business objectives cooperatively. But, in the true fact of today's globalizes and complex market place, there is the need to make such a business arrangement in order to gain competitive advantages among the fierce competitors in the market place.

Enterprises that enter into strategic alliance usually expect to benefit in one or more ways. Some of the potential benefits that enterprises could achieve are such as:

(i) Gaining capabilities

An enterprise may want to produce something or to enquire certain resources that it lacks in the knowledge, technology and expertise. It may need to share those capabilities that the other firms have. Thus, strategic alliance is the opportunity for the enterprise to achieve its objectives in this aspect. Further to that, in later time the enterprise also could then use the newly acquired capabilities by itself and for its own purposes.

(ii) Easier access to target markets

Introducing the product into a new market can be complicated and costly. It may expose the enterprise to several obstacles such as entrench competition, hostile government regulations and additional operating complexity. There are also the risks of opportunity costs and direct financial losses due to improper assessment of the market situations.

Choosing a strategic alliance as the entry mode will overcome some of those problems and help reduce the entry cost. For example, an enterprise can license a product to its alliance to widen the market of that particular product.

(iii) Sharing the financial risk

Enterprises can make use of the strategic arrangement to reduce their individual enterprise's financial risk. For example, when two firms jointly invested with equal share on a project, the greatest potential that each of them stand to loose is only half of the total project cost in case the venture failed.

(iv) Winning the political obstacle

Bringing a product into another country might confront the enterprise with political factors and strict regulations imposed by the national government. Some countries are politically restrictive while some are highly concerned about the influence of foreign firms on their economics that they require foreign enterprises to engage in the joint venture with local firms. In this circumstance, strategic alliance will enable enterprises to penetrate the local markets of the targeted country.

(v) Achieving synergy and competitive advantage

Synergy and competitive advantage are elements that lead businesses to greater success. An enterprise may not be strong enough to attain these elements by itself, but it might possible by joint efforts with another enterprise. The combination of individual strengths will enable it to compete more effectively and achieve better than if it attempts on its own.

For example, to create a favorable brand image in the consumer's mind is costly and time-consuming. For this reason, an enterprise deciding to introduce its new product may need a strategic arrangement with another enterprise that has a ready image in the market.

As a conclusion, strategic alliance is beneficial and it can exists in many forms. As mentioned above, cooperation in the sharing of production facilities, combining of knowledge, skills and technology, marketing of each other's products using existing distribution networks and co-funding of projects are the collective forms of strategic alliances.

Types of Strategic Alliance

There are four types of strategic alliances: joint venture, equity strategic alliance, non-equity strategic alliance, and global strategic alliances.

(i) Joint venture is a strategic alliance in which two or more firms create a legally independent company to share some of their resources and capabilities to develop a competitive advantage. When two companies invest funds into creating a third, jointly owned company, that new subsidiary is called a joint venture. Because the joint venture can access assets, knowledge and funds from both of its partners it can combine the best features of those companies without altering the parent companies. The new company is an ongoing entity that will be in business for itself, but profits are owned by the parents.

The purpose of joint ventures is that two companies can achieve more together, in terms of growth, revenue and so on. There are several benefits of entering in joint ventures, such as:

- **Pooling of resources**
- **Full utilization of under utilized resources**
- **Higher rates of profits**
- **Low risk factor**
- **Massive leverage**

The types of joint ventures mainly depend on, objective of the joint venture, number of parties involved and duration of the joint venture. Some popular forms of joint ventures in India, are:

Licensing:

A foreign company authorizes an Indian company to use its strong brand name, to produce a certain product. The overseas company charges a license fee, for sharing its brand name, patents or copyrights. In this manner, the foreign company ensures an immediate access to the Indian market at a lower price. However, the foreign company does not have any control over the distribution, sales and image of the product in the Indian market.

Franchising:

In this type of a joint venture, a foreign company (franchisor) lends its well-known brand name, goodwill, technical know-how and expertise, to an Indian company (franchisee), to conduct its business. In turn, the franchisor receives a specific amount of turnover from the franchisee. This type of a joint ventures involve low risk, less investment and ensure fast entry in Indian markets for the franchisor. McDonalds is an example of this type of franchising in India. It lends its brand name and business know-how to individual entrepreneurs.

The success of a joint venture projects depends on proper planning and clear objectives. To minimize any complications in later stages, it is essential to thoroughly discuss the terms and conditions of the contract. Further, before signing the contract, it is important to consult a lawyer who is well versed with company law and international laws.

Examples : **Sony-Ericsson** is a joint venture by the Japanese consumer electronics company Sony Corporation and the Swedish telecommunications company **Ericsson** to make mobile phones. The stated reason for this venture is to combine Sony's consumer electronics expertise with Ericsson's technological leadership in the communications sector. Both companies have stopped making their own mobile phones.

(ii) **Equity strategic alliance** is an alliance where partner companies own unequal shares of equity in the venture and are considered to be superior at passing on know-how between companies because they are closer to hierarchical control than non equity alliances. For example, Ford Motor Company and Mazda Motor Corporation formed a long-standing equity strategic alliance.

(iii) **Non-equity strategic alliance** is an alliance in which two or more firms develop a contractual-relationship to share some of their unique resources and capabilities to create a competitive advantage.

Example of a successful non-equity strategic agreement is the du and Vodafone alliance formed in 2009. The essence of the partnership is to better meet the needs of their respective customers in the UAE. The first phase of the agreement allowed du, a new entrant in the UAE market, to gain access to Vodafone's extensive suite of products, services and devices for the UAE market. Both Vodafone and du customers gained preferential roaming rates on the partners' networks. du is also able to leverage Vodafone Group's procurement to achieve cost reductions. During the second phase of the agreement announced in late October 2009, additional joint initiatives were explored including mobile broadband connectivity products, secure remote mobile access for small business users, converged email solutions, faster and exclusive access to new models of handsets.

(iv) **Global Strategic Alliances** working partnerships between companies (often more than two) across national boundaries and increasingly across industries, sometimes formed between company and a foreign government, or among companies and governments.

A global strategic alliance is usually established when a company wishes to edge into a related business or new geographic market -- particularly one where the government prohibits imports in order to protect domestic industry. Typically, alliances are formed between two or more corporations, each based in their home country, for a specified period of time. Their purpose is to share in ownership of a newly formed venture and maximize competitive advantages in their combined territories.

The cost of a global strategic alliance is usually shared equitably among the corporations involved, and is generally the least expensive way for all concerned to form a partnership. An acquisition, on the other hand, offers a faster start in exploiting an overseas market, but tends to be a much more expensive undertaking for the acquiring company -- one that is likely to be well out of the reach of a solo operator. While a global strategic alliance works well for core business expansion and utilizing existing geographic markets, an acquisition works better for immediate penetration to new geographic territories. Hence, an alliance provides a good solution to global marketers that lack required distribution to get into overseas markets.

A global strategic alliance is also much more flexible than an acquisition with respect to the degree of control enjoyed by each party. Depending on your resources, you can structure an equity or non-equity partnership. Within an equity partnership, you can hold a minority, majority or equal stake. In a non-equity partnership, the host country partner has a greater stake in the deal, and thus holds a majority interest. Yet whom you choose as your partner is arguably more important than how the partnership is structured. For when it gets down to business, you want a partner who will have an active contribution to make, and who is flexible and able to resolve conflicts as the alliance evolves. Even more important, however, is that you keep clearly in mind what you are seeking to gain from the alliance, and that you choose a partner whose contribution will enable you to achieve those goals.

The HP and Microsoft global strategic alliance is one of the longest standing alliances of its kind in the industry, with more than 25 years of combined marketplace leadership focused on helping customers and channel partners around the world improve productivity through the use of innovative technologies.

Branded the HP and Microsoft Frontline Partnership, the companies share technology, engineering and marketing resources to create and promote solutions based on industry-standard computing platforms that help solve some of the most challenging IT problems.

HP and Microsoft have jointly engineered solutions that deploy smoothly, seamlessly and deliver competitive advantage. Over time, the alliance has expanded from its earliest roots focused on the desktop PC to include innovations in the data center and emerging technologies for businesses of all sizes. The alliance also has expanded to provide opportunities for our more than 32,000 joint resellers and ecosystem partners.

Other forms of Alliance

Collaborative agreements between businesses can take a number of forms and are becoming increasingly common as businesses aim to get the upper hand over their competitors. The main types of strategic alliances are listed below:

Outsourcing

The 1980s was the decade where outsourcing really rose to prominence, and this trend continued throughout the 1990s to today, although to a slightly lesser extent.

The early forecasts, such as the one from American Journalist Larry Elder, have been shown to not always be true:

"Outsourcing and globalization of manufacturing allows companies to reduce costs, benefits consumers with lower cost goods and services, causes economic expansion that reduces unemployment, and increases productivity and job creation."

Affiliate Marketing

Affiliate marketing has exploded over recent years, with the most successful online retailers using it to great effect. The nature of the internet means that referrals can be accurately tracked right through the order process.

Amazon was the pioneer of affiliate marketing, and now has tens of thousands of websites promoting its products on a performance-based basis.

Technology Licensing

This is a contractual arrangement whereby trade marks, intellectual property and trade secrets are licensed to an external firm. It's used mainly as a low cost way to enter foreign markets. The main downside of licensing is the loss of control over the technology – as soon as it enters other hands the possibility of exploitation arises.

Product Licensing

This is similar to technology licensing except that the license provided is only to manufacture and sell a certain product. Usually each licensee will be given an exclusive geographic area to which they can sell to. It's a lower-risk way of expanding the reach of your product compared to building your manufacturing base and distribution reach.

Franchising

Franchising is an excellent way of quickly rolling out a successful concept nationwide. Franchisees pay a set-up fee and agree to ongoing payments so the process is financially risk-free for the company. However, downsides do exist, particularly with the loss of control over how franchisees run their franchise.

R&D

Strategic alliances based around R&D tend to fall into the joint venture category, where two or more businesses decide to embark on a research venture through forming a new entity.

Distributors

If you have a product one of the best ways to market it is to recruit distributors, where each one has its own geographical area or type of product. This ensures that each distributor's success can be easily measured against other distributors.

Distribution Relationships

This is perhaps the most common form of alliance. Strategic alliances are usually formed because the businesses involved want more customers.

The result is that cross-promotion agreements are established.

Consider the case of a bank. They send out bank statements every month. A home insurance company may approach the bank and offer to make an exclusive available to their customers if they can include it along with the next bank statement that is sent out.

It's a win-win agreement – the bank gains through offering a great deal to their customers, the insurance company benefits through increased customer numbers, and customers gain through receiving an exclusive offer.

Direct cooperation

Direct cooperation alliances are usually entered into for the purpose of operational efficiency or geographic expansion. They are non-equity alliances and are managed less formally than joint ventures. Rather than creating a separate entity or alliance partners obtaining a shareholding, direct cooperation usually involves a contractual arrangement.

Although they may appear similar to transactional dealings direct cooperation alliances involve a greater commitment by the strategic partners and performance objectives are defined and measured by the partners in cooperation.

Minority investment

This type of strategic alliance is an equity alliance and is used most frequently by young rapidly growing organizations. The young firm obtains capital from corporate investors by providing the corporate investor with a minority shareholding in their company.

The purpose of minority investment is less specific than in a joint venture and unlike a joint venture one partner retains control through their majority shareholding. Investors usually have a strategic interest in the growth and success of the company that extends beyond a simple return on investment.

Examples of Successful Strategic Alliances

Strategic alliances are partnerships in which two or more companies work together to achieve objectives that are mutually beneficial. Companies may share resources, information, capabilities and risks to achieve this. According to Producer's eSource, a common reason for entering into a strategic alliance is to obtain the advantage of another company's innovations without having to invest in new research and development. While companies have used acquisition to accomplish some of these goals in the past, forming a strategic alliance is more cost-effective.

Starbucks

According to Rebecca Larson, assistant Professor of Business at Liberty University, Starbucks partnered with Barnes and Nobles bookstores in 1993 to provide in-house coffee shops, benefiting both retailers. In 1996, Starbucks partnered with Pepsico to bottle, distribute and sell the popular coffee-based drink, Frappacino. A Starbucks-United Airlines alliance has resulted in their coffee being offered on flights with the Starbucks logo on the cups and a partnership with Kraft foods has resulted in Starbucks coffee being marketed in grocery stores. In 2006, Starbucks formed an alliance with the NAACP, the sole purpose of which was to advance the company's and the NAACP's goals of social and economic justice.

Apple

According to "An Overview of Strategic Alliances," Apple has partnered with Sony, Motorola, Phillips, and AT&T in the past. Apple has also partnered more recently with Clearwell in order to jointly develop

Clearwell's E-Discovery platform for the Apple iPad. E-Discovery is used by enterprises and legal entities to obtain documents and information in a "legally defensible" manner, according to a 2010 press release.

Strategic Alliance and Joint Venture

As economies become more globalized, more and more firms are participating in foreign markets. The most popular participation strategies include exporting, licensing, strategic alliances, joint ventures, and direct foreign investment. Each of these involves different levels of risk, capital, and returns.

The use of strategic alliances and joint ventures is rapidly becoming popular with a growing number of multinational firms. According to Cullen, an international strategic alliance is an "agreement between two or more firms from different countries to cooperate in any value-chain activity from R&D to sales". Hitt offered this definition, "joint venture is when an independent firm is created by at least two other firms".

Strategic alliances gained increased popularity in the 1990s, Harbison and Pekar reported that from 1987 to 1992 more than 20,000 new alliances were formed in the U.S, up from 5100 between 1980 and 1987. By 1999, U.S. corporations were involved in over 2,000 alliances with companies in Europe alone, according to Cullen. These cooperative strategies offer many potential advantages to the participant, but they are also pitted with special problems.

Joint Venture vs Strategic Alliance

Joint venture and Strategic Alliance differ from each other financially and legally too. There is difference between them in their definitions too. A joint venture is indeed a contractual agreement between two or more companies that come together in business in terms of the performance of a business task.

A strategic alliance on the other hand is a formal relationship between two or more companies in pursuit of common goal in their business even while remaining as independent organizations. This is the main difference between the two terms joint venture and strategic alliance.

In other words it can be said the two or more companies that join together in a joint venture do not remain as independent companies in a joint venture. On the other hand the two or more companies that join together in a strategic alliance will remain as independent organizations in a strategic alliance.

There has been a lot of debate on the issue whether joint venture is better than strategic alliance. It is generally felt that joint venture is better than strategic alliance for some interesting reasons. A joint venture is legally binding in a better way than a strategic alliance.

When it comes to tax purposes strategic alliance is a bit disadvantageous when compared to joint venture. On the other hand you will find strategic alliance more flexible when compared to joint venture. Alliance can also be broken by the help of less number of lawyers. A joint venture on the other hand is not easily broken for that matter. This is because of the fact that it is more legally binding in nature.

Things would work better in strategic alliance due to the fact that it is characterized by a wonderful combination of resources or information. On the other hand lot of hard work has to be put into joint venture in order to taste success.

Joint ventures and strategic alliances allow companies with complementary skills to benefit from one another's strengths. They are common in technology, manufacturing and commercial real estate development, and whenever a company wants to expand its sales or operations into a foreign country. In a joint venture, the companies start and invest in a new company that's jointly owned by both of the parent companies. A strategic alliance is a legal agreement between two or more companies to share access to their technology, trademarks or other assets. A strategic alliance does not create a new company.

Both forms of partnership can be used to transfer technology, assets and knowledge between complementary companies. Strategic alliances are usually undertaken to allow each company to

pursue a new market, product or strategy that they can't manage on their own. Joint ventures are often used to shield the parent companies from the risk of a new venture failing; if the new product flops, the joint venture can go bankrupt without harming the parent company except to the extent of its investment. Some countries require that all companies that do business within their borders be at least partly owned by citizens of that country. In this case, a foreign company can start a joint venture with a domestic company to comply with the law.

The competitive advantage of strategic alliances

In today's environment, creating sustainable value for customers and shareholders requires creating effective alliances. Alliances are essential building blocks for companies to achieve stronger and more effective market presence.

Alliances are now a fact of life for business, an important piece of current operations as well as future strategy.

As the pace of global business accelerates, and customers continually become more demanding and sophisticated, companies are finding the competitive landscape dramatically changing. Markets are moving so quickly that is very difficult for one company to stay current on all technologies, resources, competencies, and information needed to attack, and be successful in those markets. Strategic alliances offer a means for companies to access new markets, expand geographic reach, obtain cutting-edge technology, and complement skills and core competencies relatively fast. Strategic alliances have become a key source of competitive advantage for firms and have allowed them to cope with increasing organizational and technological complexities that have emerged in the global market.

Nowadays, strategic alliances are a business concept that's changing the structure and dynamics of competition throughout the world. Using a broad interpretation, strategic alliance is a relationship between firms to create more value than they can on their own. The firms unite to reach objectives of a common interest, while remaining independent.

Companies are forming alliances with their rivals, their suppliers, and even their customers. Increasingly, groups of companies are competing against other groups, changing the distribution of economic power in society and nudging more and more single companies into alliances.

In recent years, there has been an explosion of alliances around the world and across industries. For example, in February 2001, The Coca-Cola Company and Procter & Gamble announced a $4.2-billion U.S. dollars joint venture to use Coca- Cola's huge distribution system to increase reach and reduce time to market for the P&G products Pringles and Sunny Delight. Star Alliance is the largest partnership in the airline industry; its reach extends to 130 countries and more than 815 destinations, with collective revenue for the partnership at more than $63 billion U.S. dollars. Hewlett-Packard and NTT DoCoMo created a partnership to conduct joint research on technology for fourth generation mobile phones, bringing together HP's network infrastructure and computer servers with DoCoMo's wireless broadband technology.

Alliances take a number of forms and go by various labels. Alliances may be contracts, limited partnerships, general partnerships, or corporate joint ventures, or may take less formal forms, such as a referral network. Richard J. Chernesky shows that virtually all strategic alliances fit into three basic classifications of either "trading", "functional" or "dynamic" operating alliances.

A "trading" alliance is straightforward - nothing more than buyers and sellers forming a largely passive sales and distribution or export/import arrangement based on contractual terms.

A "functional" alliance integrates certain basic "functions" between the two parties by pooling efforts to attain specific goals and establish ongoing management relationships. These functional alliances are usually used to pursue or improve research and development projects, share costs, provide geographical market access and, generally, enhance distribution or sales activities.

A "dynamic" alliance involves the "hidden" assets of the two parties in terms of the skills, knowledge and capacity necessary to deliver results. Examples of "hidden assets" are research and development capabilities, proprietary technology, organizational strength or market-based acceptance. In a dynamic alliance, selected

hidden assets are integrated. However, in many instances, the parties do not know exactly what assets are going to be required because the structure of the alliance almost always evolves during negotiations and initial operations.

Accordingly, strategic alliances have also been characterized as "relational" contracting. Relational contracting is a very flexible arrangement emphasizing mutual collaboration in response to changes in business circumstances. It usually involves a fluid situation that emphasizes receptiveness to modification over time rather than to the detailed and inflexible front-end documentation of expectations. These alliances possess the common feature of ongoing mutual interdependence, a condition in which one party is vulnerable to another whose behavior is not under the control of the first. The overarching theme that seems to unite alliances is that "each needs the other's abilities to advance their respective interests."

In general, to create successful alliances, a company must understand when alliances make strategic sense and how to manage them for a business results. Alliances can be extremely useful in situations of great uncertainty and in markets with growth opportunities that a company either cannot or does not want to pursue on its own. More specifically, the most common reasons for forming strategic alliances and achieve competitive advantages are as follows:

- Setting new global standards. Entering into an alliance can be the best way to establish standards of technology in the sector.
- Confronting competition. When a high-volume producer decides to attack a new geographic market, defense is difficult if it does not have comparable size. Alliance between companies is a response which has often led to positive results. It is equally valid to attempt an attack on a leader that has consolidated its own positions.
- Overcoming protectionist barriers. Alliances can allow companies to avoid controls on importation and overcome barriers to commercial penetration. Alliances can also be a way to respect the bonds posted by the "host" country regarding value added local content and participation in the capital of local businesses.
- Dividing risks. For certain projects, risks of failure are high, and even higher when investments are elevated.
- Economy of scale. There are many alliances designed to divide fixed costs of production and distribution, seeking to improve volume.
- Access to a market segment. In mature segments, a company often wants to develop in a market segment where it is not present through an agreement with another company.
- Access to a geographic market. A strategic alliance is often a way to enter a market that is protected by (national) tariff and other barriers, or dominated by another company with particular competitive advantages.
- Access to technology. Convergence among technologies is the origin of many alliances. It is increasingly more frequent that companies need to appeal to their competition in different sectors if they want to realize a product line.
- Uniting forces. Some projects are too complex, with costs that are too high, to be managed by a single company (military supplier contracts, civil infrastructure construction).
- Bridging a gap. If a company does not have the resources or capabilities necessary to develop a particular strategy, an alliance with one or more companies is the most logical solution. Making an alliance to gain access to resources and capabilities that are lacking internally is perhaps the most frequent motive leading a company to seek partners.

- "Anticipating a play". The advantages and risks of pioneering are significant. In many sectors, the first company to enter the market with a new product achieves advantages that are difficult for the competition to overcome. The company is the first along the experience curve. It gets the best positions for distribution. It invests initial profit margins in the production process, distancing itself further from the competition. The strategic alliance can have the scope of utilizing the pioneering experience of one of the partners. If this experience is brought to the alliance, it confers the advantages on the other partners as well.

Besides competitive advantages, strategic alliances can have some disadvantages.

Alliances are costly, not only due to cash leaving the company's hands, but rather due to returns from which it could be denied. First, they involve the investment of managerial time resources in establishing the alliance, managing it, and resolving possible conflicts of interest between the partners over the functioning of the alliance.

Moreover, alliances can create indirect costs by blocking the possibility of cooperating with competing companies, thus possibly even denying the company various financing options. For instance, an alliance with Ericsson in the area of cellular communications could reduce the likelihood of contracts with Nokia, thereby putting the company at risk that if Ericsson is weakened, so will be all the companies that depend upon it.

Alliances also expose the company to its partners, and the unique technologies that it has are sometimes revealed to its partner company, which could later become a competitor or could utilize the fruits of the venture or the know-how better than the startup itself. In addition, strategic partners may often lead the company in directions that serve the partner company better than they do the company itself.

Although a material part of the costs of alliances such as joint ventures may be forecasted during the negotiations for its establishment, in many cases the balance of power between the parties changes during the course of the venture's life, and the parties to it may have a change of mind. For instance, many joint ventures that were signed before the stock market crises of 2001–2002 between public companies and startups never materialized due to the drop in the stock prices of some such public companies. The fact that some of the private companies had meanwhile raised capital and actually had become stronger than the public companies utterly changed the balance of power. Likewise, the non-raising of capital by the startup could motivate the public company to try to renegotiate the terms of the venture, while taking advantage of the startup's weakness. A change in the competitive environment in the field could also affect the alternative cost of the venture.

A study of alliances indicated that out of every one hundred alliance negotiations, ninety will fail to even produce an agreement. Of the remaining ten that do result in agreements, five will fail to meet the partners' expectations for the venture. Of the five that produce acceptable results, only three will survive for more than four years.

Alliances may terminate for any number of reasons. The collaborative relationship may break down. The alliance may accomplish its mission and therefore outlive its purpose. Partner strategies may change, eliminating the need for the alliance. In his paper "Strategic alliances" Richard J. Chernesky evaluate six the most frequent problem areas which lead to alliances' failure:

1. Poor project management. Companies involved in alliances must continuously monitor how fast moving markets and advances in technology may modify the assumptions and expected outcomes that prevailed when the deals were signed. The trouble begins when executives underestimate how much time and energy must be committed to managing multiple partner alliances.
2. Strategic gridlock. Unanticipated conflicts in objectives, business plans and operations may cause a dramatic change in the viability of a particular alliance.

3. Losing control of basic strategy. In every alliance, the partners relinquish some control with the expectation of shared returns. If a participant unduly depends upon the alliance for growth, it can lose sight of its overall business strategy and fail to focus on its own business. One of the worst things that has happened with the strategic alliance concept is that a partner ends up creating a competitor.
4. Focus on benefits to partners. The failure of the parties to act in unison because of a focus on what the other participant is obtaining from the alliance.
5. Poorly defined goals. The failure to agree upon specific goals and objectives such as return on investment, market share, market expansion, cost containment, etc. often leads to unanticipated difficulties.

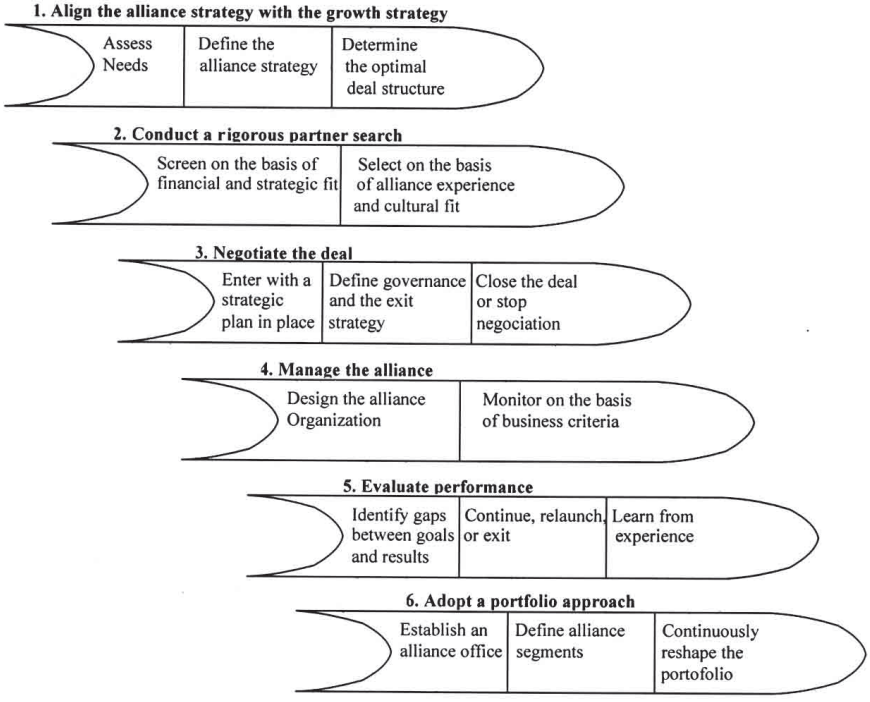


Fig. Structured Alliance Process

Source: BCG analysis

6. Poor partner choice. The failure to select the right partner can make even the best deal unsuccessful. The business attributes of General Motors' alliance with the Korean company, Daewoo, to produce the Pontiac LeMans were positive and highly attractive, but the differences in management style and corporate cultures eventually resulted in the strategic alliance being discarded.

To ensure the greatest likelihood of success, organizations contemplating forming an alliance need to develop a disciplined, structured and systemic strategic alliance process.

In order to achieve a competitive advantage, the process of alliance management should be very people-oriented. One key to managing the process is the personal relationship that develops between operating managers. When that relationship is based on trust and respect, differences (be they of substance or style) can be settled to the satisfaction of both parties. When the relationship between managers is less cordial, contracts and bureaucratic methods are needed to resolve relatively minor issues.

Once managers grasp the fact that an alliance is a process they build flexibility, responsiveness and process goals into the relationship. The process goals are based on the continual assessment and improvement of everything from the communication channels to the technology transfer process.

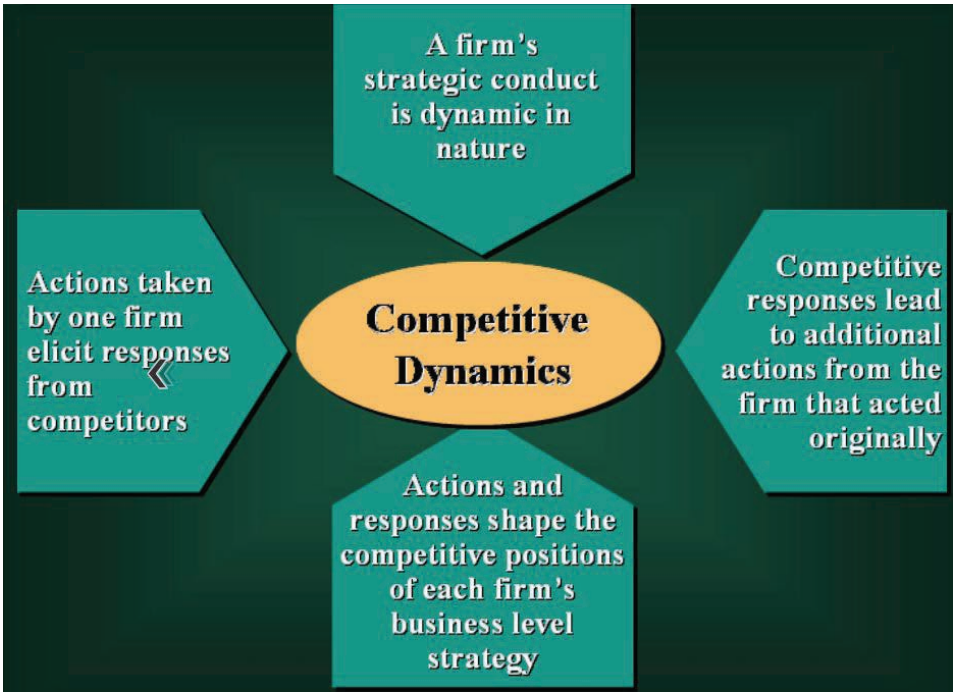
Cooperation involves both firms adapting to, and learning from, their partner's operating style. The foundation of operating style is corporate culture, and the integration of culture is an important issue in alliances. There are two steps involved in integrating corporate cultures. The first is to identify the type of culture that predominates in each firm. The second is to integrate those cultures so that the best aspects of each are encouraged in the relationship.

In conclusion, strategic alliances can be a powerful tool for achieving a company's strategic goals. Through cooperation and sharing of resources, "one plus one" may "equal three". In order to improve the chances of success, companies must follow a careful, organized process from start to finish; from strategic conception to alliance termination. It is important to take the time to properly set the strategy for the alliance, to create the optimum structure for the alliance to flourish, to set clear rules of governance, and to monitor the results on a timely basis.

As a result, strategic alliance can provide a powerful competitive advantage in new markets, cost, speed, knowledge, and technology access. Following the above framework will provide an approach to developing successful strategic alliance which has the potential to improve the organization's strategic position dramatically, perhaps even to transform the company. Strategic alliance offers the parties an option on the future, opening new doors and providing unforeseen opportunities.

5.7 COMPETITIVE DYNAMICS

Competitive dynamics is the analysis of competition at the action and response level to predict how a firm will act or react against opponents. Understanding engagements at this level is essential because this is where firms enact their strategies, test their opponents' mettle and capabilities, defend their reputations, and signal their toughness--that is, where business rivalry occurs. The dyadic or pair-wise approach of competitive dynamics makes possible focused analysis that complements Michael Porter's conventional industry structure and its extension, the strategic groups approach.



Obtaining a good overview and understanding of and industry and a given company's strategic position in the competitive landscape can be vital for positioning a business or determining the long-term outcome of competitive rivalry. You can actually get very far by just applying a few simple and well-established analytical frameworks based on the ideas of top-business thinkers.

When analyzing the competitive dynamics of any industry initially look at what are the risks of someone else moving into the market and evaluate whether there are any barriers to entry in terms of e.g. brand loyalty, vast amounts of capital needed, limited distribution access or maybe absolute cost advantage. Secondly, look at whether the buyers in the given industry has any specific bargaining power, which could be the case if e.g. there only are a limited number of big powerful buyers or in case there are many substitute products. Third, look at the potential risk of a substitute product entering the market. Fourth, evaluate the bargaining power of the suppliers by looking at the number of suppliers and their potential for switching production to something else or finding another buyer. Fifth, look at the competitive rivalry among the companies in your industry. Together the risks and competitiveness associated with these five dimensions tells you how competitive a given industry is and how well a given company is positioned in that industry as well as where the potential pitfalls or opportunities are.

An effective way of comparing two companies or providing a quick good-looking overview of one company is to look at the different dimensions that together provide a well-rounded view of where companies are headed and what infrastructure they have in place to reach their goals. Initially, analyze the company's strategy and the structure and systems it has in place to reach its goals. Subsequently, look at the company's staffs' capabilities, specific skill-sets, the style of leadership and tie it together by taking into account the company's values.

Making a quick overview based on these factors gives you a nice picture of a given company in terms of how well and with what resources and focus it is doing what. In turn it will easy to compare two or more companies utilizing this approach to draw out differences and similarities. Keeping the above-mentioned approach for analyzing the competitive dynamics in an industry in mind while looking at different companies you will be able to come with a qualified idea about which company is most likely to succeed in that industry and what could be done to improve that company's competitiveness.

A series of actions (moves) and reactions (countermoves) among firms in an industry create competitive dynamics. These action/reaction dynamics reflect the normal and innovative movement of firms in pursuit of profits. Firms act creatively (introduce a new product, a new promotion, or a new marketing agreement) to enhance or improve profits, competitive advantage, and industry position. Successful actions (actions which generate new customers and profits) promote competitive reaction as rivals attempt to block or imitate the action. The study of competitive dynamics is thus the study of how firm action (moves) affects competitors, competitive advantage, and performance. Sometimes these actions and reactions can escalate among firms so that the industry performance is adversely affected; at other times, the pattern of behavior can be more genteel and profitable.

Competitive Response

When a firm undertakes an action that generates abnormal profits or an action that affects a rival's position, competitors will be motivated to respond (Schumpeter, 1950). Porter (1980) defines a competitive response as a clear-cut, discernable counteraction carried out by the firm to defend or improve its position with regard to one or more competitors initiated actions. Response likelihood represents the extent to which a rival is likely to respond to a firm's action. It has measured as the historical proportion of times a firm reacts to a rival's action in a given time period from the total number of times the firm had the opportunity to respond. Thus, a firm that has responded to nine out of ten of a rival's actions is more likely to respond in the future than a firm that has responded one out of ten times.

In deciding to respond to a move, competitors have a wide variety of response options available at their disposal. One key dimension of responses is to imitate the initiated action. Response imitation is defined as the extent to which a response mimics or is identical in type and form to the initiated action.

A response that duplicates or matches a competitors move provides a powerful signal to the acting firm that the rival is committed to defending their market position.

Porter argued, "Finding strategic moves that will benefit from a delay in retaliation, or making moves so as to maximize the delay, are key principles of competitive interaction." Response lag or response delay represents the amount of time that elapses between a competitive action and the initiation of a response. During this time lapse, the actor gains economic rents from the action, provided it is a successful action, whereas non- or slow-responding rivals often experience market share losses or missed profit opportunities. The longer the response delay, the less obvious is the connection between the action and the response, thus reducing the power of the response as a signaling device.

Another dimension of competitive response is the *response order*. This is "the position in a temporal series of responses a firm occupies". Since actions generally affect multiple competitors, there is usually more than one firm that responds to a competitive action. Response order represents the firm's ranking in the order of responses (among multiple responding rivals) to a competitive action. Thus, a firm could be the first to respond, second to respond or a late responder. The concept of *response order* is distinct from *response delay* in that the former represents a firm's ranking in the series of responses, whereas the later represents the elapsed time between the action and the response.

The Consequences of Action

Competitive interaction is not an end in and of itself. Firms engage each other (i.e., undertake actions and responses) to achieve certain competitive outcomes. Competitive dynamics has generally used common measures of performance as the dependent variable, including: changes in market share, cumulative abnormal returns to shareholders, sales growth, as well as accounting measures of profitability and profit growth, such as return on investment Gaining market share to maintain industry leadership, dethrone an industry leader, or reduce the market share gap held leading competitors is an important objective of many firms.

High market share generally leads to higher profits stemming from economies of scale, market power, and reputational advantages. Moreover, market share is also measure of relative standing vis-à-vis competitors and, more importantly, managers *believe* that it is associated with higher profits. Accordingly, a firm's change in market share serves as an important organizational outcome for firms because it represents both growth (or decline) relative to rivals, as well as profit potential.

Section B

Strategic Cost Management

Study Note - 6

STRATEGIC COST MANAGEMENT AND CONTROL

This Study Note includes

In the contemporary business environment, cost management has become a critical survival skill for many organizations. But it is not sufficient to simply reduce costs; instead, costs must be managed strategically (Cooper and Slagmulder 1998a:14). Many authors stressed that the strategic importance of cost management has drastically increased in the recent years due to intense competition. According to Cooper and Slagmulder (1997a:108) customers in highly competitive markets expect that each generation of products presents improvements. These improvements may include: improved quality, improved functionality or reduced prices. Any of these improvements alone or any combination of them urge a firm to manage its costs to stay profitable.

6.1 THE CONCEPT OF STRATEGIC COST MANAGEMENT

Strategic cost management is understood in different ways in literature. Cooper and Slagmulder (1998a:14) argued that strategic cost management is "the application of cost management techniques so that they simultaneously improve the strategic position of a firm and reduce costs". They suggest three sorts of cost management initiative, based on whether the impact on the organization's competitive position is positive, negative or neutral. An example of a cost management initiative that strengthens an organization's position is illustrated as follows. A hospital redesigns its patient admission procedure so it becomes more efficient and easier for patients. The hospital will become known for its easy admission procedure so more people will come to that hospital if the patient has a choice. The strategic position of the hospital has just been increased over its competitors. The second example of a cost management initiative that will weaken the organization's competitive position is illustrated as follows. A large airline company only has two desks for administering and selling tickets. This set-up induces long lines for the airline customer which can ultimately result in high dissatisfaction and a bad reputation for the airline. This may reduce the amount of ticket sales when compared with the airline's competitors. Even though having only two desks available for customers may initially be cost effective, in the long run, it harms the company. As a general rule, an organization should never undertake any practices that are predicted to weaken the position of the organization.

Furthermore, Cooper (1995a:89) argued that strategic cost management needs to include all aspects of production and delivering the product; the supply of purchased parts, the design of products and the manufacturing of these products. So, strategic cost management should be inherent to each stage of a product's life cycle, i.e. during the development, manufacturing, distribution and during the service lifetime of a product. According to Welfie and Keltyka (2000:33) strategic cost management is an area that holds exciting possibilities for accountants. They also emphasized that strategic cost management attempts to improve the strategic position of an organization and reduces costs at the same time and it is important because global competition means that firms must be constantly aware of their strategic position. An organization must compete in the areas of cost, quality, customer service, and

flexibility with any cost reduction efforts contributing to an improved strategic position (Seal 1989:117). A sophisticated understanding of an organization's cost structure can go a long way in the search for sustainable competitive advantage, this point is emphasized by Shank and Govindarajan (1993:6ff.) who define strategic cost management as "the managerial use of cost information explicitly directed at one or more of the four stages of strategic management:

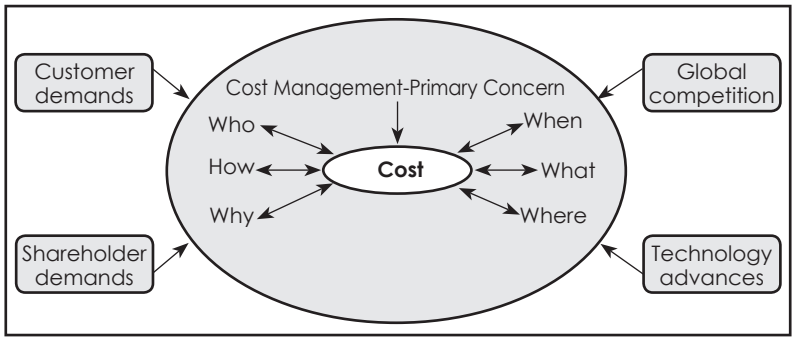
(1) formulating strategies, (2) communicating those strategies throughout the organization, (3) developing and carrying out tactics to implement the strategies, and (4) developing and implementing controls to monitor the success of objectives".

According to Horvath and Brokemper (1998:585), strategic cost management has emerged as a key element to attain and sustain a strategic competitive advantage through long-term anticipation and formation of costs level, costs structure, and costs behavior pattern for products, processes, and recourses. For this purpose, strategic cost management must provide managers with different information. Strategic cost management sees products, processes, and resources themselves as creative objects for attaining a strategic competitive advantage. This goal may not be achieved based on traditional cost management. They also argue that strategic cost management must determine and analyze long-term cost determinants (economics of scale, experience, etc.) and their influence on costs level, costs structure, and costs behavior pattern. Finally, strategic cost management should begin with participation during R&D and design stages of the product in order to avoid the costs early in the product life cycle.

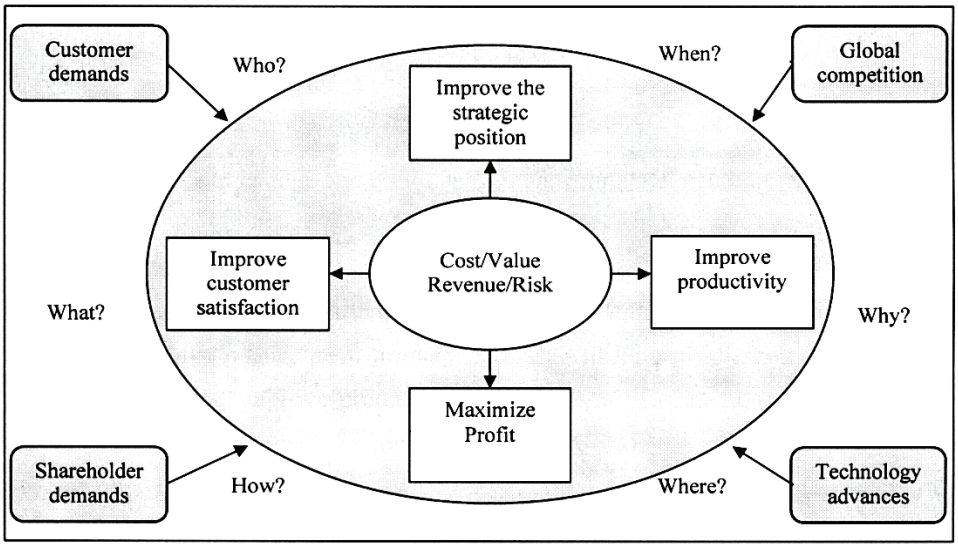
Hence, the term strategic cost management has a broad focus, it is not confined to the continuous reduction of costs and controlling of costs and it is far more concerned with management's use of cost information for decision-making. Strategic cost management is also not confined to use of cost management techniques that reduce costs and improve the strategic position of a firm at the same time. When most authors talk about strategic cost management, they are really thinking about cost reduction. However, it is often difficult to demean the importance of cost factor for the success of company, but the challenge is to increase revenue, which can be facilitated by strategic cost management. Cost-management knowledge and information is critical to their organization's success. Strategic cost management is important to organizations because it is more than focusing on costs; in the successful companies of the 21st century costs will not be the only most important factor, but also value and revenue will be considered critical factors in the success of companies.

Concerns and Objectives of Strategic Cost Management

Change is an imprint of contemporary business environment that cannot be avoided. In the 21st century, strategic cost management is facing just such a challenge. Strategic cost management has both the opportunity and difficult task of defining and shaping its own future as well as the future of companies. Trends and changes in the business environment such as: increase of global competition, increasingly demanding customers and shareholders, and rapid advances in information and manufacturing technology - traditional cost management may be not adaptable to these events (McNair 2000:28). In fact, there are many cost management systems, have been offered many solutions for companies, but their primary concern was cost reduction, as result, the late 20th century found organizations anxiously to, not deciding, their future.



Cost and revenue management is the present role of strategic cost management in the 21st century, strategic cost management primary concern will not only be cost management but also increase revenues, improve productivity and customer satisfaction, and the same time improve the strategic position of the company.



Strategic Cost Management must bridge the gap between cost and value as well as between the language of the market and the language of the business. Traditional Cost Management during the 20th Century faced many criticism, however, Strategic Cost Management during 21st Century faces a future that will be unique and rewarding compared to its current realities. The difference between Traditional Cost Management and Strategic Cost Management is explained below :

	Traditional Cost Management	**Strategic Cost Management**
Focus	Internal	External
Perspective	Value-added	Value chain
Cost analysis-way	In term of: product, customer, and function With a strongly internal focus Value added is a key concept	In terms of the various stages of the overall value chain of which the firm is a part With a strongly external focus Value-added is seen as a dangerously narrow concept
Cost analysis-objective	Three objectives will apply, without regard to the strategic context: Score keeping, attention directing, and problem solving.	Although the three objectives are always present, the design of cost management system changes dramatically depending on the basic strategic positioning of the firm: either under a cost leadership strategy, or under a product differentiation strategy.
Cost driver concept	A single fundamental cost driver pervades literature - cost is a function of volume. Applied too often only at the overall firm level.	Multiple cost drivers such as: Structural drivers (e.g. scale, scope, experience, technology, complexity) Executional drivers (e.g. participative management, total quality management) Each value activity has a set of unique cost drivers.

Cost containment philosophy	Cost reduction approached via responsibility centers or product cost issues	Cost containment is a function of the cost driver(s) regulating each value activity.
Primary concern	Cost impact	Cost/Value/Revenue relationship
Key disciplines	Finance/Accounting	Marketing/Economies
Primary role	Scorekeeper	Analyst and consultant
Management responsibility	Follower/reactive Risk-averse	Leader/proactive Comfortable with ambiguity

The emergence of SCM results from a blending of three underlying themes, each taken from the strategic management literature:

1. Value chain analysis
2. Strategic positioning analysis
3. Cost driver analysis

Each of these three themes represents a stream of research and analysis in which cost information is cast in a light very different from that in which it is viewed in conventional management accounting.

Value Chain Analysis

The first theme that underlies the work in strategic cost management concerns the focus of cost management efforts. Stated in question form: How do we organize our thinking about cost management?

In the SCM framework, managing costs effectively requires a broad focus, external to the firm. Porter (1985a) has called this focus the value chain. The value chain for any firm in any business is the linked set of value-creating activities all the way from basic raw material sources for component suppliers through to the ultimate end-use product delivered into the final consumers' hands. This focus is external to the firm, seeing each firm in the context of the overall chain of value-creating activities of which it is only a part, from basic raw material components to end-use consumers.

In contrast, management accounting today often adopts a focus that is largely internal to the firm—its purchases, its processes, its functions, its products, and its customers. Another way of saying this is that management accounting takes a value-added perspective, starting with payments to suppliers (purchases), and stopping with charges to customers (sales). The key theme is to maximize the difference (the value added) between purchases and sales.

But the value chain concept is fundamentally different from the value-added concept. From a strategic perspective, the value-added concept has two big problems; it start too late and it stops too soon. Starting cost analysis with purchases misses all the opportunities for exploiting linkages with the firm's suppliers. Such opportunities can be dramatically important to a firm.

Consider the following examples case

A few years ago, one of the major U.S. automobile companies began to implement Just in Time (JIT) management concepts in its assembly plants (Houliham. 1987). Manufacturing costs represented 30% of sales for the auto firm. It was believed that applying JIT concepts could eliminate 20% of these costs because assembly costs in Japanese auto plants were known to be more than 20% below those in U.S. plants. As the firm began to manage its factories differently to eliminate waste and the need for inventory buffers, its assembly costs began to drop noticeably. But, at the same time, the firm experienced dramatic problems with its major suppliers. They began to demand price increases that more than offset the assembly plant costs savings. The auto firm's first response was to chide its suppliers that they, too, needed to embrace JIT concepts for their own operations.

A value chain perspective revealed a much different picture of the overall situation. Of the auto company's sales, 50% was purchases from parts suppliers; of this amount, 37% was purchases by the parts suppliers and 63% was suppliers' value added. Thus, suppliers were adding more manufacturing value to the auto than the assembly plants (63% x 50% - 31.5%, versus 30%). As the auto company reduced its need for buffer stocks, it placed major new strains on the manufacturing responsiveness of its suppliers. The suppliers' manufacturing costs went up more than the assembly plants' costs went down.

The reason, once identified, was very simple. The assembly plants experienced huge and uncertain variability in their production schedules. One week ahead of actual production, the master schedule was more than 25% wrong 95% of the time. When the inventory buffers are stripped away from a highly unpredictable production process, the manufacturing activities of the suppliers become a nightmare. For every dollar of manufacturing cost the assembly plants saved by moving toward JIT management concepts, the suppliers' plants spent much more than one dollar extra because of schedule instability.

Because of its narrow value-added perspective, the auto company had overlooked the impact of its changes on its suppliers' costs. Management had ignored the idea that JIT involves a partnership with suppliers. Management did not realize that a major element in the success of JIT for a Japanese auto assembly plant is schedule stability for its supplier firms. In fact, whereas the U.S. plants regularly missed schedules only one week ahead by 25% or more, the Japanese plants varied 1% or less from schedules planned four weeks in advance (Jones & Udvare, 1986).! The failure to adopt a value chain perspective doomed this major effect by a leading U.S. firm. The lack of awareness of supply chain cost analysis concepts on the part of this company's management accountants proved to be a very costly oversight. Should those management accountants have been exposed to value chain concepts somewhere in their accounting education?

In addition to starting too late, value-added analysis has another major flaw; is stops too soon. Stopping cost analysis at sales misses all the opportunities for exploiting linkages with the firm's customers. Customer linkages can be just as important as supplier linkages.

Exploiting customer linkages is the key idea behind the concept of life cycle costing. Life cycle costing deals explicitly with the relationship between what a customer pays for a product and the total cost the customer incurs over the life cycle of using the product. Forbis and Mehta (1981) describe how a life cycle costing perspective on the customer linkage in the value chain can lead to increased profitability. Explicit attention to post purchase costs by the customer can lead to more effective market segmentation and product positioning. Or, designing a product to reduce post purchase costs of the customer can be a major weapon in capturing competitive advantage. In many ways, the lower life cycle cost of imported Japanese autos helps to explain their success in the U.S. market.

Just as many cost management problems are misunderstood because of failure to see the impact on the overall value chain, many cost management opportunities are missed in the same way.

The Strategic Positioning Concept

The second major theme underlying the work in strategic cost management concerns the perceived uses of management accounting information, stated, again, in question form: What role does cost management play in the firm?

The theme of SCM can be stated very succinctly. In SCM, the role of cost analysis differs in important ways depending on how the firm is choosing to compete. Following Porter's (1980) delineation of basic strategic choices, a business can compete either by having lower costs (cost leadership) or by offering superior products (product differentiation). That these two approaches demand very different conceptual frameworks has been widely accepted in the strategy literature and, although strategic positioning does not involve simple either/or choices in practice, the implications for strategic management have been frequently amplified.! but the implications of strategic positioning for management accounting are not as well explored. Since differentiation and cost leadership involve different managerial mindsets, they also involve different cost analysis perspectives. As one example of how strategic positioning can significantly influence the role of cost analysis, consider the decision to invest in more carefully engineered

product costs. For a firm, following a cost leadership strategy in a mature, commodity business, carefully attention to engineered target costs is likely to be a very important ongoing management tool. But for a firm following a product differentiation strategy in a market-drive, rapidly growing, fast-changing business, carefully engineered manufacturing costs may well be much less important.

The Cost Driver concept

In SCM it is acknowledged that cost is caused, or driven, by many factors that are interrelated in complex ways. Understanding means understanding the complex interplay of the set of cost drivers at work in any given situation. At this level of generality, the idea is almost tautological. It is hardly contentious or counterintuitive until one contrasts it with the prevailing theme in traditional management accounting today. In management accounting, cost is a function, primarily, of only one cost drive, output volume. Cost concepts related to output volume permeate the thinking and the writing about cost: fixed versus variable cost, average cost versus marginal cost, cost-volume-profit analysis, break even analysis, flexible budgets, and contribution margin, to name a few. In SCM, output volume as such is seen to capture very little of the richness of cost behavior. Management accounting, in this regard, tends to draw upon the simple models of basic microeconomics. SCM, on the other hand, tends to draw upon the richer models of the economics of industrial organization (Scherer, 1980).

Strategic cost driver, cumulative experience, has also received some attention among management accountants over the years as a determinant of unit costs. Reference to the learning curve also appear in many managerial accounting text. However, rather than seeing experience as one of many cost drivers, the accounting literature sees it more narrowly as an explanation of how the relationship between cost and output volume changes over time as cumulative output increases for one particular product of process. That is, even in the learning curve literature in accounting, output volume is still the preeminent cost driver. Experience is seen as a phenomenon that can help explain the changing relationship between output volume and costs over time.

If output volume is a poor way to explain cost behavior, what is a better way? Porter (1985a) presents one attempt to create a comprehensive list of cost drivers, but his attempt is more important than his particular list. In the strategic management is more important than this particular list. In the strategic management literature, better lists exist (Riley, 1987). Following Riley, the following list of cost drivers is broken into two categories. The first category comprises "structural" cost drivers, drawing upon the industrial organization literature (Scherer, 1980). From this perspective there are at least five strategic choices by the firm regarding its underlying economic structure that drive cost position for any given product group:

(i) Scale: How big an investment to make in manufacturing, in R&D, and in marketing resources.

(ii) Scope: Degree of vertical integration. Horizontal integration is more related to scale.

(iii) Experience: How many times in the past the firm has already done what it is doing again.

(iv) Technology: What process technologies are used at each step of the firm's value chain.

(v) Complexity: How wide a line or products or services to offer to customers.

Each structural driver involves choices by the firm that drive product cost. Given certain assumptions, the cost calculus of each structural driver can be specified. Of the structural drivers, scale, scope, and experience have received a large amount of attention from economists and strategists over the years. Of these three, only experience has drawn much interest from management accountants, as noted previously.

Complexity, as a structural variable, has received the most attention among accountants recently. Some examples of the potential importance of complexity as a cost determinant are in the work on activity based costing by Kaplan (1987), Cooper (1986), or Shank and Govindarajan (1988d). We consider this work as a useful strategic analysis tool, but not as the primary tool.

The second category of cost drivers, executional drivers (Riley, 1987), are those determinants of a firm's cost position that hinge on its ability to execute successfully. Whereas structural cost drivers are not monotonically scaled with performance, executional drivers are. That it for each of the structural drivers, more is not always better. There are diseconomies of scale, or scope, as well as economics. A more complex line. Too much experience can be as bad as too little in a dynamic environment. For example, Texas Instruments emphasized the learning curve and became the world's lowest-cost producer of microchips that were no longer state of the art. Technological leadership versus followership is a legitimate choice for most firms.

In contrast, for each of the executional drivers, more is always better. The list of basic executional drivers includes at least the following:

Work force involvement (participation) - the concept of work force commitment to continual improvement.

Total quality management (beliefs and achievement regarding product and process quality).

Capacity utilization (given the scale choices on plant construction).

Plant layout efficiency. (How efficient, against current norms, is the layout)

Product configuration. (Is the design or formulation effective?)

Exploiting linkages with suppliers and/or customers, per the firm's value chain.

While it may not always be true that a higher level of these executional factors improves cost position, examples of diseconomies are much less frequent.

Operationalizing each of these drivers also involves specific cost analysis issues. Many strategy consultants maintain that the strategic cost analysis field is moving very quickly toward executional drivers because the insights from analysis based on structural drivers are too often old fashioned. It is somewhat ironic that the cost drivers concept is moving from one revolution to a second one before the accounting world has caught up with the first one.

Whatever cost drivers are on the list, the key ideas are as follows:

- For strategic analysis, volume is usually not the most useful way to explain cost behavior.
- In a strategic sense, it is more useful to explain cost position in terms of the structural choices and executional skills that shape the firm's competitive position.
- Not all the strategic drivers are equally important all the time, but some (more than one) of them are very probably very important in every case.
- For each cost driver there is a particular cost analysis frame work that is critical to understanding the positioning of a firm. Being a well-trained cost analysis requires knowledge of these various frameworks...

6.2 STRATEGIC COST ANALYSIS – TARGET COSTING, LIFE CYCLE COSTING AND KAIZEN COSTING

In every business, the owners and managers need to know what their product or service costs to deliver and what they can sell it for. They want to make strategic decisions that maximize their profits, and they require information to do this. Even not-for-profit businesses have a service or product that they wish to offer but are constrained by the funding they receive from grants, donations and bequests.

The simple truth is that you can not decide what to do unless you know the cost. This link between cost information and strategy has always been present, possible in an unsophisticated and informal manner. Increasing competitiveness and the contributions made by academics, consultants, and practicing business people have made that link explicit. The conclusion is that strategic decisions cannot be successfully made unless you understand cost information.

Strategic Cost Analysis explains the tools that managers need. It examines the different methods of calculating cost, techniques for controlling and monitoring costs, and ways to integrate cost data and strategy into every aspect of the organization. It helps companies identify, analyze and use strategically important resources for continuing success.

Strategic Cost Analysis (SCA) focuses on an organization's various activities, identifies the reasons for their costs, and financially evaluates strategies for creating a sustainable competitive advantage. The technique provides organizations with the total costs and revenues of strategic decisions. This requires creative thinking, and managers need to identify and solve problems from an integrative and cross-functional viewpoint.

Example of SCA include the following :

- Deciding on product mixes and production volumes
- Outsourcing decisions
- Cost reductions
- Investment and profit growth in different markets
- Responses to suppliers' and competitors' activities
- Changes in consumer demand

Target Costing and Life Cycle Costing

Target costing and lifecycle costing can be regarded as relatively modern advances in management accounting, so it is worth first looking at the approach taken by conventional costing.

Typically, conventional costing attempts to work out the cost of producing an item incorporating the costs of resources that are currently used or consumed. Therefore, for each unit made the classical variable costs of material, direct labour and variable overheads are included (the total of these is the marginal cost of production), together with a share of the fixed production costs. The fixed production costs can be included using a conventional overhead absorption rate or they can be accounted for using activity-based costing (ABC). ABC is more complex but almost certainly more accurate. However, whether conventional overhead treatment or ABC is used the overheads incorporated are usually based on the budgeted overheads for the current period.

Once the total absorption cost of units has been calculated, a mark-up (or gross profit percentage) is used to determine the selling price and the profit per unit. The mark-up is chosen so that if the budgeted sales are achieved, the organization should make a profit.

There are two flaws in this approach

1. The product's price is based on its cost, but no one might want to buy at that price. The product might incorporate features which customers do not value and therefore do not want to pay for, and competitors' products might be cheaper, or at least offer better value for money.

This flaw is addressed by target costing

2. The costs incorporated are the current costs only. They are the marginal costs plus a share of the fixed costs for the current accounting period. There may be other important costs which are not part of these categories, but without which the goods could not have been made. Examples include the research and development costs and any close down costs incurred at the end of the product's life. Why have these costs been excluded, particularly when selling prices have to be high enough to ensure that the product makes a profit. To make a profit, total revenue must exceed total costs in the long term.

This flaw is addressed by lifecycle costing

Target costing

Target costing is very much a marketing approach to costing. The Chartered Institute of Marketing defines marketing as:

'The management process responsible for identifying, anticipating and satisfying customer requirements profitably.'

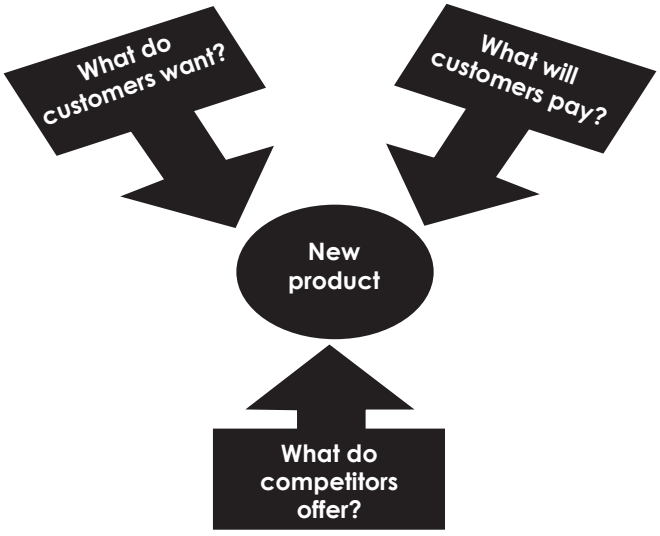
In marketing, customers rule, and marketing departments attempt to find answers to the following questions:

- Are customers homogeneous or can we identify different segments within the market?
- What features does each market segment want in the product?
- What price are customers willing to pay?
- To which competitor products or services are customers comparing ours?
- How will we advertise and distribute our products? (There are costs associated with those activities too.)

Marketing says that there is no point in management, engineers and accountants sitting in darkened rooms dreaming up products, putting them into production, adding on, say 50% for mark-up then hoping those products sell. At best this is corporate arrogance; at worst it is corporate suicide.

Note that marketing is not a passive approach, and management cannot simply rely on customers volunteering their ideas. Management should anticipate customer requirements, perhaps by developing prototypes and using other market research techniques.

The really important information relating to a new product is:



Of course, there will probably be a range of products and prices, but the company cannot dictate the market, customers or competitors. There are powerful constraints on the product and its price and the company has to make the required product, sell it at an acceptable and competitive price and, at the same time, make a profit. If the profit is going to be adequate, the costs have to be sufficiently low. Therefore, instead of starting with the cost and working to the selling price by adding on the expected margin, target costing will start with the selling price of a particular product and work back to the cost by removing the profit element. This means that the company has to find ways of not exceeding that cost.

For example, if a company normally expects a mark-up on cost of 50% and estimates that a new product will sell successfully at a price of ₹ 12, then the maximum cost of production should be ₹8:

Cost + Mark-up = Selling price

100% 50% 150%

₹ 8 ₹4 ₹12

This is a powerful discipline imposed on the company. The main results are:

- The establishment of multifunctional teams consisting of marketing people, cost accountants, production managers, quality control professionals and others. These teams are vital to the design and manufacturing decisions required to determine the price and feature combinations that are most likely to appeal to potential buyers of products.
- An emphasis on the planning and design stage. This becomes very important to the cost of the product because if something is designed such that it is needlessly expensive to make, it does not matter how efficient the production process is, it will always be a struggle to make satisfactory profits.

Here are some of the decisions, made at the design stage, which can affect the cost of a product:

- the features of the product.
- how to avoid 'over design'.
- the number of components needed.
- whether the components are standard or specialised.
- the complexity of machining and construction.
- where the product can be made.
- what to make in-house and what to sub-contract.
- the quality of the product.
- the batch size in which the product can be made.

You will see from this list that activity-based costing can also play an important part in target costing. By understanding the cost drivers (cost causers) a company can better control its costs. For example, costs could be driven down by increasing batch size, or reducing the number of components that have to be handled by stores.

The concept of value engineering (or value analysis) can be important here. Value engineering aims to reduce costs by identifying those parts of a product or service which do not add value – where 'value' is made up of both:

- use value (the ability of the product or service to do what it sets out to do – its function) and
- esteem value (the status that ownership or use confers). The aim of value engineering is to maximise use and esteem values while reducing costs.

For example, if you are selling perfume, the design of its packaging is important. The perfume could be held in a plain glass (or plastic) bottle, and although that would not damage the use value of the product, it would damage the esteem value. The company would be unwise to try to reduce costs by economising too much on packaging.

Similarly, if a company is trying to reduce the costs of manufacturing a car, there might be many components that could be satisfactorily replaced by cheaper or simpler ones without damaging either use or esteem values. However, there will be some components that are vital to use value (perhaps elements of the suspension system) and others which endow the product with esteem value (the quality of the paint and the upholstery).

Lifecycle costing

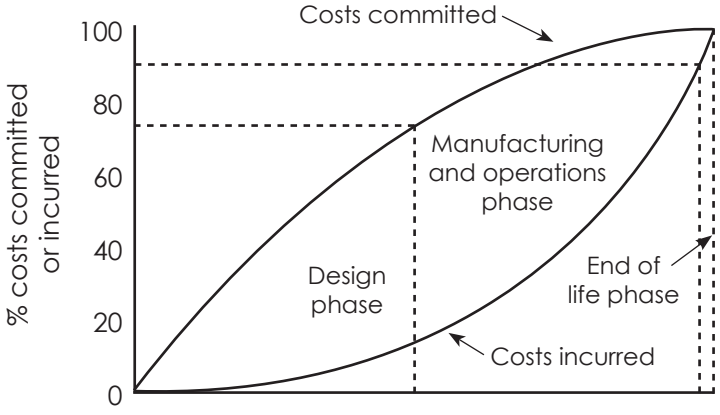
As mentioned above, target costing places great emphasis on controlling costs by good product design and production planning, but those up–front activities also cause costs. There might be other costs incurred after a product is sold such as warranty costs and plant decommissioning. When seeking to make a profit on a product it is essential that the total revenue arising from the product exceeds total costs, whether these costs are incurred before, during or after the product is produced. This is the concept of life cycle costing, and it is important to realise that target costs can be driven down by attacking any of the costs that relate to any part of a product's life. The cost phases of a product can be identified as:

Phase	**Examples of types of cost**
Design	Research, development, design and tooling
Manufacture	Material, labour, overheads, machine set up, inventory, training, production machine maintenance and depreciation
Operation	Distribution, advertising and warranty claims
End of life	Environmental clean-up, disposal and decommissioning

There are four principal lessons to be learned from lifecycle costing:

- All costs should be taken into account when working out the cost of a unit and its profitability.
- Attention to all costs will help to reduce the cost per unit and will help an organisation achieve its target cost.
- Many costs will be linked. For example, more attention to design can reduce manufacturing and warranty costs. More attention to training can reduce machine maintenance costs. More attention to waste disposal during manufacturing can reduce end-of life costs.
- Costs are committed and incurred at very different times. A committed cost is a cost that will be incurred in the future because of decisions that have already been made. Costs are incurred only when a resource is used.

Typically the following pattern of costs committed and costs incurred is observed:



The diagram shows that by the end of the design phase approximately 80% of costs are committed. For example, the design will largely dictate material, labour and machine costs. The company can try to haggle with suppliers over the cost of components but if, for example, the design specifies 10 units of a certain component, negotiating with suppliers is likely to have only a small overall effect on costs. A bigger cost decrease would be obtained if the design had specified only eight units of the component. The design phase locks the company in to most future costs and it this phase which gives the company its greatest opportunities to reduce those costs. Conventional costing records costs only as they are incurred, but recording those costs is different to controlling those costs and performance management depends on cost control, not cost measurement.

A numerical example of target and life cycle costing

A company is planning a new product. Market research information suggests that the product should sell 10,000 units at ₹ 21.00/unit. The company seeks to make a mark-up of 40% product cost. It is estimated that the lifetime costs of the product will be as follows:

(i) Design and development costs ₹ 50,000

(ii) Manufacturing costs ₹ 10/unit

(iii) End of life costs ₹ 20,000

The company estimates that if it were to spend an additional ₹ 15,000 on design, manufacturing costs/ unit could be reduced.

Required

(a) What is the target cost of the product?

(b) What is the original lifecycle cost per unit and is the product worth making on that basis?

(c) If the additional amount were spent on design, what is the maximum manufacturing cost per unit that could be tolerated if the company is to earn its required mark-up?

Solution:

The target cost of the product can be calculated as follows:

(a) Cost + Mark-up = Selling price

100%	40%	140%
₹ 15	₹ 6	₹ 21

(b) The original life cycle cost per unit = (₹ 50,000 + (10,000 x ₹ 10) + ₹ 20,000)/10,000 = ₹ 17
This cost/unit is above the target cost per unit, so the product is not worth making.

(c) Maximum total cost per unit = ₹ 15. Some of this will be caused by the design and end of life costs:
(₹ 50,000 + ₹ 15,000 + ₹ 20,000)/10,000
= ₹ 8.50

Therefore, the maximum manufacturing cost per unit would have to fall from ₹ 10 to (₹ 15 - ₹ 8.50) = ₹ 6.50.

Kaizen Costing

Yashihuro Moden defines kaizen costing as "the maintenance of present cost levels for products currently being manufactured via systematic efforts to achieve the desired cost level." The word *kaizen* is a Japanese word meaning *continuous improvement*.

Moden has described two types of kaizen costing:

- Asset and organisation specific kaizen costing activities planned according to the exegencies of each deal
- Product model specific **costing** activities carried out in special projects with added emphasis on **value analysis**

Kaizen costing is applied to products that are already in production phase. Prior to kaizen costing, when the products are under development phase, target costing is applied.

'Kaizen costing is based on the belief that nothing is ever perfect, so improvements and reductions in the variable costs are always possible'

The cost-plus method is one of the most traditional and common pricing techniques. In fact, virtually all companies in the UK used cost-plus pricing until they started to realise that they were operating in

price-competitive markets. Until then, they had naively assumed that consumers would be wiling to pay whatever price they arrived at by adding a percentage to the estimated cost of the product or service. This cost-plus approach has gradually been replaced by target costing. This addresses the pricing issue from the other direction. It must be accepted that in a competitive market a company has little influence over the selling price of its product.

Organisations use market research to establish the number of units they are likely to sell and the unit price that customers are willing to pay for the product. From this selling price, a company subtracts the profit required to meet its profit objective, arriving at a target cost. In most cases this cost will be lower than the current cost, especially if the product is subject to the learning-curve phenomenon, which would result in a "cost gap". The firm's objective is to bridge this gap – i.e., to cut the cost by using tools such as value analysis and functional analysis. Achieving the target cost requires a concerted effort from the whole company. Some firms choose a team of managers from all the main departments, whose main aim is to examine every aspect of the product and the manufacturing process to remove unnecessary costs and anything that does not add value, while maintaining quality and functionality. In some cases this may lead to a complete product redesign.

Once the design has been approved, production can begin, which is where Kaizen costing starts. The method can be defined as a focus on obtaining small, incremental cost reductions (rather than big changes at longer intervals) during the production phase of the product's life cycle. Kaizen costing is based on the belief that nothing is ever perfect, so improvements and reductions in the variable costs are always possible. Like its big brother TQM, it becomes part of the culture, involving all members of the organisation. Everyone is encouraged to offer ideas that, however small, could lead to a reduction in variable costs, which could in turn lead to a reduction in the selling price and, hopefully, a growth in sales. Alternatively, the price could be maintained and the resulting increase in profits could be used to reward the shareholders or be reinvested in other projects. It's easy to see how Kaizen costing is aligned closely with lean manufacturing, whose main aim is to cut waste through continuous improvement. This is achieved by identifying the best resources and most efficient processes to remove waste from production.

6.3 JUST IN TIME

Why Just-In-Time manufacturing when there are dozens of other manufacturing philosophies from which a company may choose? Just-In-Time (JIT) manufacturing distances itself from the competition because no large capital outlays are required. Other methods promote complexity, large overheads, automation, and other "state-of-the-art" technologies, while JIT advocates simplifying and streamlining the existing manufacturing process.

Since World War II, traditional American companies have developed a way of doing business that entails top management planning, re-planning, and more planning. Although some planning is good, it ultimately adds no value to the end product. Customers want quality products at competitive prices - they couldn't care less how much planning was required to get that product to them. By implementing JIT, much of the planning disappears and a large portion of the remaining planning is entrusted to the shop floor personnel.

All employees in the company - from top management to direct labor - must have a clear understanding of the benefits that JIT offers to them and to their company. JIT is not a cure-all for every manufacturing problem. But, if implemented properly, JIT is a no-cost or low-cost method for improving your manufacturing process.

The basis of Just-In-Time (JIT) is the concept of ideal production. It centers on the elimination of waste in the whole manufacturing environment, from raw materials through shipping. Just-In-Time is defined as "the production of the minimum number of different units, in the smallest possible quantities, at the latest possible time, thereby eliminating the need for inventory. Remember, JIT does not mean to produce on time, but to produce just in time.

JIT was invented by Taiichi Ohno of Toyota shortly after World War II. Ohno's system was designed to handle large or small volumes of a variety of parts. Many people are intimidated by JIT because of its association with Japan. If these people take a broader look at JIT, they will see that it is nothing more than good, common sense manufacturing.

From Supermarket to Shop Floor

Legend has it that Ohno got the idea for his manufacturing system from America's supermarket system. Ohno learned the **kanban** (pull) system from our supermarket system in which customers pulled items from the shelves to fill their shopping carts, thereby creating an empty space on the shelf. The empty space is a signal for the stocker to replace that item. If an item was not bought that day, there was no need to replace it. When item quantities become low, that is the signal for the stockers to order more goods from their suppliers. Customers are content to take just what they need, because they know that the goods will be there the next time they need them.

To apply this concept to manufacturing, Ohno devised a system whereby the *usage* of parts is determined by production rates. Materials are pulled through the plant by usage or consumption of the parts in final assembly. To obtain maximum results, Ohno decided to move the machines closer together and form manufacturing cells.

The JIT system continued to evolve, with the central thrust being the elimination of waste. Ohno's system has become a totally flexible system in which production rates are determined by the end user rather than the producer.

While the prevailing view of JIT is that of an inventory control system, it is much more. JIT is an operational philosophy which incorporates an improved inventory control system in conjunction with other systems, such as:

- A set-up time improvement system.
- A maintenance improvement system.
- A quality improvement system.
- A productivity improvement system.

A properly implemented JIT system should:

- Produce products customers want.
- Produce products only at the rate that customers want them.
- Produce with perfect quality.
- Produce instantly with zero unnecessary lead time.
- Produce with no waste of labor, material, or equipment. Every move has a purpose and there is no idle inventory.

Steps or elements of the implementation process of JIT generally (though not always) include the following:

- Reductions in set-up time.
- Utilization of a formal preventive maintenance program.
- Utilization of quality circles.
- Utilization of cellular manufacturing techniques.
- Cross-training of employees.
- Quality certification of suppliers.
- Reductions in vendor lead time.
- Reductions in lot sizes.

- Sole sourcing.
- Presence of one who "championed the cause of JIT within the firm.

Benefits touted as results of JIT implementation include:

- Reductions in down time.
- Reductions in inventory.
- Reductions in scrap and re-work.
- Reductions in workspace.
- Increased inventory turns.
- Increased labor utilization.
- Increased equipment utilization.
- Improved service to customers.

A real business example: Dell Computer Corporation

In this company an order for a customized personal computer that comes in over the internet at 9 am, can be on a delivery truck to the customer by 9 p.m. In addition, Dell's low cost production system allows it to under price its rivals by 10% to 15%. How does the company's just in time system deliver lower costs? While machines from Compaq and IBM can languish on dealer shelves for two months Dell does not start ordering components and assembling computers until an order is booked. By ordering right before assembly, Dell figures its parts, on average, are 60 days newer than those in an IBM or Compaq machine. That can translate into a 6% profit advantage in components alone.

Constraints of JIT Theory

The 'Just In Time' process is, however, not without limitations. One of the major constraints of JIT is that it leaves consumers and suppliers open to supply shocks. Moreover, the strategy is heavily dependent on the demand curve of the time when it is applied.

Heavy market demands will result in indent of large amounts of stock, while lower demands will result in the requisition of small amounts of cargo. When Ford achieved his success with the 'Just In Time' strategy, he was dealing with a labor force that was desperate for money and did not have much for self-esteem. The prosperity of the 1920's and the advent of labor unions as well as product proliferation resulted in conflict with the 'Just In Time' process implemented by the Ford foundations. In spite of all these limitations, 'Just In Time' strategy has survived and continues to be accepted.

While JIT has some benefits, these are matched by its potential limitations:

- Difficulty of predicting market demand. While JIT may present cost savings for businesses, this advantage should be weighed against the difficulty of predicting market demand, which consistently fluctuates for most industries.
- Slow dispatch. The JIT system can result in slower dispatch or even an inability to fulfil customer orders on time. This will impact on customer satisfaction and sales.
- Theory and practice. While there's much written and researched about JIT, for inventory management, it can be a challenging theory to apply. While the theory seems to encourage businesses to stay lean and dynamic, it can make it more difficult for businesses to respond to changing market conditions such as a sudden jump in product demand.

A real business example: Toyota

Just-in-time manufacturing system is vulnerable to unexpected disruptions in supply chain. A production line can quickly come to a halt if essential parts are unavailable. Toyota, the developer of JIT, found this

out the hard way. One Saturday, a fire at Aisin Seiki Company's plant stopped the delivery of all break parts to Toyota. By Tuesday, Toyota had to close down all of its Japanese assembly line. By the time the supply of break parts had been restored, Toyota had lost an estimated $15 billion in sales.

JIT AND QUALITY

The single most substantial ingredient of JIT is quality. It is impossible for JIT to be successful until the company has drastically improved its attitude toward quality. In the language of the Malcolm Baldrige National Quality Award, quality is a "race with no finish line." The ultimate aspiration is to satisfy all customers (internal and external) all the time. The Wallace Company, a past winner of the Baldrige Award, installed a buzzer on the shop floor that sounded anytime a customer called their customer service hot line. Instantly all workers knew they had a dissatisfied customer. Can you imagine installing such a device in a traditional manufacturing company?

The Chicken or The Egg

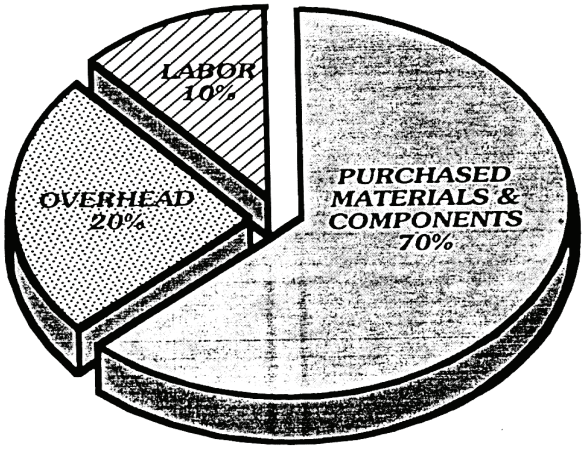
Analogous to the familiar chicken or the egg question, it is often asked, "Which comes first, quality or JIT?" Quality is a two way street; JIT is impossible without quality, but quality is directly enhanced by JIT. Although quality is possible without JIT, it requires the use of wasteful procedures such as inspection and rework. JIT proposes the idea of "do it right the first time" rather than inspecting in quality. In a JIT environment, each internal customer (the next operator down the line) must be completely satisfied by the previous operation. Any problems in quality are resolved immediately, rather than allowing them to contaminate the system further.

To produce quality you must install quality. Quality must evolve from both sides at the same time. To allow operators to satisfy their internal customers, quality procedures, materials, machines, and mindset must be present. JIT is not possible without quality, but JIT is a means by which quality is achieved.

A mathematics riddle known as the Xeno's paradox asks if a person walks toward a wall, each step being one half as large as the previous one, when will that person reach the wall? The answer is "never", but that person is continuously getting closer and closer to his or her goal. Continuous improvement in quality must be viewed in the same way. If you set a standard at 95 percent, people figure that they are doing fine as long as they are at or near that objective. Companies have to be motivated to advance quality to increasingly higher and higher standards. Ultimately the goal should be perfection.

JIT PURCHASING

Probably no single group will conflict with the principles of JIT as much as the purchasing department. JIT purchasing is as different from traditional purchasing as JIT manufacturing is from traditional manufacturing. The goal of a purchasing department is the same as that for the manufacturing floor—the elimination of waste. Typical expenditures for a United States manufacturer are 70 percent purchased material and components, 10 percent labor, and 20 percent overhead (Hay, 117).



The fact that 70 percent of cost is purchased material reinforces the importance of total commitment to JIT by the purchasing department. This commitment will not be obtained unless the purchasing employees fully understand JIT principles because only then will they apply these principles to their purchasing processes. Purchasing cost is a critical factor for a JIT manufacturing system, but it lags behind quality and delivery lead time in importance. Vendors must deliver quality products on time (just in time) before a JIT system can work, regardless of cost. JIT purchasing offers a framework for a true partnership between vendors and companies that helps to solve the problems of cost, quality and lead time.

Backflushing in JIT System

1. Sequential Tracking: Traditional normal and standard costing systems use the Sequential Tracking method for accounting costs. This involves recording journal entries in the same order as transactions occur, i.e. purchase, issue of materials, production, OH absorption, etc.
2. Backflush Costing: An alternative approach to Sequential Tracking is Backflush Costing. It is a costing system that omits recording some or all of the journal entries relating to the cycle from purchase of Direct Materials to the sale of Finished Goods. The Journal Entries for the subsequent stages use normal or standard costs to work backward to flush out the costs in the cycle for which the Journal Entries were omitted earlier.
3. Suitability in JIT: Given the large transaction volumes associated in JIT, Backflush Costing is ideal when compared to Sequential Tracking method. However, the following issues must be corrected before effective implementation of Backflush Costing -
   (a) Accurate Production Reports; The total production figure entered into the system must be absolutely correct, or else the wrong component type and quantities will be subtracted from stock. Errors in Production Reporting can be reduced by proper staff training and reducing staff turnover.
   (b) Proper Scrap Reports: All abnormal scrap must be diligently tracked and recorded. Otherwise, these materials will fall outside the Backfttushing System and will not be charged to inventory. Since Scrap can occur anywhere in a production process, lack of attention by any of the Production Staff can result in an inaccurate inventory.
   (c) Lot Tracing: Lot Tracing is impossible under Backflushing System. It is required when a Manufacturer needs to keep records of which production lots were used to create a product in case all the items in a lot must be recalled. Only a Picking System can adequately record this information. Some computer systems allow Picking and Backflushing System to co-exist.
   (d) Inventory Accuracy: The inventory balance may be too high at all times because the Backflushing Transaction that 'relieves inventory usually does so only once a day, during which time other inventory is sent to the production process. This makes it difficult to maintain an accurate set of inventory records in the warehouse.

The success of a Backflushing System is directly related to the Company's willingness to invest in a well-paid, well-experienced, well-educated production staff that undergoes little turnover.

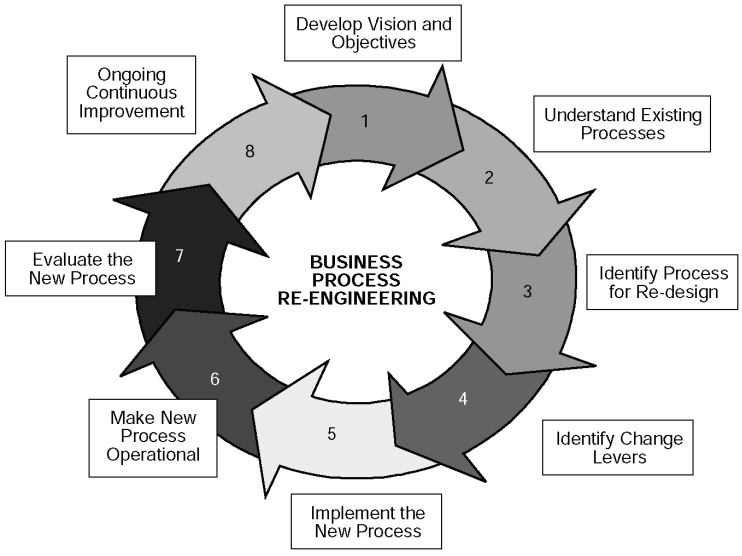
6.4 BUSINESS PROCESS RE-ENGINEERING

Business process re-engineering (BPR) is a business management strategy, originally pioneered in the early 1990s, focusing on the analysis and design of workflows and processes within an organization. BPR aimed to help organizations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world-class competitors. In the mid-1990s, as many as 60% of the Fortune 500 companies claimed to either have initiated reengineering efforts, or to have plans to do so.

BPR seeks to help companies radically restructure their organizations by focusing on the ground-up design of their business processes. According to Davenport (1990) a business process is a set of logically

related tasks performed to achieve a defined business outcome. Re-engineering emphasized a holistic focus on business objectives and how processes related to them, encouraging full-scale recreation of processes rather than iterative optimization of subprocesses.

Business process re-engineering is also known as business process redesign, business transformation, or business process change management.



Source: Vakola *et al.* (1998)

The globalization of the economy and the liberalization of the trade markets have formulated new conditions in the market place which are characterized by instability and intensive competition in the business environment. Competition is continuously increasing with respect to price, quality and selection, service and promptness of delivery. Removal of barriers, international cooperation, technological innovations cause competition to intensify. All these changes impose the need for organizational transformation, where the entire processes, organization climate and organization structure are changed. Hammer and Champy provide the following definitions:

Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance such as cost, quality, service and speed.

Process is a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis on how work is done within an organization. " (Davenport 1993).

Each process is composed of related steps or activities that use people, information, and other resources to create value for customers as it is illustrated in the following example

An example of a business process: Credit card approval in a bank.

An applicant submits an application. The application is reviewed first to make sure that the form has been completed properly. If not, it is returned for completion. The complete form goes through a verification of information. This is done by ordering a report from a credit company and calling references. Once the information is verified, an evaluation is done. Then, a decision (yes or no) is made. If the decision is negative, an appropriate rejection letter is composed. If the decision is positive, an account is opened, and a card is issued and mailed to the customer. The process, which may take a few weeks due to workload and waiting time for the verifications, is usually done by several individuals. Business processes are characterized by three elements: **the inputs**, (data such customer inquiries or materials), **the processing** of the data or materials (which usually go through several stages and may necessary stops that turns out to be time and money consuming), and **the outcome** (the delivery of the expected result).

The problematic part of the process is processing. Business process reengineering mainly intervenes in the processing part, which is reengineered in order to become less time and money consuming.

The term "Business Process Reengineering" has, over the past couple of year, gained Increasing circulation. As a result, many find themselves faced with the prospect of having to learn, plan, implement and successfully conduct a real Business Process Reengineering endeavor, whatever that might entail within their own business organization. Hammer and Champy (1993) define business process reengineering (BPR) as:

" the fundamental rethinking and **radical** redesign of **the business processes** to achieve **dramatic** improvements in critical, contemporary measures of performance, such as cost, quality, service and speed".

An example of BPR application.

A typical problem with processes in vertical organizational structure is that customers must speak with various staff members for different inquiries. For example, if a bank customer enters into the bank determined to apply for a loan, apply for an ATM card and open a savings account, most probably must visit three different desks in order to be serviced. When BPR is applied to an organization the customer communicates with only one person, called "case manager", for all three inquiries.

The implementation of "One Stop Shopping" as a major customer service innovation, requires the close coordination with a team of staff assigned to a process powered by IT for exchanging information and documents in order to service the customer's request. For instance a customer applying for a loan "triggers" a team of staff assigned to service a loan application. The manager completes an application for a loan in electronic form, which in turn is submitted through the network to the next team member, the credit control director, who examines the credit status of the customer. If the credit status is not satisfactory the rejection of the loan is approved by the credit manager and a rejection form is filled and it is returned to the case manager. The case manager explains to the customer the reason that his application was rejected.

On the other hand, if the credit status of the customer is satisfactory, the application is submitted electronically to the next team member, who calculates interest rates and payment tables. The application is then submitted to the credit manager for approval using a digital signature. The approval of the application along with the payment table is delivered to the customer by the case manager.

Most importantly, while the loan application team was processing the loan application, the case manager "triggered" the account team to open a savings account and the ATM team to supply the customer with an ATM card. The customer leaves the bank having a response for his loan application, a new savings account and an ATM card, and all these without having to move around the desks for signatures and documents. All the customer's requests were satisfied at the same time in parallel motion.

How can BPR be applied to an organization?

When British Telecom had announced their Business Plan, all competitors were eager to find out who would be the new CEO of the organization. To the surprise of all the new CEO it was the **customer**. The company had decided to transform all the operations of the organization the way customers wanted them to operate. The most important action in applying BPR is the company's **strategic** goal to provide customer oriented services. BPR is a technique used to implement this type of organizational structure.

Having the management commitment for change, another very important factor for implementing BPR, is the enabling role of **Information Technology.** The way that businesses are organized around departments is very logical since, for instance, there were physical barriers in the communication of the accounting department with production department. (The warehouse could be in another location in the another part of the city). So it wasn't possible for a cross-functional team to communicate efficiently. In the 90s when telecommunication technologies were becoming abundant and low costing BPR was becoming a world-wide applicable managing technique for business upgrade, enabled by the technology.

Employees can easily operate as a team using intranets/extarnets, workflow and groupware applications, eliminating distances. We can **work together** even though we are located in **different** places.

BPR Characteristics

The BPR characteristics - outcomes include the following:

- Several jobs are combined into one.
- Decision-making becomes part of the job of employees (employee empowerment).
- Steps in the processes are performed in natural order, and several jobs get done simultaneously.
- Processes have multiple versions. This enables the economies of scale that result from mass production, yet allows customization of products and services.
- Work is performed where it makes the most sense.
- Controls and checks and other non-value-added work are minimized.
- Reconciliation is minimized by cutting back the number of external contact points and by creating business alliances.
- A single point of contact is provided to customers.
- A hybrid centralized/decentralized operation is used.

Principle of BPR

BPR is achieving dramatic performance improvements through radical change in organizational processes, rearchitecting of business and management processes. It involves the redrawing of organizational boundaries, the reconsideration of jobs, tasks, and skills. This occurs with the creation and the use of models. Whether those be physical models, mathematical, computer or structural models, engineers build and analyze models to predict the performance of designs or to understand the behavior of devices. More specifically, BPR is defined as the use of scientific methods, models and tools to bring about the radical restructuring of an enterprise that result in significant improvements in performance.

Redesign, retooling and reorchestrating form the key components of BPR that are essential for an organization to focus on the outcome that it needs to achieve. The outcome pursued should be an ambitious outcome (as for instance, are a 24 hour delivery to any customer anywhere in the world, approval of mortgage loans within 60 minutes of application, or ability to have on-line access to a patient's medical records no matter where they are in any major city in the world). These types of visionary goals require rethinking the way most organizations do business, careful redesign. They will additionally need very sophisticated supporting information systems and a transformation from a traditional organizational structure to a network type organization.

In resuming, the whole process of BPR in order to achieve the above mentioned expected results is based on key steps-principles which include redesign, retool, and reorchestrate. Each step-principle embodies the actions and resources as presented in the table below.

REDESIGN	RETOOL	RECORCHESTRATE
• Simplify • Standardize • Empowering • Employeeship • Groupware • Measurements	• Networks • intranets • extranets • Work Flow	• synchronize ▪ process ▪ IT ▪ human resources

The 3 Rs of re-engineering

Creating the new enterprise involves considerable change in virtually everything to do with people's working lives. Rather than fixing the old, we set out to create the new. There is a fundamental transformation occurring in business - in terms of its structure, processes, people, and technology. The table following presents the changes in that occur in the business under BPR.

Changes in the World of Work

From Conventional	To BPR
Functional departments	Process Teams
Simple tasks (division of labor)	Empowered employees
Controlled people (by management)	Multidimensional work
Training of employees	Education of employees
Compensation for skill and time spent	Compensation for results
Pay raises based on promotions and seniority	Low pay plus high performance-related bonuses
Advancement based on ability	Advancement based on performance
Protective organizational culture	Productive organizational structure
Managers supervise and control	Managers coach and advise
Hierarchical organizational structure	Horizontal (flat) structure
Executives as scorekeepers	Executives as leaders
Separation of duties and functions	Cross-functional teams
Linear and sequential processes	Parallel process
Mass production	Mass customization

Source: Based on Hammer and Champy, 1993.

In resuming, the whole process of BPR in order to achieve the above mentioned expected result is based on key step-principles which include redesigning, retooling and reorchestrating.

Objectives of BPR

When applying the BPR management technique to a business organization the implementation team effort is focused on the following objectives:

Customer focus. Customer service oriented processes aiming to eliminate customer complaints.

Speed. Dramatic compression of the time it takes to complete a task for key business processes. For instance, if process before BPR had an average cycle time 5 hours, after BPR the average cycle time should be cut down to half an hour.

Compression. Cutting major tasks of cost and capital, throughout the value chain. Organizing the processes a company develops transparency throughout the operational level reducing cost. For instance the decision to buy a large amount of raw material at 50% discount is connected to eleven cross checkings in the organizational structure from cash flow, inventory, to production planning and marketing. These checkings become easily implemented within the cross-functional teams, optimizing the decision making and cutting operational cost.

Flexibility. Adaptive processes and structures to changing conditions and competition**.** Being closer to the customer the company can develop the awareness mechanisms to rapidly spot the weak points and adapt to new requirements of the market.

Quality. Obsession with the superior service and value to the customers. The level of quality is always the same controlled and monitored by the processes, and does not depend mainly on the person, who servicing the customer.

Innovation. Leadership through imaginative change providing to organization competitive advantage.

Productivity. Improve drastically effectiveness and efficiency. In order to achieve the above mentioned objectives the following BPR project methodology is proposed.

Methodology of a BPR project implementation / alternative techniques

BPR is world-wide applicable technique of business restructuring focusing on business processes, providing vast improvements in a short period of time. The technique implements organizational change based on the close coordination of a methodology for rapid change, employee empowerment and training and support by information technology. In order to implement BPR to an enterprise the followings key actions need to take place:

- Selection of the strategic (added-value) processes for redesign.
- Simplify new processes - minimize steps - optimize efficiency -(modeling).
- Organize a team of employees for each process and assign a role for process coordinator.
- Organize the workflow - document transfer and control.
- Assign responsibilities and roles for each process.
- Automate processes using IT(Intranets, Extranets, Workflow Management)
- Train the process team to efficiently manage and operate the new process
- Introduce the redesigned process into the business organizational structure

Most reengineering methodologies share common elements, but simple differences can have a significant impact on the success or failure of a project. After a project area has been identified, the methodologies for reengineering business processes may be used. In order for a company, aiming to apply BPR, to select the best methodology, sequence processes and implement the appropriate BPR plan, it has to create effective and actionable visions. Referring to 'vision' we mean the complete articulation of the future state (the values, the processes, structure, technology, job roles and environment)

For creating an effective vision, basic steps are mentioned below.

- the right combination of individuals come together to form an optimistic and energized team
- clear objectives exist and the scope for the project is well defined and understood
- the team can stand in the future and look back, rather than stand in the present and look forward
- the vision is rooted in a set of guiding principles.

All methodologies could be divided in general 'model' stages:

The Envision stage: the company reviews the existing strategy and business processes and based on that review business processes for improvement are targeted and IT opportunities are identified.

The Initiation stage: project teams are assigned, performance goals, project planning and employee notification are set.

The Diagnosis stage: documentation of processes and sub-processes takes place in terms of process attributes (activities, resources, communication, roles, IT and costs).

The Redesign stage: new process design is developed by devising process design alternatives and through brainstorming and creativity techniques.

The Reconstruction stage: management technique changes occur to ensure smooth migration to the new process responsibilities and human resource roles.

The Evaluation stage: the new process is monitored to determine if goals are met and examine total quality programs.

Expected Results / Benefits

The expected results for a company that implements business process reengineering are the following:

- Reallocation of jobs and processes so as to be combined into fewer, to be executed in natural order, simultaneously and by the least possible number of employees.
- Reorganization of the company's structure (downsizing) and employee empowerment.
- Jobs and processes become flexible so as to be executed according to the needs of each case, company's and customer's need's (hybrid centralized/decentralized operations)

The above changes will bring reductions of costs in the company, better quality (as far as price, promptness of delivery and offerings of related services) in the products and services provided to the customers. BPR shows that there is 'more than one way to skin a cat' and enables a fresh view without ingrained prejudice affecting judgement. It can produce huge initial savings where a business is struggling and often has the affect of turning around an unprofitable operation. Also, it leaves the business with a fully documented model of the operation, which is invaluable if embarking on a quality programme.

The expected outcome from a successful BPR process should the desired one for the favor of the business concerned. The dramatic changes that are caused involve people's jobs and working relationships as it is very often that jobs are eliminated and the entire process is not as beneficial for all.

Types of firms / organizations that BPR can be applied

BPR could by implemented to all firms (manufacturing firms, retailers, services, etc.) and public organizations that satisfy the following criteria:

- Minimum Number of employees: 20 (at least 4 in management positions).
- Strong management commitment to new ways of working and innovation.
- Well formed IT infrastructure.

Business Process Reengineering could be applied to companies that confront problems such as the following:

- High operational costs
- Low quality offered to customers
- High level of ''bottleneck" processes at pick seasons
- Poor performance of middle level managers
- Inappropriate distribution of resources and jobs in order to achieve maximum performance, etc.

NOTE: Benchmarking already disussed in Study Note 3, Page 3.108

6.5 COST CONTROL AND REDUCTION

The central concern of any company is how to reduce its costs, since any cost reduction flows straight into profits. However, cost reduction must be accomplished without impacting customer loyalty or reducing the ability of the organization to achieve its long - term goals. Thus, the real issue is how to carefully pare away unnecessary costs while maintaining a robust organization.

Cost Reduction Analysis shows how to do this. It describes a variety of cost reduction tools and the issues associated with using them, and then goes on to describe various forms of cost reduction in key expense areas, such as sales and marketing, production, payroll, and benefits.

Cost control is different from cost reduction. The word "control" indicates an exercise in restraint. When expenses are controlled, they are restrained from growing larger than they should grow. The process of cost reduction, on the other hand, concerns reducing expenses that are too high. Controlling is a very different concept than reducing.

Very Constraining

In terms of business practices, cost control is a much better plan of action. It indicates that expenses have not been allowed to grow past a reasonable level than what the expenses are intended to accomplish. There could probably be a lot of debate over which is easier, controlling or reducing expenses, but controlling costs is the best way to maintain or increase cash flow.

Cost control requires management from the start of the business. Cost reduction is a reaction to a problem. It is always better to be proactive than reactive. To control costs means managers are staying on top of operations and attempting to create the maximum profit margin. Managers who must implement a cost reduction plan are solving a problem that might possibly have been avoided.

Cost control affects every expense category in a company. But cost control is a lot more than just saying "no" to incurring an expense. It is a management technique that requires all business activities to be evaluated on several levels.

- Is the activity designed to operate as efficiently as possible?
- Have necessary materials being purchased at the lowest price while maintaining quality?
- Can the process be mechanized or computerized to minimize labor costs?
- Have the cost of service levels been related to the benefits provided in a nonprofit?

Cost control is a systematic review of the resources a company uses to achieve its mission.

Unconstrained Success

Cost control is cost management. Reviewing expenses to find areas that can be cut is not nearly as effective as upfront cost management. To determine if costs are remaining within reason, it is desirable to compare expenses against industry benchmarks. Expense benchmarks are indicators of competitive standing.

One of the major benefits of cost control is the ability of a company to keep cash flow at necessary levels for operations. With cost management, excessive amounts of cash are not tied up in too much inventory, too high supply stocks, or over staffed departments. This keeps cash available for other purposes including navigating economic waves, expansions needs, or equipment maintenance and repairs.

Many companies use outside assessments to analyze company efficiency including the results of cost control efforts. This not only brings new viewpoints to the process, it provides important internal review. Sometimes it is difficult to be objective when you deal with the management of a business on a day-to-day basis. Professional analysts can bring a broader scope to operations resulting in improved cost control strategies.

A customized assessment of company operations can improve cost control measures already taken in a company. Businesses that understand the difference between the concepts of constraining and reducing understand the value of expert advice. Management's attitude towards cost control is often its own benchmark – it shows how well a business understands what it takes to succeed.

Business success is about teamwork and it takes teamwork to control costs. A single manager cannot do the job alone without employee cooperation. Whether a company utilizes a third party review or not, cost control is about keeping control so a business can have unconstrained success!

Planning and Control

Cost control refers to management's effort to influence the actions of individuals who are responsible for performing tasks, incurring costs, and generating revenues. First managers plan the way they want people to perform, then they implement procedures to determine whether actual performance complies with these plans. Cost control is a continuous process that begins with the annual budget. As the fiscal year progresses, management compares actual results to those projected in the budget and incorporates into the new plan the lessons learned from its evaluation of current operations. Through the budget process and accounting controls, management establishes overall company objectives, defines the centers of responsibility, determines specific objectives for each responsibility center, and designs procedures and standards for reporting and evaluation.

The planning process, then, provides for two types of control mechanisms: feedforward, which provides a basis for control at the point of action (the decision point); and feedback, which provides a basis for measuring the effectiveness of control after implementation. Management's role is to feedforward a futuristic vision of where the company is going and how it is to get there, and to make clear decisions coordinating and directing employee activities. Management also oversees the development of procedures to collect, record, and evaluate feedback.

Control Reports

Control reports are informational reports that tell management about a company's activities. Control reports are only for internal use, and therefore management directs the accounting department to develop tailor-made reporting formats. Accounting provides management with a format designed to detect variations that need investigating. In addition, management also refers to conventional reports such as the income statement and balance sheet, and to external reports on the general economy and the specific industry.

Control reports need to provide an adequate amount of information so that management may determine the reasons for any cost variances from the original budget. A good control report highlights significant information by focusing management's attention on those items in which actual performance significantly differs from the standard.

The evaluation of management's performance and the company's operations is cost control.

Standards

For cost control purposes, a budget provides standard costs. As management constructs budgets, it lays out a road map to guide its efforts. It states a number of assumptions about the relationships and interaction among the economy, market dynamics, the abilities of its sales force, and its capacity to provide the proper quantity and quality of products demanded. An examination of the details of the budget calculations and assumptions reveals that management expects operations to produce the required amount of units within a certain cost range. Management bases its expectations and projections on the best historical and current information, as well as its best business judgment.

For example, when calculating budget expenses, management's review of the historic and current data may strongly suggest that the production of 1,000 units of a certain luxury item will cost ₹ 1,00,000, or ₹ 100 per unit. In addition, management might determine that the sales force will expend about ₹ 80,000 to sell the 1,000 units. This is a sales expenditure of ₹ 80 per unit. With total expenditures of ₹ 180,

management sets the selling price of ₹ 500 for this luxury item. At the close of a month, management compares the actual results of that month to the standard costs to determine the degree and direction of any variance. The purpose for analyzing variances is to identify areas where costs need containment.

In the above illustration, accounting indicates to management that the sales force sold 100 units for a gross revenue of ₹ 50,000. Accounting's data also show that the sales force spent ₹ 7,000 that month, and that production incurred ₹ 12,000 in expenses. While revenue was on target, actual sales expense came in less than the projected, with a per unit cost of ₹ 70. This is a *favorable* variance. But production expenses registered an *unfavorable* variance since actual expenditures exceeded the projected. The company produced units at ₹ 120 per item, ₹ 20 more than projected. This variance of 20 percent significantly differs from the standard costs of ₹ 100 and would likely cause management to take corrective action. As part of the control function, management compares actual performance to predetermined standards and makes changes when necessary to correct variances from the standards. The preparation of budgets and control reports, and the resulting analysis of variances from performance standards, give managers an idea of where to focus their attention to achieve cost reductions.

Cost Cutting for Small Businesses

A variety of techniques can be employed to help a small business cut its costs. One method of cost reduction available to small businesses is hiring an outside analyst or consultant. These individuals may be independent consultants or accountants who analyze costs as a special service to their clients. They generally undertake an in-depth, objective review of a company's expenditures and make recommendations about where costs can be better controlled or reduced. Some expense-reduction analysts charge a basic, up-front fee, while others collect a percentage of the savings that accrue to the company as a result of their work. Still others contract with specific vendors and then pool the orders of their client companies to obtain a discount. Some of the potential benefits of using a consultant include saving time for the small business owner, raising awareness of costs in the company, and negotiating more favorable contracts with vendors and suppliers.

Steps that a small business can take relatively quickly and can start them down the path of cost reduction include such things as printing or photocopying on both sides of the paper whenever possible. Securing supplies to which employees have access, like locking the office supply cabinet, to better track usage of these items. Canceling insurance policies on unused equipment and vehicles is another way to check unnecessary costs. Establishing a regular cost-cutting program can be done by setting aside time to review several months' worth of checks and invoices and make a detailed list of all monthly expenses. Then, decide upon a few areas that might benefit from comparison-shopping for better prices. If the small business owner is not inclined to undertake the comparison-shopping personally, a responsible employee can be assigned to the task.

Despite the importance of cost control to small businesses, and the potential for cost savings, cost reduction alone cannot guarantee success. For cost cutting to be effective, the sales and revenue end of the business must be healthy.

Mitchell went on to explain that every business reaches a point in its growth when management recognizes a need to cut costs, usually in the face of a crisis. "Over time, you get a cost cutting culture," consultant Paul Taffinder told Mitchell.

The effective implementation of a cost control and reduction program takes planning and time. It should be seen as a continuous process and one that will need ongoing attention. Instead of blindly trying to cut costs in the face of a crisis, Mitchell recommended that managers embrace cost cutting as a strategic issue and approach the task from a marketing perspective. "If you are going to talk about waste, you need to define what value is, because the opposite of waste is value," business school professor Dan Jones told Mitchell. "And you can only define value from the end customer's perspective. If you can really do this—if you really know what it is that doesn't add value to the customer—then you can start asking 'How can we get rid of that?' Otherwise, we are just saying 'Let's cut costs."

Control is the process by which management ensures that the company is confirming to prescribe plans and policies in working towards the attainment of corporate objectives. The central features of control is not coercion as is so often thought, nor is it the detail study of past mistakes, but rather the focusing of attention on current and future activities to ensure that they are performed in accordance with management wishes. The existence of a control process enables management to know from time to time where the company stand in relation to a predetermined and desirable future position. Progress towards objectives must be observed, measured, and directed if these objectives are to be achieved-this is the function of control. Control and planning are complementary. They are the two sides of the same coin.

Cost Reduction

Cost Reduction is the achievement of the real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for the use intended or diminution in the quality of the product.

The Cost Reduction efforts generally focus on the following two key areas -

(a) Reduction in Expenditure: Reduction in unit cost resulting from reduction in expenditure in respect of a given volume of output.

(b) Increased Productivity: Reduction in unit cost by an increase in productivity i.e. increase in yield or rate of output for a given expenditure.

Generally, Cost Reduction is achieved by a combination of these influences, and it may be difficult to identify the extent of contribution which each factor will make to the overall savings.

Difference between Cost Reduction and Cost Control

Particulars	Cost Reduction	Cost Control
1. Permanence	Permanent, Real and genuine savings in cost	Could be a temporary saving also
2. Nature of Saving	Saving in Cost per unit	Saving either in Total Cost or Cost per unit
3. Nature of process	It presumes the existence of concerned potential savings in norms or standards and therefore it is a corrective process.	It does not focus on costs independent of revenue nor considers product attributes as given. It is a wholistic control process.
4. Performance Evaluation	It is not concerned with maintenance of performance according to standards.	The process involves setting up a target, investigating variances and taking remedial measures to correct them.
5.Nature of Standards	Continuous process of critical examination, includes analysis and challenge of standards.	Control is achieved through compliance with standards. Standards by themselves are not examined.
6. Dynamism	Fully dynamic approach.	Lacks dynamism when compared to cost reduction.
7. Coverage	Universally applicable to all areas of business. Does not depend upon standards, though target amounts may be set.	Limited applicability to those items of cost for which standards can be set.
8. Nature of Costs	Emphasis here is partly on present costs and largely on future costs.	Emphasis on present and past behaviour of costs.

9. Analysis	To find out substitute ways and new means.	Competitive analysis of actual results with established norms.
10. Nature of Function	Corrective Action - operates even when efficient cost control systems exist. There is room for reduction in the achieved costs.	Preventive Function - costs are optimized before they are incurred.
11. Tools and Techniques	Value Engineering, Work Study, Standardisation and Simplification, Variety Reduction, Quality Measurement and Research, Operations Research, Market Research, Job Evaluation and Merit Rating Improvement in Design, Mechanisation and Automation.	Budgetary Control and Standard Costing.

Difference between Cost Reduction and Cost Management

Particulars	**Cost Reduction**	**Cost Management**
Meaning	It is the permanent reduction in the unit cost of goods or services without affecting their quality or suitability for their intended use.	It is a system that establishes linkages between costs and revenues and relates them with the product to maximize Firm's profits.
Objective	Critical examination of each aspect of business and their analysis and review to improve the efficiency and effectiveness so as to reduce costs through techniques of Value Analysis, Work Study, Standardisation etc.	Optimal utilization of resources to enhance the operating income of the business entity.
Nature of process	It presumes the existence of concealed potential savings in norms or standards and therefore it is a corrective process.	It does not focus on costs independent of revenue nor considers product attributes as given. It is a wholistic control process.

Study Note - 7

STRATEGIC DECISION MAKING

This Study Note includes

7.1 Decision Making and Pricing Strategies
7.2 Operating Costing
7.3 Transfer Pricing
7.4 Relevant Cost Analysis
7.5 Target Costing
7.6 Life Cycle Costing
7.7 Kaizen Costing

7.1 DECISION MAKING AND PRICING STRATEGIES

One of the essential part of creating and running a small business is creating a mission or vision for the business and a set of goals the company aims to achieve. Strategic decision making, or strategic planning, describes the process of creating a company's mission and objectives and deciding upon the courses of action a company should pursue to achieve those goals.

Strategic decision making is an ongoing process that involves creating strategies to achieve goals and altering strategies based on observed outcomes. For example, the managers of a pizza restaurant might have the objective of increasing sales and decide to implement a strategy of offering lower prices on certain products during off hours to attract more customers. After a month of pursuing the new strategy, managers can look at sales data for the month and evaluate whether the strategy resulted in increasing sales and then choose to keep the new price scheme or alter their strategy.

Effective strategic business decisions bring together the right resources for the right markets at the right time. Timing is crucial. For example, Tesco developed its online ordering and delivery service as internet shopping expanded. Virgin sold off its music stores as downloading music became more popular.

The quality of a company's decision making helps it to gain an advantage over competitors. Business decisions must reflect an organisation's aims (its purpose), such as to maximise returns for its shareholders. They should also relate to its objectives (its goals), such as to be the market leader in its field. To achieve its aims and objectives, a business puts in place strategies. This approach applies regardless of the size of the business.

A rational decision making approach can help to reduce uncertainty. However, the external environment of a business adds variable factors which can increase risk. For example, suppose an engineering business needs new cost-saving technology to improve production and make it competitive. Justifying this expenditure becomes more difficult in a recession. However, what is the risk of not taking action? Will the business survive without the technology?

It is also important to balance risk against the likely return on investment. The extent to which this happens may depend on the organisational culture. Some businesses encourage risk taking; some are more risk-averse. Virgin reflects its owner, Richard Branson, an entrepreneur who thrives on risk taking (both in business and in his personal life). The Nationwide Building Society, which has a duty to safeguard its members' money, adopts a more cautious approach. High-performing organisations use the skills of their people to ensure they make more effective decisions than poor ones.

Some of the areas involving decisions to be taken by Management Accountant are -

1. Stock Management and Inventory Control Decisions,
2. Plant Location Decisions,
3. Machinery Replacement / Capital Budgeting Decisions,
4. Sale at Split-off or Further Processing Decisions,
5. Product Decisions - Dropping or adding a product line,
6. Marketing Decisions,
7. Submitting Tenders and Quotations for new jobs based on relevant cost analysis,
8. Acceptance of Incremental Orders in different situations like spare capacity, full capacity etc,
9. Make or Buy Decisions,
10. Operate or Shut Down Decisions,
11. Product Pricing Decisions - Reduction or maintenance of price,
12. Opening of new sales territory or branch,
13. Intra-Company Transfer Pricing Decisions,
14. Purchasing vs. Lease Financing Decisions.

The above areas involve the use of Marginal Costs, Relevant Costs and Differential Cost approaches.

Inventory Decision

To be successful, most businesses other than service businesses are required to carry inventory. In these businesses, good management of inventory is essential. The management of inventory requires a number of decisions. Poor decision making regarding inventory can cause:

1. Loss of sales because of stock outs.
2. Depending on circumstances, inadequate production for a period of time.
3. Increases in operating expenses due to unnecessary carrying costs or loss from discarding obsolete inventory.
4. An increase in per unit cost of finished goods.

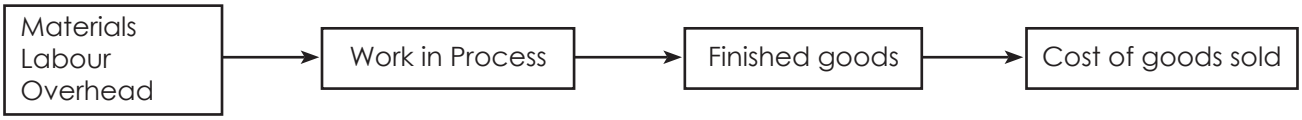
Of all the activities in a manufacturing business, inventory creation is the most dynamic and certainly the most visible activity. In one sense, inventory involves all production activity from the purchase of raw materials to the delivery of finished goods inventory to the customer. The financial accounting for inventory is concerned primarily with determining the correct count and the assignment of historical cost. However, from a management accounting viewpoint, the central focus is on manufacturing the right amounts at the lowest cost consistent with a quality product. From a financial viewpoint, poor management of inventory can adversely affect cash flow. Also, excessive inventory can cause a decrease in ROI.

Finished goods inventory represents the company's product available for sale at a given point in time. A certain amount of inventory must be available at all times in order to have an effective marketing operation. The poor management of inventory, including finished goods, is often reflected in the use of terms such as stock outs, back orders, decrease in inventory turnover, lost sales, and inadequate safety stock.

The existence of inventory results in expenses other than the cost of inventory itself which typically are categorized as:

1. Carrying costs
2. Purchasing costs.

Inventory is a term that may mean finished goods, materials, and work in process. In a manufacturing business, there is a logical connection between these three types of inventory:



To have finished goods inventory, production must take place at a rate greater than sales. Inventory decisions have a direct impact on production. For example, a decision to increase safety stock means that the production rate must increase until the desired level of safety stock is achieved.

From an accounting standpoint, there are two main areas of concern. First, from a financial accounting viewpoint, the main accounting problems concern:

1. The flow of costs (**FIFO, LIFO**, average cost)
2. Use of a type of inventory costing method (periodic or perpetual)
3. Taking of physical inventories.
4. Techniques for estimating inventory

From a financial accounting viewpoint, the cost assigned to inventory directly affects net income. If ending inventory is overstated, then net income is overstated and conversely, if ending inventory is understated then net income is understated. Also, the use of direct costing rather than absorption costing can affect net income.

From a management accounting viewpoint, there are variety of inventory decisions that affect net income. Decisions regarding inventory can be placed in two general categories: (1) those decisions that affect the quantity of inventory and (2) those decisions that affect the per unit cost of inventory.

Decisions that affect the quantity of inventory

1. Order size
2. Number of orders
3. Safety stock
4. Lead time
5. Planned production

Decisions that affect the cost per unit of inventory

1. Suppliers of raw material (list price and discounts)
2. Order size (quantity discounts)
3. Freight

In addition, decisions pertaining to labour and overhead also indirectly affect the per unit cost of inventory. In a manufacturing business, the costs of labour and overhead do not become operating expenses until the manufacturing costs appear as part of cost of goods sold. Labour and overhead costs are deferred in inventory until the inventory has been sold.

Purchase of Materials Decision

The main management accounting tool that may be used to make inventory purchase decisions is the **EOQ** model. This tool recognizes that there are two major decisions regarding the materials inventory: (1) orders size and (2) number of orders.

There are consequently two major questions:

1. How many units should be purchased each time a purchase is made (order size)?
2. How many purchases should be made (number of orders)?

To understand an **EOQ** model, it is essential that the concept of average inventory be understood. Inventory is never static and is constantly rising and falling over time, even in the very short term. Inventory, for example, rises when raw materials are purchased and falls when raw material is used. Because inventory in a business is constantly changing, it is necessary to think in terms of average inventory levels. The high points and low points of inventory are easy to explain and illustrate, if a purchasing policy is consistently applied and the rate of usage of raw material is uniform. Inventory is at its highest and lowest levels when a new shipment of material arrives. Theoretically, in absence of a need for safety stock, a new shipment should arrive at the moment inventory reaches zero. Immediately, upon arrival of a new shipment, inventory is then at its highest level again. To illustrate, assume that each purchase order placed is for 18,000 units at ₹5.00 per unit and that usage of raw materials is uniform at 300 units of material per day. If production and usage of material takes place every day, then a shipment of material should last 60 days.

In terms of Rupees, the amount invested in inventory would fluctuate between ₹90,000 and zero. In this example, the average inventory would be 9,000 computed as follows:

Average Inventory = (Highest Level inventery + Lower Level inventory) / 2

At its highest level inventory would be 18,000 units and at its lowest level inventory would be 0. Based on the above equation average inventory is:

AI = (18,000 + 0)/ 2 = 9,000

∴ **Average Inventory =Order Size/2 .....** (1)

The major factor here that affects the level of inventory is order size (the number of units purchased in each order). If demand for materials for a full year is 108,000 units, then the extremes for purchasing could be one large order of 108,000 or 108,000 orders of one unit per order. Given these extremes, then average inventory could be as low as .5 unit (1 /2) or as large as 54,000 (108,000 / 2). The best order size, as will be explained and illustrated now, is determined by the cost of ordering (purchasing) and the cost of carrying inventory.

Purchasing Cost

The purchase of materials or parts necessary to make a finished product involves a process that needs to be understood. The process begins with a purchase requisition and finally ends with payment of the materials purchases. The cost of placing an order, therefore, consists of the following:

1. Cost of preparing purchase requisition
2. Cost of preparing purchase order
3. Delivery of order (postage, telephone time, filing)
4. Receiving of purchased materials (inspection, storing, receiving report)
5. Accounting costs (preparing vouchers and recording time)

It is important to remember that the cost of the inventory itself is not a purchasing cost. The purchase of inventory is typically recorded to the Materials Purchases Account and is treated as a separate and distinct cost. It is obvious that each time an order is placed some purchasing costs are incurred, and that as the number of orders placed increases, the total cost of purchasing increases.

The basic principle of purchasing then is this: Given the amount of material or parts that are needed for a specified period of time, for example a year, as order size increases the number of times required to purchase decreases. To illustrate mathematically

If we assume that each order has a measurable cost, and if we let this cost be represented by the letter P, then the total cost of purchasing may be computed as follows:

TPC = $\frac{A}{E}$ **(P) .....** (2)

where, TPC - total purchasing cost

A - periodic demand for material

P - cost of placing each order

E - Order Size

Carrying Cost

The purchase of materials or the production of finished goods normally requires that the materials or finished goods be stored until used or sold. The storage of materials or finished goods obviously requires storage space. The greater the purchase lot at any given time, the greater is the storage space required. How long inventory is stored varies directly with the rate at which it is used. In a restaurant where one loaf of bread is purchased each time and a new loaf immediately purchased when the last loaf is used up, not much space would be require. On the other hand, if 144 loaves are purchased at a time, then considerably more space would be required.

Depending on the type of raw materials, some or all of the carrying costs could be incurred:

1. Interest (a big order size requires an investment of money).
2. Taxes (inventory is typically subject to a property tax).
3. Insurance (inventory is always at risks like theft or fire or damage).
4. Storage costs (inventory requires building space and is subject to the costs associated with a building such as depreciation)
5. Salary of storekeeper and helpers, if required.
6. Spoilage.

The basic principle of carrying inventory may be explained as follows: At a certain level of inventory (reorder point), a new order must be placed. The inventory at its maximum would be equal to the order size and at a minimum would be zero if no safety stock is being carrying. Inventory is at a maximum when a new shipment is received, and at its lowest moments before the new order arrives. As explained earlier in this chapter, the inventory is not a constant amount and is best numerically described as an average.

Mathematically, total carrying cost is simply the average inventory for a period of time times the cost of carrying a single unit of inventory:

Therefore, mathematically,

Carrying cost = $\frac{\text{Order Size}}{2}$ **x (Carrying cost per unit)**

If

E - represents order size

S - represents carrying cost per unit

TCC - denotes total carrying cost

then:

TCC = $\frac{E}{2}$ **(S)** ..... (3)

EOQ Formula

Since the best order size is where **TPC = TCC**, we can mathematically solve for the best order size as follows:

$$\frac{A}{E}(P) = \frac{E}{2}(S)$$

Solving for E using basic algebra, we then get:

$$E = \sqrt{\frac{2AP}{S}} \quad \text{..... (4)}$$

Economic Order Quantity and Quantity Discounts

The previous discussion on order size was based on the assumption that quantity discounts were not available. The **EOQ** formula as explained above is not able to determine the most economic order size, given the availability of quantity discounts.

Suppliers will often provide incentives to purchasers to buy in bigger quantities. When quantity discounts are available, the basic **EOQ** formula can not be used to directly solve for the best order size. However, it must be used on an iterative (trial and error) basis to find the best order size.

When quantity discounts were not available, the cost of inventory itself, (purchases), was not relevant and could be ignored. However, because now the order size affects the cost per unit, the total cost of inventory purchases must be taken into account. Without quantity discounts, the total cost of inventory purchased remained the same regardless of order size. In order to solve for the best order size, the following equation must be used.

$$TC = \frac{A}{E}(P) + \frac{E}{2}(S) + C(A) \quad \text{..... (4)}$$

The **EOQ** formula now has **C(A)**, the total inventory purchase cost, as a cost element. When quantity discounts exists, the cost of inventory becomes relevant in the order size decision. **C** represents the cost of one unit of inventory. The other mathematical symbols have the same meaning as before:

Equation (5) above cannot be used to directly solve for order size **(E)**. The reason is that there are two unknowns: (1) order size and (2) cost per unit of inventory. Order size affects cost per unit and cost per unit affects order size.

The trial and error procedure based on equation 5 that must be used is as follows:

Step 1 Prepare a work sheet based on the total cost equation.

Step 2 Compute total cost at each price break, including an order size of one unit.

Step 3 Determine the order size range which minimizes total cost. (In many cases the best order size is a price break quantity.)

Significance and formulae of various stock levels

Level	Formula	Significance
Re-Order Level	Maximum Usage Rate x Maximum Lead Time [**OR**] Safety Stock + Lead Time Consumption	• The level at which the next purchase procedure must be initiated by preparing Purchase Requisition. • The level to maintain sufficient stock cushion to meet most efficient production facilities and requirements.
Minimum Level	Re-Order Level **Less** [Average Usage Rate x Average Lead Time]	• Lowest quantity of inventory to be maintained at all times to avoid stock-out situations • Minimum or basic investment in raw material inventory. • Level to follow-up on the- status of purchase requisition previously made at the Re-order level

Maximum Level	Re-Order Level + Re-order Quantity **Less** [Minimum Usage Rate x Minimum Lead Time]	• Maximum limit on investment in raw material inventory. • Level beyond which raw materials inventory should not be piled up.
Average Level	1/2 of [Maximum Level + Minimum Level] [**OR**] Min. Level + ½ of Re-order Quantity	Arithmetic average of maximum and minimum used in determining value of stocks for- • Stock insurance purposes. • Submission of Stock Statements to Bank • Preparation of interim financial statements.
Danger Level	Minimum Usage Rate x Minimum Lead Time [**OR**] Average Usage Rate x Minimum Lead Time	• Level at which emergency purchase action is made to replenish stocks upto minimum level. • Level at which stocks are issued only on "most needed" basis.

Product Development Decisions

Product Development embraces new development, major modification of existing products, manufacture of products which are similar to those of competitors, product line acquisition, etc.

In business and engineering, **new product development** (NPD) is the complete process of bringing a new product to market. A product is a set of benefits offered for exchange of price and can be tangible (that is, something physical you can touch) or intangible (like a service, experience, or belief). There are two parallel paths involved in the NPD process: one involves the idea generation, product design and detail engineering; the other involves market research and marketing analysis. Companies typically see new product development as the first stage in generating and commercializing new product within the overall strategic process of product life cycle management used to maintain or grow their market share.

The eight stages of product development process are as follows :

1. **Idea Generation** is often called the "NPD" of the NPD process.
    - Ideas for new products can be obtained from basic research using a SWOT analysis (Strengths, Weaknesses, Opportunities & Threats). Market and consumer trends, company's R&D department, competitors, focus groups, employees, salespeople, corporate spies, trade shows, or ethnographic discovery methods (searching for user patterns and habits) may also be used to get an insight into new product lines or product features.
    - Lots of ideas are generated about the new product. The ideas are generated in many forms. Many reasons are responsible for generation of an idea.
    - Idea Generation or Brainstorming of new product, service, or store concepts - idea generation techniques can begin when you have done your OPPORTUNITY ANALYSIS to support your ideas in the **Idea Screening Phase** (shown in the next development step).
2. **Idea Screening**
    - The object is to eliminate unsound concepts prior to devoting resources to them.
    - The screeners should ask several questions:
        - Will the customer in the target market benefit from the product?
        - What is the size and growth forecasts of the market segment / target market?
        - What is the current or expected competitive pressure for the product idea?
        - What are the industry sales and market trends the product idea is based on?
        - Is it technically feasible to manufacture the product?
        - Will the product be profitable when manufactured and delivered to the customer at the target price?

3. **Concept Development and Testing**
    - Develop the marketing and engineering details
        - Investigate intellectual property issues and search patent databases
        - Who is the target market and who is the decision maker in the purchasing process?
        - What product features must the product incorporate?
        - What benefits will the product provide?
        - How will consumers react to the product?
        - How will the product be produced most cost effectively?
        - Prove feasibility through virtual computer aided rendering and rapid prototyping
        - What will it cost to produce it?
    - Testing the Concept by asking a number of prospective customers what they think of the idea - usually[citation needed] via Choice Modelling.
4. **Business Analysis**
    - Estimate likely selling price based upon competition and customer feedback
    - Estimate sales volume based upon size of market
    - Estimate profitability and break-even point
5. **Beta Testing and Market Testing**
    - Produce a physical prototype or mock-up
    - Test the product (and its packaging) in typical usage situations
    - Conduct focus group customer interviews or introduce at trade show
    - Make adjustments where necessary
    - Produce an initial run of the product and sell it in a test market area to determine customer acceptance
6. **Technical Implementation**
    - New program initiation
    - Finalize Quality Management System
    - Resource estimation
    - Requirement publication
    - Publish technical communications such as data sheets
    - Engineering operations planning
    - Department scheduling
    - Supplier collaboration
    - Logistics plan
    - Resource plan publication
    - Program review and monitoring
    - Contingencies - what-if planning

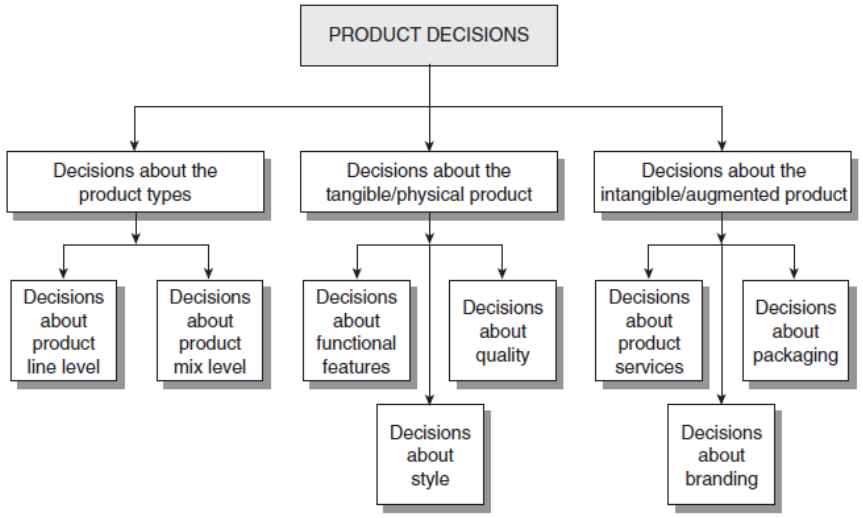
7. **Commercialization** (often considered post-NPD)
    - Launch the product
    - Produce and place advertisements and other promotions
    - Fill the distribution pipeline with product
    - Critical path analysis is most useful at this stage
8. **New Product Pricing**
    - Impact of new product on the entire product portfolio
    - Value Analysis (internal & external)
    - Competition and alternative competitive technologies
    - Differing value segments (price, value and need)
    - Product Costs (fixed & variable)
    - Forecast of unit volumes, revenue, and profit

These steps may be iterated as needed. Some steps may be eliminated. To reduce the time that the NPD process takes, many companies are completing several steps at the same time (referred to as **concurrent engineering** or **time to market**). Most industry leaders see new product development as a proactive process where resources are allocated to identify market changes and seize upon new product opportunities before they occur (in contrast to a reactive strategy in which nothing is done until problems occur or the competitor introduces an innovation). Many industry leaders see new product development as an ongoing process (referred to as continuous development) in which the entire organization is always looking for opportunities.

Product Policy

Product Policy plays a very significant and crucial role in the product establishment and its growth in the market. The marketer has to keep in mind the product policy decision while introducing a product. It acts as a tool in the hands of the marketer.

Product decision is a very conscious decision made by a company for a product. There are many different decisions. At one extreme there are such things as a minor modification of the label or colour of the package. At the other extreme, there are such things as diversification into new business fields, either through internal R&D or mergers and acquisitions.



One of the important elements of marketing mix is Product. It is very important that the firm must have a sound product policy. It is a competitive tool in the hands of the marketer. It involves four types of product policy decisions. These are:

(I) Individual product decision:-

(a) Product attribute: It consists of the quality, feature, style and design of the product. Quality of the product assures the customer that the manufacturer is giving the customer a good quality product. Feature helps the consumer in differentiating the product from other products in the market. Style and design of the product helps in bringing the attention of the customers towards the product.

(b) Product branding: The product must have its own unique brand name. Only then the customer will be able to differentiate the product from the other products. Brand name also helps the marketers in promoting the product and making consumer brand conscious.

(c) Product packaging: Packaging means the outer cover which contains the product. Like a tooth paste has two covers first in shape of tube and another cardboard cover put the tube in it. Product packaging helps the customer to get the knowledge about the product quality, quantity, weight, price etc.

(d) Product labeling: Labeling on the product is very essential as it gives the consumer information regarding the manufacturer's name, place, date of manufacturing, expiry date, calories, carbohydrates, nutritional value etc.

(e) Product support services: These are the services which are provided to the customer after selling the product to the customer like after sale services, installation etc.

(II) Product line decision:

Product line means group of product where the marketer makes the decision regarding the product line length. The product line may be short which means the marketer can increase the profit by adding a new product or there may be long product line. There are two ways of adding the product.

(a) Line stretching occurs when the company stretches its product line beyond its current range. In this respect, when a company serves the upper market, it can stretch its line downward by offering a new product in a lower price/quality (for example, Mercedes Benz in cooperation with Swatch launched Smart). By contrast, companies that serve the lower end of the market can make an upward stretch of their line by offering a new product in a higher price/quality (for example, Toyota introduced Lexus).

(b) Line filling occurs when new products are added to a company's present line for reasons like establishing an image of a full-line company, taking advantage of excess capacity, filling gaps in the market and discouraging competitive actions. For instance, there are various Kinder chocolate products in the market, such as Kinder Milk Chocolate, Kinder Bueno, Kinder Delice, Kinder Chocolate Eggs and Kinder Happy Hippo.

(III) Product mix decision:-

Product Mix

In a product mix decision based on available resources and facilities, the end results should always aim at profit maximization. For this purpose, costs, to be relevant, should meet the following criteria -

(a) The costs should be expected as Future Costs.

(b) The costs differ among the alternative courses of action i.e. Differential Cost.

Variable costs are relevant costs in product mix decisions and consequently Contribution (PV Ratio) plays a major role in profit maximization. In addition to relevancy of costs, the other factors that should be considered in deciding the product mix are -

(a) Available Production Capacity and Limiting Factors, if any.

(b) Contribution per unit of the Limiting Factor.

(c) Market Demand for the products.

(d) Opportunity Costs, if any

(IV) Product positioning decision:-

It is the way by which the marketer communicate the information of the product to the prospective buyer. It can be done on the bases of price or size or usage of the product.

Dropping or adding a product line

Since the objective of any business organization is to maximize its profits, the firm can consider the economies of dropping the unprofitable products, and adding a more remunerative product(s).

In such cases, the firm may have two alternatives as under:

(a) To drop the unprofitable product and to leave the capacity unutilized.

(b) To drop the unprofitable product and to utilize the capacity for the manufacture of a more remunerative product.

For this purpose, the contribution approach is adopted, taking the following factors into account:

1. Contribution from unprofitable product (i.e. Sale Revenue Less Variable Costs)
2. Specific fixed costs of the unprofitable product, which can now be avoided or reduced.
3. Contribution from the other profitable product, which is proposed to be produced with the balance capacity.

A segment should be added only if the increase in total contribution margin is greater than the increase in fixed costs. A segment should be dropped only if the decrease in total contribution margin is less than the decrease in fixed costs. Common fixed costs are fixed costs that support the operation of more than one segment, but are not traceable in whole or in part to any one segment. Thus they continue even when the product line is dropped. Allocated common fixed costs can make a segment look unprofitable even though dropping the segment might result in a decrease in overall company net operating income.

Too few companies subject their product lines to a regular audit to determine which products, if any, should be dropped. Too often a firm rationalizes the continuation of certain products on the basis that they are at least covering direct costs. Such reasoning overlooks the opportunity costs of not getting rid of them, including the disproportionate amount of management time spent on weak products. Substantial profit increases can often result from the elimination of weak items. Japan's Shiseido Co., its largest cosmetics group, moved to profitability by streamlining product lines and improving inventory control.

The criteria for identifying weak products focus largely on the trend of the product's contribution to profit. Each such item should then be evaluated on such considerations as future sales of the item's product type or class, its future market share assuming no changes in the product or its marketing, future market share assuming certain product and marketing changes, anticipated changes in the marketing of competitive products (including the price), the effect of dropping the product on the company's channels of distribution, the cost of dropping the item (layoffs and inventory clearances), and the effect of dropping the product on the sales and profits of the firm's other items because of joint costs or other factors.

Decisions that concern the relative amounts of each type of product or service that, given demand and resource constraints, will maximize total profits. For example, if the firm can sell as much as it can produce and has a single resource constraint, the decision rule is to maximize the contribution margin per unit of the constrained resource. However, given multiple constraints, the decision is more difficult and more sophisticated techniques must be used, such as linear programming for example.

Plant Location

Plant location refers to the choice of region and the selection of a particular site for setting up a business or factory. But the choice is made only after considering cost and benefits of different alternative sites. It is a strategic decision that cannot be changed once taken. If at all changed only at considerable loss, the location should be selected as per its own requirements and circumstances. Each individual plant is a case in itself.

Businessman should try to make an attempt for optimum or ideal location. An ideal location is one where the cost of the product is kept to minimum, with a large market share, the least risk and the maximum social gain. It is the place of maximum net advantage or which gives lowest unit cost of production and distribution. Small-scale entrepreneur can make use of locational analysis for this purpose.

The important considerations for selecting a suitable location are given as follows:

(a) Natural or climatic conditions.

(b) Availability and nearness to the sources of raw material.

(c) Transport costs in obtaining raw material and also distribution or marketing finished products to the ultimate users.

(d) Access to market: Small businesses in retail or wholesale or services should be located within the vicinity of densely populated areas.

(e) Availability of Infrastructural facilities such as developed industrial sheds or sites, link roads, nearness to railway stations, airports or sea ports, availability of electricity, water, public utilities, civil amenities and means of communication are important, especially for small scale businesses.

(f) Availability of skilled and non-skilled labour and technically qualified and trained managers.

(g) Banking and financial institutions are located nearby.

(h) Locations with links: To develop industrial areas or business centers result in savings and cost reductions in transport overheads, miscellaneous expenses.

(i) Strategic considerations of safety and security should be given due importance.

(j) Government influences: Both positive and negative incentives to motivate an entrepreneur to choose a particular location are made available. Positive includes cheap overhead facilities like electricity, banking transport, tax relief, subsidies and liberalization. Negative incentives are in form of restrictions for setting up industries in urban areas for reasons of pollution control and decentralization of industries.

If a number of alternative sites are available, decisions can be taken by reference to the following aspects -

(a) Relative advantages of one site over others.

(b) Capital Expenditure of alternative site locations.

(c) Break-Even Analysis of the project at various site locations.

(d) Incremental Rate of Return.

(e) Intangible factors, if any.

Some Examples of plant location (India)

- Most of the textile mills are found in or near Mumbai and Ahmedabad because of the humidity conditions that prevail there.
- Sites for nuclear power plants to be located in different parts of the country largely depend upon environmental, safety, socio-economic and also the engineering factors affecting the construction and operation of such plants.
- Steel plants are generally located near the Jharkhand, Bengal, Chhattisgarh and Orissa regions. This choice of site is mainly because of more economical transport of the finished goods as compared to basic raw materials.

Make-or-Buy Decision

Make-or-Buy decision (also called the outsourcing decision) is a judgment made by management whether to make a component internally or buy it from the market. While making the decision, both qualitative and quantitative factors must be considered.

Examples of the qualitative factors in make-or-buy decision are: control over quality of the component, reliability of suppliers, impact of the decision on suppliers and customers, etc.

The quantitative factors are actually the incremental costs resulting from making or buying the component. For example: incremental production cost per unit, purchase cost per unit, production capacity available to manufacture the component, etc.

COST COMPARISON

COST OF MAKE	COST OF BUY
Variable Costs	Direct Purchase Costs
+ Specific Fixed Cost (if any)	Purchase Related Costs like buying commission, transportation etc.
+ Opportunity Cost (in case of full capacity operations)	+ Opportunity Cost if any (e.g. Purchase of different quality raw material, leading to reduction in selling price of finished product).

Decisions will be as under-

- If Cost of Make < Cost of Buy, then MAKE.
- If Cost of Make = Cost of Buy, the Firm is indifferent. (Non-Cost factors to be considered)
- If Cost of Make > Cost of Buy, then BUY.

The following example illustrates the numerical part of a simple make-or-buy decision.

Example

The estimated costs of producing 6,000 units of a component are:

	Per Unit (₹)	Total (₹)
Direct Material	10	60,000
Direct Labor	8	48,000
Applied Variable Factory Overhead	9	54,000
Applied Fixed Factory Overhead @ ₹1.5 per direct labour	12	72,000
	39	2,34,000

The same component can be purchased from market at a price of ₹29 per unit. If the component is purchased from market, 25% of the fixed factory overhead will be saved.

Should the component be purchased from the market?

Solution:

	Per Unit (₹)		Total (₹)	
	Make	**Buy**	**Make**	**Buy**
Purchase Price		29		1,74,000
Direct Material	10		60,000	
Direct Labour	8		48,000	
Variable Overhead	9		54,000	
Relevant Fixed Overhead	3		18,000	
Total Relevant Costs	30	29	1,80,000	1,74,000
Difference in Favour of Buying		1		6,000

Sale at Split-off or Further Processing Decisions

Additional processing adds to a product and increases its selling price above the amount, for which it can be sold at split off. The decision to process further depends upon whether the increase in total revenues exceeds the additional costs incurred for processing beyond split off point. Joint costs incurred prior to split off point have no effect on the decision. The costs incurred before split off are past cost, sunk cost or irrelevant cost for this decision. Only future incremental revenue and differential cost should be considered. Differential cost of additional processing should include all production costs that will be incurred.

Discontinuing sales to a certain type of customer

In this situation emphasis should be to find out net advantage of selling to a particular class of customers. It calls for matching of differential revenues and differential costs. Determine whether placing orders with large customers furnishes business, which provides a higher contribution margin per week of sales personnel efforts. Therefore, company may take a decision to apply greater sales efforts to large customers and discontinue salespersons' visits to smaller customers.

Retain or Replace Decision

In this case choice is to be made between retention of equipment and its replacement. Basically, replacement of machine or equipment is a capital investment or long-term decision requiring use of discounted cash flow technique. Different cost approach is primarily followed because replacement will invariably involve additional fixed cost. Major considerations relevant to this decision are given below :

(i) Determine relevant items of cash outflows and inflows due to the decision.

(ii) Book value or written-down value is irrelevant for this decision. Loss on sale of old machinery is irrelevant for this decision.

(iii) Sale proceeds of old equipment is relevant for the decision and should be considered for this analysis.

(iv) Replacement of machinery may bring down the cost per unit, but it may involve capital outlay. Here, company may have to decide at what point replacement will be justified.

(v) Profit or loss on the sale of assets being replaced may affect taxation payment and this taxation effect should be included in analysis.

Pricing decision for special orders

Special order decisions involve determining whether a special order from a customer should be accepted. This type of decision is usually a one-time order that will not impact a company's regular sales. Before considering a special order, the company must have idle capacity, i.e., it should have the ability to complete the special order without expanding its operations. In other words, it must have capacity that is sitting idle and not being currently used. The special order decision is based on the difference between the incremental revenue and the incremental costs.

Incremental Revenues

Incremental revenues are the additional revenues generated from accepting the special order that generates additional sales of the product or service. It does not affect current sales as they will remain the same.

Incremental Costs

Incremental costs are the additional costs incurred from accepting a special order. Variable product costs will always be incremental and cause profits to decline. Other variable costs of operations including selling costs like commissions and shipping costs will be relevant as well. Rarely will cost savings be a consideration in special order decisions.

If incremental revenues **are less than** incremental costs, reject the special order, unless qualitative characteristics overwhelmingly impact the decision.

If incremental revenues **are greater than** incremental costs, accept the special order unless qualitative characteristics overwhelmingly impact the decision.

If incremental revenues **are equal to** incremental costs, focus primarily on qualitative characteristics to assess the decision.

Special orders should be accepted only if:

- Incremental revenue exceeds incremental costs
- Present sales are unaffected
- The company has idle capacity to handle the order

Special orders which do not meet these criteria should generally not be accepted. Of course, soft-benefits should be considered.

Elimination of unprofitable segment

Sometimes management have to decide whether to shut down or continue a segment of the business. A segment can be a product, department or sales territory, etc., based on decision needs of management. The decision involves choice from the two alternatives, i.e., either to keep the segment or to eliminate it. Key concept is to isolate avoidable cost. This decision is of special importance in performance evaluation. To evaluate the financial consequences of eliminating a segment, it is necessary to concentrate on the differential effect of the decision. As a general rule, it is unprofitable to eliminate any segment for which contribution margin exceeds the avoidable fixed costs.

Shut-down or Continue

A rule stating that a firm minimizes economic loss by producing no output in the short run if price is less than average variable cost. This is one of three short-run production alternatives facing by a firm. The other two are profit maximization (if price exceeds average total cost) and loss minimization (if price is less than average total cost but greater than average variable cost).

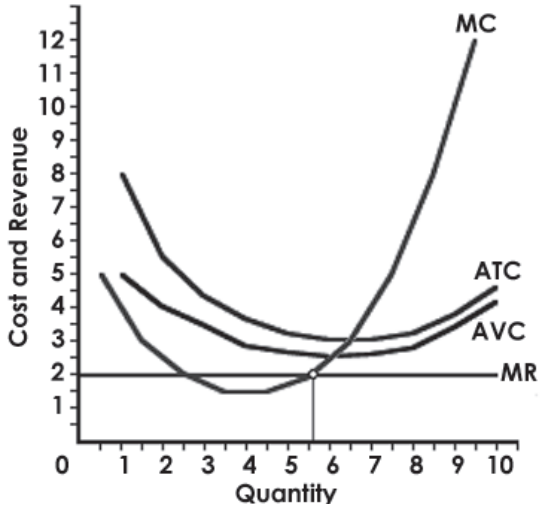
- With profit maximization, price exceeds average total cost at the quantity that equates marginal revenue and marginal cost. In this case, the firm generates an economic profit.
- With loss minimization, price exceeds average variable cost but is less than average total cost at the quantity that equates marginal revenue and marginal cost. In this case, the firm incurs a smaller loss by producing some output than by not producing any output.

In the short run, a firm incurs total fixed cost whether or not it produces any output. As such, if the market price falls below average total cost, it must decide if the economic loss from producing the quantity of output that equates marginal revenue and marginal cost is more or less than the economic loss incurred with shutting down production in the short run (which is equal to total fixed cost).

The key criterion for this decision is price relative to average variable cost.

- If price is less than average variable cost, a firm does not receive enough revenue to pay variable cost let alone any part of fixed cost. As such, the economic loss of operating is GREATER than total fixed cost. A firm is better off shutting down production in the short run, producing zero output, and awaiting a higher price.
- If price is greater than average variable cost, a firm receives sufficient revenue to pay ALL variable cost plus some fixed cost. As such, the economic loss is LESS than total fixed cost. A firm is better off producing the quantity that equates marginal revenue and marginal cost than producing no output, receiving no revenue and incurring a loss equal to total fixed cost.

Production Alternatives	
Price and Cost	**Result**
P > ATC	Profit Maximization
ATC > P > AVC	Loss Minimization
P < AVC	Shutdown



The exhibit here illustrates the shutdown situation that exists for a hypothetical perfectly competitive firm.

Expand or contract

Whenever a decision is to be taken as to whether the capacity is to be expanded or not, consideration should be given to the following points :

(i) Additional fixed expenses to be incurred

(ii) Possible decrease in selling price due to increase in production

(iii) Whether the demand is sufficient to absorb the increased production.

Limiting factors

Sometimes a company encounters following situations :

(i) Full capacity is being utilized

(ii) Output is restricted by such limiting factors as shortage of labour, shortage of materials or factory space etc.

(iii) Demand is in excess of company's productive capacity.

In these situations the best product mix is to be decided. Stress remains on contribution per unit of limiting factor and best utilization of available resources. In a situation, where more than one resources is scars, it is necessary to resort to linear programming method to determine the optimal production programme.

Pricing Strategy

Pricing strategies for products or services encompasses three main ways to improve profits. These are that the business owner can cut costs or sell more, or find more profit with a better pricing strategy. When costs are already at their lowest and sales are hard to find, adopting a better pricing strategy is a key option to stay viable.

There are three main approaches a business takes to setting price:

A. Cost based pricing

This involves setting a price by adding a **fixed amount or percentage to the cost** of making or buying the product. In some ways this is quite an old-fashioned and somewhat discredited pricing strategy, although it is still widely used.

After all, **customers are not too bothered what does it cost to make the product** – they are interested in what **value** the product provides them.

Cost-plus (or "mark-up") pricing is widely used in retailing, where the retailer wants to know with some certainty what the gross profit margin of each sale will be. An advantage of this approach is that the business will know that its costs are being covered. The main disadvantage is that cost-plus pricing may lead to products that are priced un-competitively.

Here is an example of cost-plus pricing, where a business wishes to ensure that it makes an additional ₹50 of profit on top of the unit cost of production.

Unit cost	₹100
Mark-up	50%
Selling price	₹150

How high should the mark-up percentage be? That largely depends on the normal competitive practice in a market and also whether the resulting price is acceptable to customers.

For example a standard retail mark-up is 2.4 times the cost the retailer pays to its supplier (normally a wholesaler). So, if the wholesale cost of a product is ₹10 per unit, the retailer will look to sell it for 2.4x ₹10 = ₹24. This is equal to a total mark-up of ₹14 (i.e. the selling price of ₹24 less the bought cost of ₹10).

The main advantage of cost-based pricing is that selling prices are relatively easy to calculate. If the mark-up percentage is applied consistently across product ranges, then the business can also predict more reliably what the overall profit margin will be.

B. Customer-based pricing

Penetration pricing

You often see the tagline "special introductory offer" – the classic sign of **penetration pricing**. The aim of **penetration pricing is usually to increase market share of a product,** providing the opportunity to increase price once this objective has been achieved.

Penetration pricing is the pricing technique of **setting a relatively low initial entry price**, usually lower than the intended established price, to attract new customers. The strategy **aims to encourage customers to switch to the new product** because of the lower price.

Penetration pricing is most commonly associated with a **marketing objective** of increasing market share or sales volume.

Penetration pricing is often used to support the launch of a new product, and works best when a product enters a market with relatively little product differentiation and where demand is price elastic – so a lower price than rival products is a competitive weapon.

Penetration pricing pursues the objective of quantity maximization by means of a low price. It is most appropriate when:

- Demand is expected to be highly elastic; that is, customers are price sensitive and the quantity demanded will increase significantly as price declines.
- Large decreases in cost are expected as cumulative volume increases.
- The product is of the nature of something that can gain mass appeal fairly quickly.
- There is a threat of impending competition.

As the product lifecycle progresses, there likely will be changes in the demand curve and costs. As such, the pricing policy should be re-evaluated over time.

The pricing objective depends on many factors including production cost, existence of economies of scale, barriers to entry, product differentiation, rate of product diffusion, the firm's resources, and the product's anticipated price elasticity of demand.

Price skimming

Skimming involves **setting a high price before other competitors come into the market**. This is often used for the launch of a new product which faces little or no competition – usually due to some technological features. Such products are often bought by **"early adopters"** who are prepared to pay a higher price to have the latest or best product in the market.

Good examples of price skimming include innovative electronic products, such as the Apple iPad and Sony Play Station 3.

There are some other problems and challenges with this approach:

Price skimming as a strategy cannot last for long, as competitors soon launch rival products which put pressure on the price (e.g. the launch of rival products to the iPhone or iPod).

Distribution (place) can also be a challenge for an innovative new product. It may be necessary to give retailers higher margins to convince them to stock the product, reducing the improved margins that can be delivered by price skimming. A final problem is that by price skimming, a firm may slow down the volume growth of demand for the product. This can give competitors more time to develop alternative products ready for the time when market demand (measured in volume) is strongest.

Loss leaders

The use of loss leaders is a method of sales promotion. A loss leader is a product priced below cost-price in order to attract consumers into a shop or online store. The purpose of making a product a loss leader is to encourage customers to make further purchases of profitable goods while they are in the shop. But does this strategy work?

Pricing is a key competitive weapon and a very flexible part of the marketing mix.

If a business undercuts its competitors on price, new customers may be attracted and existing customers may become more loyal. So, using a loss leader can help drive customer loyalty.

One risk of using a loss leader is that customers may take the opportunity to "bulk-buy". If the price discount is sufficiently deep, then it makes sense for customers to buy as much as they can (assuming the product is not perishable).

Using a loss leader is essentially a short-term pricing tactic for any one product. Customers will soon get used to the tactic, so it makes sense to change the loss leader or its merchandising every so often.

Predatory pricing (this is illegal)

With predatory pricing, prices are deliberately set very low by a dominant competitor in the market in order to **restrict or prevent competition**. The price set might even be free, or lead to losses by the predator. Whatever the approach, predatory pricing is illegal under Competition Law.

Psychological pricing

The aim of **psychological pricing** is to make the customer believe the product is cheaper than it really is. Pricing in this way is intended to attract customers who are looking for "value".

C. Competitor-based pricing

If there is strong competition in a market, customers are faced with a wide choice of who to buy from. They may buy from the cheapest provider or perhaps from the one which offers the best customer service. But customers will certainly be mindful of what is a reasonable or normal price in the market.

Most firms in a competitive market do not have sufficient power to be able to set prices above their competitors. They tend to use **"going-rate" pricing** – i.e. **setting a price that is in line with the prices charged by direct competitors**. In effect such businesses are **"price-takers"** – they must accept the going market price as determined by the forces of demand and supply.

An advantage of using competitive pricing is that selling prices should be line with rivals, so price should not be a competitive disadvantage.

The main problem is that the business needs some other way to attract customers. It has to use non-price methods to compete – e.g. providing distinct customer service or better availability.

Pricing of New Product

One of the four major elements of the marketing mix is price. Pricing is an important strategic issue because it is related to product positioning. Furthermore, pricing affects other marketing mix elements such as product features, channel decisions, and promotion.

While there is no single recipe to determine pricing, the following is a general sequence of steps that might be followed for developing the pricing of a new product:

1. **Develop marketing strategy** - perform marketing analysis, segmentation, targeting, and positioning.
2. **Make marketing mix decisions** - define the product, distribution, and promotional tactics.
3. **Estimate the demand curve** - understand how quantity demanded varies with price.
4. **Calculate cost** - include fixed and variable costs associated with the product.
5. **Understand environmental factors** - evaluate likely competitor actions, understand legal constraints, etc.
6. **Set pricing objectives** - for example, profit maximization, revenue maximization, or price stabilization (status quo).
7. **Determine pricing** - using information collected in the above steps, select a pricing method, develop the pricing structure, and define discounts.

Price Discounts

The normally quoted price to end users is known as the list price. This price usually is discounted for distribution channel members and some end users. There are several types of discounts, as outlined below.

- **Quantity discount** - offered to customers who purchase in large quantities.
- **Cumulative quantity discount** - a discount that increases as the cumulative quantity increases. Cumulative discounts may be offered to resellers who purchase large quantities over time but who do not wish to place large individual orders.
- **Seasonal discount** - based on the time that the purchase is made and designed to reduce seasonal variation in sales. For example, the travel industry offers much lower off-season rates. Such discounts do not have to be based on time of the year; they also can be based on day of the week or time of the day, such as pricing offered by long distance and wireless service providers.

- **Cash discount** - extended to customers who pay their bill before a specified date.
- **Trade discount** - a functional discount offered to channel members for performing their roles. For example, a trade discount may be offered to a small retailer who may not purchase in quantity but nonetheless performs the important retail function.
- **Promotional discount** - a short-term discounted price offered to stimulate sales.

Other Pricing Strategies

In terms of the marketing mix some would say that price is the least attractive element. Marketing companies should really focus on generating as high a margin as possible. The argument is that the marketer should change product, place or promotion in some way before resorting to price reductions. However price is a versatile element of the mix as we will see.

Our financial objectives in terms of price will be secured on how much money we intend to make from a product, how much we can sell, and what market share will get in relation to competitors. Objectives such as these and how a business generates profit in comparison to the cost of production, need to be taken into account when selecting the right pricing strategy for your mix. The marketer needs to be aware of its competitive position. The marketing mix should take into account what customers expect in terms of price.

There are many ways to price a product. Let's have a look at some of them in addition to the approaches discussed earlier.

Premium Pricing

Use a high price where there is a unique brand. This approach is used where a substantial competitive advantage exists and the marketer is safe in the knowledge that they can charge a relatively higher price. Such high prices are charged for luxuries such as Cunard Cruises, Savoy Hotel rooms, and first class air travel.

Economy Pricing

This is a no frills low price. The costs of marketing and promoting a product are kept to a minimum. Supermarkets often have economy brands for soups, spaghetti, etc. Budget airlines are famous for keeping their overheads as low as possible and then giving the consumer a relatively lower price to fill an aircraft. The first few seats are sold at a very cheap price (almost a promotional price) and the middle majority are economy seats, with the highest price being paid for the last few seats on a flight (which would be a premium pricing strategy).

Product Line Pricing

Where there is a range of products or services the pricing reflects the benefits of parts of the range. For example car washes; a basic wash could be ₹2, a wash and wax ₹4 and the whole package for ₹6. Product line pricing seldom reflects the cost of making the product since it delivers a range of prices that a consumer perceives as being fair incrementally – over the range.

Optional Product Pricing

Companies will attempt to increase the amount customers spend once they start to buy. Optional 'extras' increase the overall price of the product or service. For example airlines will charge for optional extras such as guaranteeing a window seat or reserving a row of seats next to each other. Again budget airlines are prime users of this approach when they charge you extra for additional luggage or extra legroom.

Captive Product Pricing

Where products have complements, companies will charge a premium price since the consumer has no choice. For example a razor manufacturer will charge a low price for the first plastic razor and recoup its margin (and more) from the sale of the blades that fit the razor.

Product Bundle Pricing

Here sellers combine several products in the same package. This also serves to move old stock. Blu-ray and videogames are often sold using the bundle approach once they reach the end of their product life cycle. You might also see product bundle pricing with the sale of items at auction, where an attractive item may be included in a lot with a box of less interesting things so that you must bid for the entire lot. It's a good way of moving slow selling products, and in a way is another form of promotional pricing.

Promotional Pricing

Pricing to promote a product is a very common application. There are many examples of promotional pricing including approaches such as BOGOF (Buy One Get One Free), money off vouchers and discounts.

Sales are extravaganzas of promotional pricing!

Geographical Pricing

Geographical pricing sees variations in price in different parts of the world. For example rarity value, or where shipping costs increase price. In some countries there is more tax on certain types of product which makes them more or less expensive, or legislation which limits how many products might be imported again raising price.

Value Pricing

This approach is used where external factors such as recession or increased competition force companies to provide value products and services to retain sales e.g. value meals at McDonalds and other fast-food restaurants. Value price means that you get great value for money i.e. the price that you pay makes you feel that you are getting a lot of product.

Monopoly Pricing

Monopoly is a market conditions with the following features –

(a) One seller of a particular good or service.

(b) Absence of competition.

(c) Absence of close substitutes.

(d) Power to influence price.

Price determination:

(1) Substitute Firms who sell similar products enter the market and because of differentiation of products by sellers, monopolistic competition arises.

(2) Since there is a limit to the growth of competitors, the excess profits earned by monopolistic situation attracts new competition. This will have a long-run effect on the excess profits, which will tend to diminish because of the price competition with close substitutes.

(3) Hence, the price determination will be as under-

   (a) Short Run Optimal Price: In the short run, the individual Firm will go on producing as long as additional units add more to revenue than to cost. It will stop at the point beyond which additional output adds more to cost than to revenue. Hence, the Optimal Price is determined at the level of output at which Marginal Revenue equals to Marginal Cost.

   (b) Long Run Optimal Price: In the long run, Average Revenue curve will be more elastic, since large number of substitutes will be available. Therefore, equilibrium is established when Firms are earning normal profits. Profits are normal only when Average Revenue is equal to A veroce Cost.

Competitive Pricing

Pure / Perfect Competition is characterised by the following conditions -

(a) A large number of Buyers and Sellers.

(b) Homogenous product.

(c) Free entry or exit for Firms.

(d) Perfect knowledge of Purchasers and Sellers on prices & quantities.

(e) Absence of Market Segmentation.

(f) Absence of Transportation Cost.

(g) Perfect mobility of Factors of Production.

Price Determination:

1. Under Pure Competition, a Firm has no pricing policy of its own as it has to accept the prevalent market price. At this price, it can sell all of its production if it so desires.
2. The Firm can sell nothing at any higher price.
3. The Firm's decision is not on price, but on the quantity to sell.
4. The Firm can continue to produce so long as its Marginal Cost is less than or equal to its Selling Price. Upto the point at which the Marginal Cost is equal to price, increase in output will add to revenue and thereafter the increase will add to cost. (Note: The Marginal Cost Curve should cut the Marginal Revenue curve from below).

Monopoly Pricing vs. Competitive Pricing

Firm under perfect competition and the firm under monopoly are similar as the aim of both the seller is to maximise profit and to minimise loss. The equilibrium position followed by both the monopoly and perfect competition is MR = MC. Despite the similarities, these two forms of market organization differ from each other in respect of price-cost-output. There are many points of difference which are noted below:

(1) Under perfect competition there are a large number of buyers and sellers in the market competing with each other. The price fixed by the industry is accepted by all the firms operating in the market. As against this, under monopoly, there is only one single seller but a large number of buyers. The distinction between, firm and industry disappears under this type of market situation.

(2) The average revenue curves under competition and monopoly take different shapes. The average revenue (price) curve under perfect competition is a horizontal straight line parallel to OX-axis. The industry demand curve or revenue curve slopes downward from left to right. But under monopoly the firm is itself the industry.

There is only one demand curve common both to the monopoly firm and monopoly industry. The average revenue curve under monopoly slopes downward and its corresponding marginal revenue curve lie below the average revenue curve. Under perfect competition MR Curve is the same as AR Curve.

(3) Under perfect competition price equals marginal cost at the equilibrium output, but under monopoly equilibrium price is greater than marginal cost. Under perfect competition marginal revenue is the same as average revenue at all levels of output. Thus at the equilibrium position under perfect competition marginal cost not only equals marginal revenue but also average revenue.

On the other hand under monopoly both the AR and MR curve slope downward and MR curve lies below AR curve. Thus average revenue is greater than marginal revenue at all levels of output. Hence at the equilibrium output of the monopolist price stands higher than marginal cost. Under competition price MR=MC. In monopoly equilibrium, price > MC.

(4) A competitive firm makes only normal profit in the long run. As against this, a monopolist can make super normal profits even in the long run. In perfectly competitive market there is freedom of entry and exit. Attracted by the supernormal profit earned by the existing firms the new competitive firms enter the market to compete away the supernormal profit. Output rises and profit becomes minimum.

Thus in the long run a competitive firm earns only normal profit. But under monopoly the firm continues earning supernormal profits even in the long run since there are strong barriers to the entry of new firms in the monopolistic industry.

(5) A monopolist can discriminate prices for his product, a firm working under perfect competition cannot. The monopolist will be increasing his total profit by price discrimination if he finds Elasticities of demand are different in different markets.

As against this a competitive firm cannot change different prices from different buyers since he faces a perfectly elastic demand at the going market price. A slight rise in price he will lose the sellers and makes loss. Thus a competitive firm can not discriminate prices which a monopolist can do.

Sensitivity Analysis in Pricing Decisions

Price sensitivity can be defined as the degree to which consumers' behaviours are affected by the price of the product or service. **Price sensitivity** is also known as **price elasticity of demand** and this means the extent to which sale of a particular product or service is affected. Another way of explaining price sensitivity is, "the consumer demand for a product is changed by the cost of the product. It basically helps the manufacturers to study the consumer behaviour and assists them in making good decisions about the products.The level of price sensitivity varies depending on various products and consumers. Price sensitivity, in economics, is generally quantified through the price elasticity of demand.

Explaining the concept of price sensitivity

In the past, many trade companies relied on two most common pricing strategies:

- "Cost plus" pricing which requires companies to make regular adjustments as their costs increase. Some cost charges like rent hike or collective bargaining agreement can, however, impact market participants in different ways thus forcing some companies to heave their prices more than the competitors.
- "Competitive pricing" is the second common pricing strategy. This strategy involves setting prices on the basis of price set by the competitors. This approach can, however, be problematic if the pricing does not reflect imperative differences in what is being proffered. Moreover, this approach presumes the competition creates the most effective price for a product or service.

Both of the aforesaid pricing approaches, however, share common failings. The most important one is the lack of critical information on what is willingly being paid by the consumers. Secondly, these pricing strategies depend largely on subjective judgment of the management instead of depending on data-driven empirical evidence determining the impact of distinctive pricing levels on demand.

Price sensitivity can be measured by dividing the percentage change in the quantity purchased of the product or service with the percentage change in the price.

Formula

The standardized formula for measuring price sensitivity is:

Price Sensitivity = (Change in Quantity Purchased / Change in Price)%

Example:

In order to observe the price sensitivity, let us consider that, when Nestle apple nectar prices increase by 60%, the juice purchases fall with the figure of 35%. Using the mentioned formula we can easily calculate the price sensitivity for nestle apple nectar:

Price Sensitivity = -35% / 60% = -0.60 (Approx).

Therefore, we can conclude that for every percentage with which the Nestle apple nectar price increases; it affects the purchase by almost more than half percentage. Likewise, all the products can be studied by taking into account the changes in price and increase or decrease in the demand.

Those products are said to be price sensitive in which the change in price is not much but the demand is affected on the large scale. This is the case usually with the convenience products or the products which have a huge range of alternatives. Those products which are not much reactive to change in price are called price inelastic. Such products are usually daily used products and are a necessity of life and consumers do not have any other option other than purchasing them.

7.2 OPERATING COSTING

Operating Costing is a method of costing applied in ascertaining the cost of rendering services. It is not applicable for entities manufacturing tangible goods. The main objective of operating costing is to compute the cost of the services offered by the organization. Entities/companies usually use this method of costing are as follows:

(a) Utility Services: canteen, hospital

(b) Distribution Services: Electricity

(c) Transportation Services: Railways, Bus etc.

(d) Other Services: such as Management Consultants, courier services etc.

Two Steps in Operating Costing:

I. Cost Unit: It is necessary to decide the unit of cost. The cost units vary from industry to industry. For example, in goods transport industry, cost per tonne kilometer is to be ascertained while in case of passenger transport, cost per passenger kilometer is to be ascertained. Costs units may be single or composite.

(a) Single cost unit:

Enterprise	Cost Unit
Transport	Per tonne, per Km, per passenger
Hospital	Per bed
Water Supply	Per gallon

(b) Composite Cost Unit:

Passenger Transport	Per passenger-km
Goods Transport	Per tonne-km, tonne mile
Hotel	Per room day
Cinema	Per seat per show
Electricity	Per kilowatt hour

II. Identify costs: The next step is to identify various costs under different headings as below:

(a) Fixed or standing charges

(b) Semi-fixed or maintenance charges

(c) Variable or running charges

Service sector companies provide their customers with services or intangible products.

Activities of service sector may be used for:

- Provision of services to outside customers
- Provision of services internally (i.e., Captive Consumption)

Characteristics of Service Sector

Activities are Labour Intensive

- Direct Material cost would be small or non-existent.
- Labour cost constitutes a significant portion of the total operating costs of a service sector entity.

Cost unit is usually difficult to define

- It is very difficult when compared to selection of cost unit for manufacturing sector.
- Services provided by professionals would be:
    1. Rendering a Loan Service
    2. Representing someone in court of law
    3. Selling an Insurance Policy
- For computing unit cost of these services the most important cost would be professional's labor cost.
- The direct labour cost is traceable to service rendered.
- In addition to labour cost, service sector incurs various overhead costs for offering a service & are classified as service overhead.
- In order to arrive at correct cost incurred for rendering services, it is imperative that such overheads be allocated/apportioned over the cost units.

Collection of Costing Data in Service Sector

- Costs are accumulated under various heads for control purposes & for decision making.
- Costs are usually grouped into Fixed & Variable.
- Format in which costs data is presented depends upon the nature of industry & management.
- For preparing cost sheet under operating costing, costs are usually accumulated for a specific period.
- As there is no direct relationship between costs & level of services there is tendency in service sector to view all costs as overheads & the cost control will be relatively ineffective.
- This gives an impetus for the application of Activity Based Costing in Service Sector, with a desire to secure better understanding of costs, as an aid to decision making & cost control.

Costing Methods in Service Sector

(A) Job Costing Method

- The cost of a particular service is obtained by assigning costs to a distinct identifiable service.
- It is used in Accounting firm, Advertising firms, etc.
- For assigning indirect costs, Activity Based Costing may be used.

(B) Process Costing Method

- The cost of a service is obtained by assigning costs to masses of similar unit & then computing unit cost on an average basis.
- It is used in Retail Banking, Postal Delivery, Credit Card, etc.

(3) Hybrid Costing Method

- Combination of Job & Process Costing Method

Customer Costing in Service Sector

- It is a new approach to Management.
- It's Central theme is Customer Satisfaction.
- When specific output of industry is difficult to be identified & where there are multiple customers, it is important to cost customers.
- An analysis based on Activity Based Costing of customers profitability provides valuable information to help management in pricing customer.
- For Customers costing purpose, costs are divided into following categories. These are:
    1. Customer Specific Costs: These are direct & indirect costs of providing service to each customer and customer related cost assigned to them.
    2. Customer-Line Categories: These are the costs which are broken into the broad segments of customers and not individual customer.
    3. Company Costs: These are charged to Company.

7.3 TRANSFER PRICING

Large organizations are divided into a number of divisions to facilitate managerial control. The problem of transfer pricing arises when one division of the organization transfers its output to another division as an input.

A **transfer price** is the price of one segment (sub unit, department, division etc.) of an organization charges for a product or service supplied to another segment of the same organization. Transfer prices are used when individual entities of a larger multi-entity firm are treated and measured as separately run entities.

In managerial accounting, when different divisions of a multi-entity company are in charge of their own profits, they are also responsible for their own "Return on Invested Capital". Therefore, when divisions are required to transact with each other, a transfer price is used to determine costs. Transfer prices tend not to differ much from the price in the market because one of the entities in such a transaction will lose out: they will either be buying for more than the prevailing market price or selling below the market price, and this will affect their performance.

The transfer from one segment to another is only an internal transfer and not a sale.

Transfer pricing is needed to monitor the flow of goods and services among the divisions of a company and to facilitate divisional performance measurement. The main use of transfer pricing is to measure the notional sales of one division to another division. Thus the transfer prices used in the organization will have a significant effect on the performance evaluation of the various divisions. Transfer price creates revenues for the Transferring Division and Costs for the Recipient Division, affecting each sub-unit's Operating Income. This requires that the system of transfer pricing should be objective and equitable.

Objectives of Transfer Pricing

1. **Goal congruence:** The prices should be set so that the divisional management desire to maximize divisional earnings is consistent with the objectives of the company as a whole. The transfer prices should not encourage sub-optimal decision-making. The system should be so designed that decisions that improve business unit profits will also improve company profits.
2. **Performance appraisal:** The prices should enable reliable assessments to be made of divisional performance. The prices form part of information, which should:
    (i) Guide decision making.
    (ii) Appraise managerial performance.

(iii) Evaluate the contribution made by the division to overall company profits.

(iv) Assess the worth of the division as an economic unit.

The transfer prices should be designed such that they help in measuring the economic performance

3. **Divisional autonomy:** The prices should seek to maintain the maximum divisional autonomy so that the benefits of decentralization (motivation, better decision-making, initiatives, etc.) are maintained. The profits of one division should not be dependent on the actions of other divisions.
4. **Simple and easy:** The system should be simple to understand and easy to administer.
5. The transfer price should provide each segment with the relevant information required to determine the optimum trade-off between company costs and revenues.
6. To optimise the profit of the company over a given short period of time. Here the stress is on maximum utilisation of plant capacity.
7. To optimise the allocation of companies' financial resources. This is a long-term objective.

Fundamental Principles for Transfer Price

The fundamental principle is that the transfer price should be similar to the price that would be charged if the product were sold to outside customers or purchase from outside vendors. When profit centers of a company buy from and sell to one another, two decisions must be made periodically for each product that is being produced by one business unit and sold to another:

(i) Should the company produce the product inside the company or purchase it from and outside vendor? This is the **sourcing decision**.

(ii) If produced inside, at what price should the product be transferred between profit centers? This is the **transfer price decision.**

Transfer price systems can range from the very simple to the extremely complex, depending on the nature of the business.

Transfer Pricing Methods:

There are three general methods for establishing transfer prices.

1. **Market-Based Transfer Price:** In the presence of competitive and stable external markets for the transferred product, many firms use the external market price as the transfer price. When there is a perfectly competitive market for the goods and services that are bought and sold between divisions of an organization, the transfer price should be the market price.

   The transfer price may be slightly lower than the market price if the selling expenses are lower for interdivisional transfers, e.g. because there is no advertising cost for transfers between divisions.

   There is a problem for managers in that market prices may fluctuate.

   Transferring products or services at market prices generally leads to optimal discussion where three conditions are satisfied

   - The market for the intermediate products is perfectly competitive.
   - Inter dependencies of sub units are minimal.
   - There are no additional cost or benefits to the company as a whole from buying or selling in the external market, instead of transacting internally.

   Market conditions which are appropriate for adoption

   - Are generally appropriate in a perfect market, where there is homogeneous product with only one price for both sellers and buyers and no buying or selling costs.

- In a perfect market, Selling Division (SD) will be operating at full capacity and can sell whatever quantity of intermediate product it can produce in the external market. In this situation, internal transfers will result in a need to sacrifice external sales. The benefit forgone that is the contribution lost (opportunity cost) from sacrificing external sales should be included in the transfer price. Thus in this situation TP = MP will be consistent with the general TP rule.
- TP = MC + OC = MP
- In a perfect market, the minimum TP is also the maximum TP. Thus, both Selling Division and Buying Division will be happy with a transfer price set as the market price.
- The adoption of market-based transfer price in a perfectly competitive market meet the criteria of a good transfer price, that is it will promote goal congruent decisions, preserve divisional autonomy and provide an equitable basis for performance evaluation.

Advantages:

- Forces selling division to be competitive with market conditions.
- Does not penalize buying division by charging a price greater than it would have to pay on the market.

Disadvantages:

- May lead selling division to ignore negotiation attempts from buying division and sell directly to outside customers.
- Could cause an internal shortage of materials.
- Forces buying division to purchase materials from the outside.
- Overall company profits may fall even though selling division makes a profit.

2. **Cost-Based Transfer price:** In the absence of an established market price, many companies base the transfer price on the production cost of the supplying division. The most common methods are:
   - Full Cost
   - Cost-plus
   - Variable Cost plus Lump Sum charge
   - Variable Cost plus Opportunity cost
   - Dual Transfer Prices

   Each of these methods is outlined below.

   Full Cost

   A popular transfer price because of its clarity and convenience and because it is often viewed as a satisfactory approximation of outside market prices.

   (i) Full actual costs can include inefficiencies; thus its usage for transfer pricing often fails to provide an incentive to control such inefficiencies.

   (ii) Use of full standard costs may minimize the inefficiencies mentioned above.

   Cost-Plus

   When transfers are made at full cost, the buying division takes all the gains from trade while the supplying division receives none. To overcome this problem the supplying division is frequently allowed to add a mark-up in order to make a "reasonable" profit. The transfer price may then be viewed as an approximate market price.

Variable Cost plus a Lump Sum Charge

In order to motivate the buying division to make appropriate purchasing decisions, the transfer price could be set equal to (standard) variable cost plus a lump-sum periodical charge covering the supplying division's related fixed costs.

Variable Cost plus Opportunity Cost

Also know as the Minimum Transfer Price:

Minimum Transfer Price = Incremental Cost + Opportunity Cost.

For internal decision making purposes, a transfer price should be at least as large as the sum of:

- cash outflows that are directly associated with the production of the transferred goods; and,
- the contribution margin foregone by the firm as a whole if the goods are transferred internally.

Sub-optimal decisions can result from the natural inclination of the manager of an autonomous buying division to view a mix of variable and fixed costs of a selling division plus, possibly, a mark-up as variable costs of his buying division. Dual transfer pricing can address this problem, although it introduces the complexity of using different prices for different managers.

Dual Transfer Prices

To avoid some of the problems associated with the above schemes, some companies adopt a dual transfer pricing system. For example:

- Charge the buyer for the variable cost. The objective is to motivate the manager of the buying division to make optimal (short-term) decisions.
- Credit the seller at a price that allows for a normal profit margin. This facilitates a "fair" evaluation of the selling division's performance.

Limitations

(i) It can lead buying division (BD) to make "sub-optimal" decisions because BD regards the transfer price (which includes the fixed costs) as a wholly variable cost.

3. **Negotiated Transfer Price:** Senior management does not specify the transfer price. Rather, divisional managers negotiate a mutually-agreeable price. Negotiated transfer prices arise from the outcome of a bargaining process between selling and buying divisions. It is typically combined with free sourcing. In some companies, though, H.Q. reserves the right to interfere in the negotiation process and impose an "arbitrated" solution.

Market conditions which are appropriate for adoption

- In an imperfect market (different selling costs for internal and external sales, differential market prices), transfer prices set at the prevailing or planned market price are not optimal i.e. will not induce SD and BD to adopt optimal output level. Central/corporate management intervention is necessary in order to ensure that optimal output levels are set but this process may undermine divisional autonomy.
- In this situation, it is more appropriate to adopt negotiated transfer prices. If both managers had been provided with all the information and were educated to use information correctly, it is likely that a negotiated solution would have emerged which would have been acceptable to both the divisions and the group.
- When there is unused capacity, the transfer price range for negotiations generally buying between the minimum price at which SD is willing to sell (its marginal cost) and the maximum price BD is willing to pay (the external supplier price net off any external purchase related costs).

Advantages

- Autonomy ↔ Decentralisation
- Better information about costs and benefits
- Most appropriate where there are market imperfections for the intermediate product and when managers have equal bargaining power.
- To be effective, managers must understand how to use cost and revenue information.

Disadvantages

- Can lead to sub-optimal decisions
- Time – consuming
- Divisional profitability may be strongly influenced by the bargaining skills and powers of the divisional managers.

Example : A hypothetical company called Cristal Ltd has a Molten Glass Division, and the following is a summary of that division's activities last year:

Output & sales (*all to external customers*)	Selling price	Marginal cost (variable cost)	Fixed costs
40,000 tons	₹ 120 per ton	₹ 65 per ton	₹ 7,20,000 per annum

The company also has a Glass Bottles Division, which needs 10,000 tons of molten glass per annum in order to manufacture its bottles. At present, however, the Glass Bottles Division buys all of its molten glass from an external supplier at a price of ₹105 per ton.

Obviously, since the Molten Glass Division produces something which the Glass Bottles Division needs, the possibility of these two divisions doing some business with each other should at least be considered. Let's look at a number of possible scenarios

Scenario 1: No spare capacity in the Molten Glass Division

This means that the Molten Glass Division cannot increase its output above the level of 40,000 tons per annum which it is already producing (and selling to external customers). Therefore, if any tons of molten glass are sold to the Glass Bottles Division, then there will have to be a corresponding reduction in the quantity sold to external customers. Applying the principle set out earlier, the Molten Glass Division will want to set the transfer price as follows:

- Marginal cost of producing molten glass = ₹65 per ton.
- Opportunity cost of making the transfer = lost contribution from foregoing the sale to the external customer = [₹120 selling price - ₹65 marginal cost] = ₹55 per ton.
- Hence: Transfer price = [Marginal cost incurred up to the point of transfer] + [Opportunity cost of making the transfer] = ₹65 + ₹55 = ₹120 per ton.

The Molten Glass Division will not want to transfer their product for less than ₹120, since to do so would reduce the division's profits.

However, the Glass Bottles Division will not be willing to pay this price, or indeed any price higher than the ₹105 which they are currently paying to the external supplier. Therefore the two divisions will not be able to agree on a transfer price, and will not want to trade with each other.

We can show that this outcome is goal congruent (i.e., it is in the best interests of Cristal Ltd. as a whole) and that any other transfer price would be potentially detrimental to the company's best interests. Suppose, for example, that the Molten Glass Division were to match the price (₹105) being offered by the Glass Bottles Division's external supplier. How would the divisions, and Cristal Ltd. as a whole, be affected?

- Glass Bottles Division: No change in profit (because it would still be paying the same price as before for molten glass, albeit to the Molten Glass Division rather than to the external supplier).
- Molten Glass Division: Reduction in sales revenue, and therefore reduction in profit, of [(₹120 - ₹105) * 10,000 tons] = ₹1,50,000.
- Cristal Ltd.: Loss of revenue = (₹120 * 10,000 tons = ₹12,00,000); Reduction in payments to external suppliers = (₹105 * 10,000 tons = ₹10,50,000); Hence reduction in profit = (₹12,00,000 - ₹10,50,000 = ₹150,000).

Scenario 2: Spare capacity in the Molten Glass Division

Assume now that the Molten Glass Division has the capacity to increase its output above the current level of 40,000 tons per annum, but that there is no demand from external customers for these potential additional tons. This means that it is now possible to produce some extra molten glass for sale to the Glass Bottles Division *without* any reduction in the quantity sold to external customers. In other words, where spare capacity exists, there is no opportunity cost associated with making the transfer. The minimum transfer price acceptable to the Molten Glass Division for units produced using spare capacity can be calculated as follows:

- Marginal cost of producing molten glass = ₹65 per ton.
- Opportunity cost of making the transfer = Nil.
- Hence: Transfer price = [Marginal cost incurred up to the point of transfer] + [Opportunity cost of making the transfer] = ₹65 + Nil = ₹65 per ton.

If molten glass produced using spare capacity is transferred to the Glass Bottles Division at any transfer price in excess of ₹65 per ton, then the Molten Glass Division's profits will increase by: [(Transfer price - ₹65) * Number of tons transferred].

Furthermore, if the Glass Bottles Division pays a transfer price of less than ₹105 per ton (i.e., the price currently charged by the external supplier), then the Glass Bottles Division's profits will increase by: [(₹105 – Transfer price) * Number of tons transferred].

Therefore, so far as units which can be produced using spare capacity are concerned, a transfer price which is greater than ₹65 but less than ₹105 will result in increased profits for both divisions (compared with the profits which they would earn if they did not trade with each other). In line with the principle of divisional autonomy, it is appropriate to leave it to the two division managers to negotiate the precise transfer price within this range.

Goal congruence is also achieved. By using spare capacity, the company is producing molten glass at an incremental cost of ₹65 per ton instead of buying it from an external supplier at ₹105 per ton. Therefore, Cristal Ltd.'s profits are increased by: [(₹105 - ₹65 = ₹40) * Number of tons produced using spare capacity].

Scenario 3: LIMITED Spare capacity in the Molten Glass Division

This is a variation on Scenario 2. Suppose, for example, that the maximum production capacity of the Molten Glass Division is 45,000 tons per annum. Since there is demand from external customers for 40,000 tons, this means that spare capacity is just 5,000 tons.

Remember that the Glass Bottles Division needs 10,000 tons per annum. Therefore, only half of its needs (5,000 tons) can be produced using spare capacity, and these transferred tons should be priced in accordance with Scenario 2.

If the Molten Glass Division were to also supply the Glass Bottles Division with the other half of its needs (i.e., another 5,000 tons) then it would have to reduce sales to external customers by a corresponding amount. Therefore these units should be priced in accordance with Scenario 1.

Hence in this situation it is optimal to have two transfer prices, i.e., a lower one for transfers which can be produced using spare capacity and a higher one for transfers which involve an opportunity cost because they involve foregoing sales to external customers.

It is important to resist the temptation in these circumstances to use an 'average' price for all transfers, because it is sure to be suboptimal. Suppose, for example, that the following situation had been arrived at:

- For units to be produced using spare capacity (Scenario 2), the divisions agreed on the 'midpoint' of the range of acceptable prices, i.e., (₹65 + ₹105) / 2 = ₹85.
- As regards units which could not be produced using spare capacity, but would instead reduce the number of units available for sale to external customers, the division managers accepted (in accordance with the logic of Scenario 1) that the transfer price should be ₹120 (the price charged to external customers whom these transfers would displace).

So far, so good. The transfer pricing arrangement (involving the first 5,000 transfers being priced at ₹85 per ton, and any subsequent transfers at ₹120 per ton) is optimal for Cristal Ltd., in line with the logic of Scenarios 1 and 2. But suppose now that we decided to 'average' these two prices, to come up with a single transfer price which would apply to all transfers:

- Transfer price = (₹85 + ₹120) / 2 = ₹102.50.
- It is easy to see that this transfer price is suboptimal. The Glass Bottles Division will want to buy all 10,000 tons of glass from the Molten Glass Division, since ₹102.50 is lower than the price (₹105) which it is paying to its external supplier. But this is not optimal for Cristal Ltd. since (as we saw in Scenario 1) optimization is achieved only if transfers which displace sales to external customers are priced at the price charged to external customers.

Scenario 4: When negotiation fails

We saw in Scenario 2 that inter-divisional negotiations are likely to be needed in order to determine the transfer price which should apply to output produced using spare capacity. But this raises the question as to what should happen if the negotiations fail.

We have seen that the range of transfer prices which should be acceptable to both managers (for output produced using spare capacity) is ₹65 to ₹105. But suppose that each division tries to hold out for a transfer price very favourable to itself (e.g., the Molten Glass Division refuses to go below a transfer price of ₹100 and the Glass Bottles Division refuses to go above ₹70). Because there is no agreement on transfer price there will be no inter-divisional transfers, and the Glass Bottles Division will continue to buy all of its molten glass from the external supplier at ₹105 per ton. Since the company could have produced this molten glass for ₹65 per ton, this is clearly suboptimal for Cristal Ltd. as a whole.

When division managers cannot agree on a transfer price, should the company's top management intervene to order the divisions to make the transfer if (as in this case) it is obvious that the transfer would be in the company's best interests? The answer is no. There are two reasons for this:

1. For the reasons stated earlier, the preservation of divisional autonomy is an important principle which should not lightly be breached.
2. If the division managers are allowed to suffer the consequences of their own intransigence, then they are unlikely to make the same mistake in future. For example both managers will be aware that if they had 'split the difference' and agreed on a transfer price of ₹85 per ton, then they could each have earned an incremental profit of ₹20 per ton. By failing to agree a price, they have deprived themselves of this profit in the current period. They are likely to remember this lesson in future transfer pricing negotiations.

Benefits of transfer pricing policy

An ideal transfer pricing policy will benefit the organisation in the following ways :

- Divisional performance evaluation is made easier.
- It will develop healthy inter-divisional competitive spirit.
- Management by exception is possible.
- It helps in co-ordination of divisional objectives in achieving organisational goals.
- It provides useful information to the top management in making policy decisions like expansion, sub-contracting, closing down of a division, make or buy decisions, etc.
- Transfer price will act as a check on supplier's prices.
- It fosters economic entity and free enterprise system.
- It helps in self-advancement, generates high productivity and encouragement to meet the competitive economy.
- It optimises the allocation of company's financial resources based on the relative performance of various profit centres, which in turn are influenced by transfer pricing policies.

Transfer Price in different situations :

(i) **If Unit variable cost and unit selling price are not constant**

If Variable Cost p.u. and Selling Price p.u. are not constant, Transfer Prices should be determined in the following manner -

1. **Optimum Level for Company:** The optimum level of output for a Firm as a whole should be determined, by preparing Profit Statement at different output levels. The ideal Transfer Price will be that which will motivate the Divisional Managers to produce at this level of output.
2. **Decision from Company viewpoint:** In certain cases, some departments of the Firm might have to produce its output at a level less than its full capacity. In such cases, a Transfer Price may be imposed centrally, considering overall Company profitability and sub-ordination of divisional to organisational interest.

(ii) **If there are reasonably competitive market for the transferred product and there are full autonomy to the divisional managers to do the internal or external transaction**

When Divisions are not captives of Internal Divisions and they are free to do business both internally and externally and when there are reasonably competitive external markets for the transferred products, the most suitable Transfer Price would be the Market Price, as it generally leads to optimal decisions.

(iii) **If the external market is not reasonably competitive for the transferred product**

If the External Market for the Transferred Goods is not reasonably competitive, the following conditions arise -

1. **Spare Capacity of Transferring Division:** Here, Opportunity Cost will be zero. Hence Minimum Transfer Price should be equal to the Incremental Costs incurred upto the point of internal transfer.
2. **Full Capacity of Transferring Division:** Here, Opportunity Costs (i.e. Contribution Foregone on External Sales) should be added to the incremental costs for, determining the Minimum Transfer Price.

Situations causing Conflicts and Resolving the Conflicts

The criteria for fixing Transfer Prices are - (a) Goal Congruence, (b) Management Effort, (c) Segment Performance Evaluation, (d) Sub-unit autonomy, and (e) Motivation Value. However, no single transfer price can serve all of these criteria. They often conflict and managers are forced to make trade-offs.

Some situations of conflicts between objectives are -

1. **Goal Congruence vs Performance Evaluation**: The Transfer Price that leads to the short-run optimal economic decision is Relevant Cost. If the Transferring Division has excess capacity, this cost will be equal to Variable Cost only (since Opportunity Costs are Nil). The Transferring Division will not recover any of its Fixed Costs when transfers are made at Variable Costs, and will therefore report a Loss.
2. **Goal Congruence vs. Divisional Autonomy**: In case of failure of a division to achieve the objective of 'Goal Congruence', the Management of the Company may dictate their Transfer Price'. If a Transfer Price is imposed on the Manager of the Supplying Division, the concept of divisional autonomy and decentralisation is undermined,
3. **Performance Evaluation vs. Profitability**: A Transfer Price that may be satisfactory for evaluating divisional performance may lead divisions to make sub-optimal decisions when viewed from overall Company perspective.

Conflicts between Divisions and Company as a whole: If Divisional Managers are given "absolute free hand" in decision making on Transfer Prices, there is a possibility that divisional goals may be pursued, ignoring overall Company interests. This may force the top Management to interfere in decision-making. However, interference of top Management and "dictating a Transfer Price" on the divisions is usually the main basis of conflict between a Division and the Company as a whole.

Conflicts Resolution: To resolve transfer pricing conflicts, the following transfer pricing methods can be suggested -

(i) Dual-Rate Transfer Pricing System, and / or

(ii) Two-Part Transfer Pricing System.

Dual-Rate Transfer Pricing uses two separate Transfer Prices to price each inter-divisional transaction, as under -

(i) Debit Cost in Recipient Division (Cost = Relevant Costs, i.e. Variable Cost + Opportunity Cost, if any)

(ii) Credit Income in Transferring Division [Income = Market Price, or Full Cost plus mark-up (whether or not Intermediate Product is marketable)]

Here, Company Profits = Total of Divisional Profits Less Inter-Divisional Mark-up,

(i.e. difference between two Transfer Pricing Rates used above X Quantity Transferred)

Advantages:

- **Incentive to Transferring Division:** The Transferring Division Manager is motivated to transfer the Intermediate Product internally, since each unit transferred generates a profit (due to mark-up).
- **No Unjust Enrichment:** If the Transfer Price is set at the Transferring Division's Marginal Cost for the Intermediate Product, that division will not have any contribution from internal transfers. All the total contribution from inter-divisional trading will be assigned to the Recipient Division. Such unjust enrichment is avoided through the use of mark-up.
- **Optimal Decisions:** Since Relevant Cost is used as the second. Transfer Price, (for debiting Cost in Recipient Division) the Transfer Pricing system automatically promotes goal congruence by leading to optimal decisions.

Disadvantages:

- **Confusing:** Use of different Transfer Prices causes confusion, particularly when more than two divisions are involved.
- **Artificial:** Dual Transfer Prices are considered to be artificial.
- **No incentive:** Fixed Price with mark-up protects Transferring Divisions from competition. It gives them little incentive to improve their productivity.
- **Misleading:** Dual Transfer Prices can result in misleading information and create a false impression of divisional profits. There is a possibility of double-counting of profits. At the extreme, all divisions may report profits, when the Company as a whole is losing money.

Two-Part Transfer Pricing : This is another method of resolving Transfer-Pricing disputes between a Division and the Company as a whole. Under this method. Transfer Price = Marginal Cost + Lump-sum Fixed Fee.

This Method is most suited when there is no market for the Intermediate Product, and the Transferring Division has no capacity constraints. The Transferring Division is provided with sufficient incentive for internal transfer, since Marginal Costs are fully recovered and the lump-sum fee received will reduce its losses by recovering Fixed Costs.

7.4 RELEVANT COST ANSLYSIS

For decision making purpose, it is necessary to classify costs and revenues based on whether they are relevant or irrelevant to the decisions. Relevant costs and revenues are those, that are influenced by the decisions. Irrelevant costs and revenues are those, that are not affected or influenced by the decisions.

Relevant costs are those expected future costs that are essential but differ for alternative courses of action. It is a future cost that would arise as a direct consequence of the decision under review.

Relevant costing is a management accounting toolkit that helps managers reach decisions when they are posed with the following questions:

1. Whether to buy a component from an external vendor or manufacture it in house?
2. Whether to accept a special order?
3. What price to charge on a special order?
4. Whether to discontinue a product line?
5. How to utilize the scarce resource optimally?, etc.

Relevant costing is an incremental analysis which means that it considers only relevant costs i.e. costs that differ between alternatives and ignores sunk costs i.e. costs which have been incurred, which cannot be changed and hence are irrelevant to the scenario.

The costs which should be used for decision making are often referred to as "relevant costs". CIMA defines relevant costs as 'costs appropriate to aiding the making of specific management decisions'.

To affect a decision a cost must be:

(a) Future: Past costs are irrelevant, as we cannot affect them by current decisions and they are common to all alternatives that we may choose.

(b) Incremental: Expenditure which will be incurred or avoided as a result of making a decision. Any costs which would be incurred whether or not the decision is made are not said to be incremental to the decision.

(c) Cash flow: Expenses such as depreciation are not cash flows and are therefore not relevant. Similarly, the book value of existing equipment is irrelevant, but the disposal value is relevant.

Example

Company A manufactures bicycles. It can produce 1,000 units in a month for a fixed cost of ₹ 3,00,000 and variable cost of ₹500 per unit. Its current demand is 600 units which it sells at ₹1,000 per unit. It is approached by Company B for an order of 200 units at ₹700 per unit. Should the company accept the order?

Solution:

A layman would reject the order because he would think that the order is leading to loss of ₹100 per unit assuming that the total cost per unit is ₹800 (fixed cost of ₹ 3,00,000/1,000 and variable cost of ₹500 as compared to revenue of ₹700).

On the other hand, a management accountant will go ahead with the order because in his opinion the special order will yield ₹200 per unit. He knows that the fixed cost of ₹300,000 is irrelevant because it is going to be incurred regardless of whether the order is accepted or not. Effectively, the additional cost which Company A would have to incur is the variable cost of ₹500 per unit. Hence, the order will yield ₹200 per unit (₹700 minus ₹500 of variable cost).

Normally, the following are relevant Costs:

Differential Cost

- A differential cost is the difference in cost items under two or more decision alternatives specifically two different projects or situations. Where same item with the same amount appears in all alternatives, it is irrelevant. For example, a plot of land can be used for a shopping mall or entertainment park. The plot is irrelevant since it would be used in both the cases.
- An example of differential cost would be of a company which is selling its products through distributors. It is paying them a commission of ₹16 million. Any alternate which costs lesser would be considered. Let us suppose that the company is planning to appoint salespersons to sell its products and cancels the contracts with distributors. In this case, the selling expense is expected to be to ₹12 million. There is cost differential ₹4 million (₹16 m - 12m). This is a good sign but the risk would have to considered for changing the channel of distribution. If there is low risk, it would be prudent to go for own arrangements for sales.

  Differential costs must be compared to differential revenues. In case, switching over to direct sales bring additional revenues of ₹2 million, it would increase the net benefit to ₹6 million. This would provide more comfort to the decision maker while considering a change in the distribution channel.

Incremental or Marginal Cost

- Whereas differential cost is a difference between the cost of two independent alternatives, incremental or marginal cost is a cost associated with producing an additional unit. In case of a university, it could be cost of admitting another student. Even operating a second shift is an example of incremental cost. It would be noted that the two decisions are not independent as second shift depends upon first shift.
- Increamental cost must be compared with incremental revenues to arrive at a decision.

Opportunity Cost

- It is cost of opportunity foregone. Mr. Ahmed Shah left a bank job which was paying him ₹15,000 per month and got admission in a University. Monthly fee-charge in the university is ₹10,000 per month. For Ahmed Shah, this would be ₹25,000 per month (₹10,000 + ₹15,000).
- Farhana is a fresh graduate from a business university. She got two offers, one of ₹25,000 from an investment bank and another of ₹15,000 for a teaching-assistant in a university. Another of her class-fellow, Shabana got the same offer from the same university. While Shabana would be happy to join the university, Faraha would not be as she would lose an opportunity to serve at the bank for ₹25,000.
- Whenever an organization is deciding to go for a particular project, it should not ignore opportunities for other projects. It should consider (i) what alternative opportunities are there? (2) Which is the best of these alternative opportunities?

Avoidable costs

These are costs that can be eliminated in whole or in part by choosing one alternative over another. Avoidable costs are relevant costs.

Replacement Cost: It is the cost at which there could be purchase of an asset or material identical to that which is being replaced or revalued. It is the cost of replacement at current market price and is relevant for decision-making.

Imputed Costs

These are Notional Costs appearing in the Cost Accounts only e.g. notional rent charges, interest on capital for which no interest has actually been paid. These are relevant costs for decision-making. Where alternative capital investment projects are being evaluated, it is necessary to consider the imputed interest on capital before a decision is arrived at as to which is the most profitable project.

Out-of-Pocket Cost

These are costs that entail current or near future cash outlays for the decision at hand. Such costs are relevant for decision - making, as these will occur in near future. This cost concept is a short-run concept and is used in decisions on fixing Selling Price in recession, Make or Buy, etc. Out-of-Pocket costs can be avoided or saved if a particular proposal under consideration is not accepted.

Special Decisions

There are special decisions where relevant costs and benefits are to identified before proceeding further. Such decisions are:

- Accept or reject an order when there is excess capacity
- Accept or reject an order when there is no excess capacity
- Outsource a product or service
- Add, drop a product, service or department
- Sell or process further
- Optimization of limited resources or working under constraint.

Irrelevant Costs

Sunk Costs

Sunk costs are costs that were incurred in the past. **Committed costs** are costs that will occur in the future, but that cannot be changed. As a practical matter, sunk costs and committed costs are equivalent with respect to their decision-relevance; neither is relevant with respect to any decision, because neither can be changed. Sometimes, accountants use the term "sunk costs" to encompass committed costs as well.

Experiments have been conducted that identify situations in which individuals, including professional managers, incorporate sunk costs in their decisions. One common example from business is that a manager will often continue to support a project that the manager initiated, long after any objective examination of the project seems to indicate that the best course of action is to abandon it. A possible explanation for why managers exhibit this behavior is that there may be negative repercussions to poor decisions, and the manager might prefer to attempt to make the project *look* successful, than to admit to a mistake.

Here is an example. Consider a student who is between her junior and senior year in college, deciding whether to complete her degree. From a financial point of view (ignoring nonfinancial factors) her situation is as follows. She has paid for three years of tuition. She can pay for one more year of tuition and earn her degree, or she can drop out of school. If her market value is greater with the degree than without the degree, then her decision should depend on the cost of tuition for next year and the opportunity cost of lost earnings related to one more year of school, on the one hand; and the increased earnings throughout her career that are made possible by having a college degree, on the other hand.

In making this comparison, the tuition paid for her first three years is a sunk cost, and it is entirely irrelevant to her decision. In fact, consider three individuals who all face this same decision, but one paid ₹24,000 for three years of in-state tuition, one paid ₹48,000 for out-of-state tuition, and one paid nothing because she had a scholarship for three years. Now assume that the student who paid out-of-state tuition qualifies for in-state tuition for her last year, and the student who had the three-year scholarship now must pay in-state tuition for her last year. Although these three students have paid significantly different amounts for three years of college (₹0, ₹24,000 and ₹48,000), all of those expenditures are sunk and irrelevant, and they all face exactly the same decision with respect to whether to attend one more year to complete their degrees. It would be wrong to reason that the student who paid ₹48,000 should be more likely to stay and finish, than the student who had the scholarship.

Committed Cost

A committed cost is an investment that a business entity has already made and cannot recover by any means, as well as obligations already made that the business cannot get out of.

For example, if a company buys a machine for ₹40,000 and also issues a purchase order to pay for a maintenance contract for ₹2,000 in each of the next three years, all ₹46,000 is a committed cost, because the company has already bought the machine, and has a legal obligation to pay for the maintenance. A multi-year property lease agreement is also a committed cost for the full term of the lease, since it is extremely difficult to terminate a lease agreement.

Absorbed Cost

The indirect costs that are associated with manufacturing. Absorbed costs include such expenses as insurance, or property taxes for the building in which the manufacturing process occurs. When the total manufacturing costs are determined, the implicit absorbed costs are not considered, but will be included in a separate account.

Absorbed Fixed Cost: Fixed Costs which do not change due to increase or decrease in activity is irrelevant to decision-making. Although Fixed Costs are absorbed in cost of production on a normal rate, they are irrelevant for managerial decision-making. However if Fixed Costs are specific, they become relevant for decision-making.

Fixed Costs are unrelated to output and are generally irrelevant for decision-making purpose. However, in the following circumstances, Fixed Costs become relevant for decision-making -

1. When Fixed Costs are specifically incurred for any contract,
2. When Fixed Costs are incremental in nature.
3. When the fixed portion of Semi-Variable Cost increases due to change in level of activity consequent to acceptance of a contract.
4 When Fixed Costs are avoidable or discretionary,
5. When Fixed Costs are such that one cost is incurred in lieu of another (the difference in costs will be relevant for decision-making.)

Relevant Cost for Material

Case-1	Opportunity Cost of Material already purchased and **having no other use** in current production process **and having No Realisable Value.**	Nil
Case-2	Opportunity Cost of Material already purchased and **having no other use** in current production process but **having Realisable Value.**	Opportunity Cost of the Material i.e., Best Alternative Use
Case-3	Opportunity Cost of Material **required under proposed production**. Only some portion thereof is held in stock out of purchase **and having no other use** in current production process but **having Realisable Value.**	Realisable Value

Case-4	Opportunity Cost of Material already Purchased and held in Godown **and having Regular Use** in current production process.	Replacement Cost i.e., Current Purchase Price
Case-5	Opportunity Cost of Material already Purchased and held in Godown **and having Regular Use** in current production process as a substitute Material.	Replacement Cost i.e., Current Purchase Price
Case-6	Opportunity Cost of Material already purchased and **having no other use** in current production process **and having No Realisable Value** but can be disposed by incurring some additional cost.	Saving in Additional Disposal Cost i.e., Benefit or (-) Cost.
Case-7	Opportunity Cost of Material **(Say A)** already purchased that can be used after **suitable alteration in place of other material (Say B) or can be disposed off.**	**(a)** Resale Value of Material **A** or **(b)** Current Purchase Price of Material **B** – Alteration cost of Material **A**. **Whichever is higher**

Instead of all the above 7 cases remember:

Already purchased Material **not** used in **Regular Production Process**	• The maximum Benefit you can drive from the Material is the Opportunity Cost. **(for other than using in an offer)** • If used in Offer the **Old** Purchase Price.
Material used in **Regular Production Process or** Material required to be purchased for the offer.	Current Purchase Price

Labour

Labour is of two types: -

(1) Casual Labour

- It means Temporary Labour.
- Payment according to work only.
- It may be Idle or Busy (if Busy it means Short Supply)

(2) Permanent Labour

- Those Labour whom the management could not reduce, retrench, terminate, due to an agreement with labour.
- Agreed Labour payment irrespective of work.
- It may be Idle or Busy.

Relevant Cost of Labour

	Idle	**Busy**
Casual	Cost to be incurred	Cost to be incurred + Contribution Lost
Permanent	Nil	Benefit Lost (ignoring Sunk Cost)

Relevant Cost of Machines

Machine	**Relevant Cost**
Useless	Difference of Resale Value
Regular Use	Difference of Replacement Cost

Example-1

Machine (Original Cost)	₹ 1,00,000
Life of Machine	5 Years
WDV	Nil
Resale Value	₹ 10,000
No other use of the machine.	

Offer: To use the machine for construction of a Guest House for 1 year. Resale Value after 1 year is ₹1,000. Find out the Opportunity Cost of Machine.

Solution:

- Relevant Cost of utilising machine in order to complete the offer is ₹ 9,000 (10,000 – 1,000), that is benefit lost due to acceptance of offer.
- If the machine has no other use then Relevant Cost is difference of Resale Value.

Example-2 – (Relevant cost of machines which are in Regular Use)

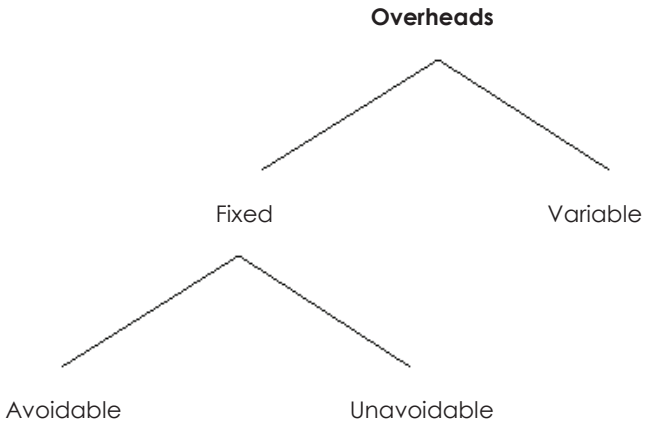
The Company has M1 type of Machines which are of regular use. The company receives an offer for construction of guest house. The Company requires M1 type of machine.

- Current Purchase Price of Machine at beginning of the Year ₹1,00,000.
- Such machine shall be transferred to regular work at ₹ 90,000 at the end of work of offer.

Solution:

Cost to be incurred	10,0000
(-) Transferred Cost	90,000
Difference of Replacement Cost	**10,000**

Relevant Cost for Fixed Assets



Fixed Overheads

(1) Avoidable Fixed Costs: are always relevant for the decision (cost to be incurred) like extra machine rent, extra supervisor salary.

(2) Unavoidable Fixed Costs: Always to be ignored due to Sunk Cost (future obligation already decided).

- Change in apportionment does not change in cash outflow.
- For **Decision Making** Fixed Costs are always to be expressed in totality instead of unit wise.

Variable Overheads

- Variable Overheads to be incurred due to acceptance of offer, hence relevant for decision making.
- If Variable Overheads include **Indirect Material, Indirect Labour** then such Variable Overheads to be linked with **Production.**
- If Variable Overheads include **Indirect Expenses** (Power, Electricity, Energy) then Variable Overheads always linked with **Working Hours.**
- If the break-up of Variable Overheads are not given in question then always presume Variable Overheads include Indirect Expenses like power, electricity, **based on hours.**

If the Question is silent about nature of Resources: -		
(i)	Material	Slow Moving
(ii)	Labour	Casual
(iii)	Casual + Busy	Short Supply
(iv)	Overheads	Fixed – Unavoidable (allocated, absorbed, recovered, apportioned, added to products, General Overheads)

7.5 TARGET COSTING

Target costing is a pricing method used by firms. It is defined as "a cost management tool for reducing the overall cost of a product over its entire life-cycle with the help of production, engineering, research and design". A target cost is the maximum amount of cost that can be incurred on a product and with it the firm can still earn the required profit margin from that product at a particular selling price.

In the traditional cost-plus pricing method materials, labor and overhead costs are measured and a desired profit is added to determine the selling price. Target costing involves setting a target cost by subtracting a desired profit margin from a competitive market price.

A lengthy but complete definition is "Target Costing is a disciplined process for determining and achieving a full-stream cost at which a proposed product with specified functionality, performance, and quality must be produced in order to generate the desired profitability at the product's anticipated selling price over a specified period of time in the future."

This definition encompasses the principal concepts: products should be based on an accurate assessment of the wants and needs of customers in different market segments, and cost targets should be what result after a sustainable profit margin is subtracted from what customers are willing to pay at the time of product introduction and afterwards. These concepts are supported by the four basic steps of Target Costing: (1) Define the Product (2) Set the Price and Cost Targets (3) Achieve the Targets (4) Maintain Competitive Costs.

To compete effectively, organizations must continually redesign their products (or services) in order to shorten product life cycles. The planning, development and design stage of a product is therefore critical to an organization's cost management process. Considering possible cost reduction at this stage of a product's life cycle (rather than during the production process) is now one of the most important issues facing management accountants in industry.

Here are some examples of decisions made at the design stage which impact on the cost of a product.

1. The number of different components
2. Whether the components are standard or not
3. The ease of changing over tools

Japanese companies have developed target costing as a response to the problem of controlling and reducing costs over the product life cycle.

Definition, Explanation and Formula of Target Costing:

Target costing is the process of determining the maximum allowable cost for a new product and then developing a prototype that can be profitably made for that maximum **target cost** figure. A number of companies--primarily in **Japan**--use target costing, including Compaq, Culp, Cummins Engine, Daihatsu Motors, DaimlerChrysler, Ford, Isuzu Motors, ITT, NEC, and **Toyota** etc.

All acceptable definition of target costing does not exist, following important definitions have been given :

"Target costing can be defined as a cost management tool for reducing the overall cost of a product over its entire life cycle with the help of production engineering, research and design, marketing and accounting departments." ---------- Samurai.

"In reality, target costing is not a quantification technique, but rather a complete cost reduction programme starting even before the first drawings of the product have been prepared. It is an approach aimed at reducing the cost of new products throughout their life cycle, while meeting customer requirements in terms of quality and reliability among others, examining all conceivable ideas relating to cost reduction at the planning development and prototyping stages. Target costing is not a simple cost reduction technique but a complete profit management system." ---------- Kato.

The target costing for a product is calculated by starting with the product's anticipated selling price and then deducting the desired profit. Following **formula or equation** further explains this concept:

Target Cost = Anticipated selling price – Desired profit

The product development team is then given the responsibility of designing the product so that it can be made for no more than the target cost.

Following set of activities further explains the concept of target costing technique:

TARGET COSTING PROCESS DIAGRAM

<table>
<tr><td colspan="3">Determine Customer Wants and Price Sensitivity</td></tr>
<tr><td colspan="3">↓</td></tr>
<tr><td colspan="3">Planned Selling Price is Set</td></tr>
<tr><td colspan="3">↓</td></tr>
<tr><td colspan="3">Target Cost is Determined As: Selling Price Less Desired Profit</td></tr>
<tr><td colspan="3">↓</td></tr>
<tr><td colspan="3">Teams of Employees from Various Areas and Trusted Vendors Simultaneously</td></tr>
<tr><td colspan="3">↓</td></tr>
<tr><td>Design Product</td><td>Determine Manufacturing Process</td><td>Determine Necessary Raw Materials</td></tr>
<tr><td colspan="3">↓</td></tr>
<tr><td colspan="3">Costs are Considered Throughout this Process. The Process Requires Trade-offs to Meet Target Costs</td></tr>
<tr><td colspan="3">↓</td></tr>
<tr><td colspan="3">Once Target Cost is Achieved the Manufacturing Begins and Product is Sold</td></tr>
</table>

The Process of Implementation - Target Costing into a New Product

The target costing approach brings the management accountant into the process at the early planning stage. The management accountant is contributing to the early decisions— should the company be making this kind of product? What constraints need to be applied in the design stage? Is the market demand consistent with our projections? Can we achieve the determined return in this competitive of a market?

Market Driven Selling Price - Desired Profit = Target Cost

In the target costing model and opposed to the traditional method of costing, costs are not the driver rather they are driven. The market sets the price, management sets the profit margin, and the difference becomes the allowable cost—cost defined and constrained by price realities and profit goals. New and increasingly necessary, target costing abides to the following logical flow and procedures:

Establishing a Selling Price for the Product

The target costing process begins by establishing a selling price, based on market research, for the new product. From this target-selling price, the desired (target) profit is subtracted to determine the target cost. In all likelihood, this target is below the company's current manufacturing cost. Teams from many departments then perform functional cost analysis in an attempt to reduce costs to a level in the acceptable range. If the current cost estimate is at the target, the firm must decide whether or not to introduce the new product. If the current cost estimate is above the target, functional cost analysis is used to make changes and prepare another cost estimate.

Establishing a Target Profit for the Product

Marketing plays a crucial role in the determination of the target cost. The starting point for a target cost is the estimated selling price for the product determined by market analysis. Sales volume is also estimated and, from the total estimated sales revenue, the desired profit is subtracted. Management determines this desired profit margin in reference to the company's long-term strategy. Retail prices and sales volumes are proposed by the marketing function based on its research and the company's desired market share. Total sales revenue for each new product over its life can now be estimated. The target profit, usually determined by using return on sales, is subtracted from the total sales revenue. The target cost is now determined.

Determine the Target Cost

The target profit is subtracted from the target price to arrive at the target cost. Management accounting can play an important role in effectively determining target profits and target costs. Accountants can supply the information required to support marketing analysis for a new product and relate it to existing products. After the target cost is determined by subtracting the target profit from the target price, functional cost analysis is used to achieve the target cost. Functional cost analysis is a group activity typically involving employees from different departments (such as marketing, design, engineering, production, purchasing, and accounting) and is aimed at proposing alternatives for reducing overall product cost.

This team-oriented approach requires that the employees of different departments bring together their knowledge and experience in the organisation to contribute to the cost reduction process. Working with product designers, their motivation is not only to cut the number of parts but also to work toward the use of standard parts in designs that give products desired functions at a lower cost.

Which Type of Company Would Benefit From Target Costing?

Whenever a new and innovative approach to doing business is discovered, the question arises as to which clients and potential clients might this methodology provide an appropriate fit. In addition, and consistent with many new financial or operational approaches, target costing may not be for everyone. Some companies, which seem to benefit most from target costing, are those, which maintain the following criteria:

- Assembly-oriented industries, as opposed to repetitive-process industries that produce homogeneous products;
- Involved heavily with the diversification of the product lines;
- Use technologies of factory automation, including computer-aided design, flexible manufacturing systems, office automation, and computer-aided manufacturing;

- Have experienced shorter product life cycles where the pay-back for factory automation typically must be achieved in less than eight years;
- Must develop systems for reducing costs during the planning, design and development stages of a product's life cycle;
- Are implementing management methods such as just-in-time, value engineering, and total quality control.

Reasons for Using Target Costing Technique:

The **target costing approach** was developed in recognition of two important characteristics of markets and costs. The first is that many companies have less control over price than they would like to think. The market (i.e., supply and demand) really determines prices, and a company that attempts to ignore this does so at its peril. Therefore, the anticipated market price is taken as a given in target costing. The second observation is that most of the cost of a product is determined in the design stage. Once a product has been designed and has gone into production, not much can be done to significantly reduce its cost. Most of the opportunities to reduce cost come from designing the product so that it is simple to make, uses inexpensive parts, and is robust and reliable. If the company has little control over market price and little control over cost once the product has gone into production, then it follows that the major opportunities for affecting profit come in the design stage where valuable features that customers are willing to pay for can be added and where most of the costs are really determined. So that it is where the effort is concentrated--in designing and developing the product. The difference between target costing and other approaches to product development is profound. Instead of designing the product and then finding out how much it costs, the target cost is set first and then the product is designed so that the target cost is attained.

Example of Target Costing:

To provide a simple numerical **example of target costing**, assume the following situations:

Handy Appliance Company feels that there is a market niche for a hand mixer with certain new features. Surveying the features and prices of hand mixers already in the market, the marketing department believes that a price of ₹30 would be about right for the new mixer. At that price, marketing estimates that 40,000 of new mixers could be sold annually. To design, develop, and produce these new mixers, an investment of ₹ 20,00,000 would be required. The company desires a 15% return on investment (ROI). Given these data, the target cost to manufacture, sell, distribute, and service one mixer is ₹22.50 as calculated below:

Projected sales (40,000 mixers ₹30 per mixer)	₹12,00,000
Less desired profit (15% ₹20,00,000)	3,00,000
Target cost for 40,000 mixers	₹ 9,00,000
Target cost per mixer (₹ 9,00,000 / 40,000 mixer)	₹ 22.50

This ₹22.5 target cost would be broken into target cost for the various functions: manufacturing, marketing, distribution, after-sales service, and so on. Each functional area would be responsible for keeping its actual costs within target.

Advantages and Disadvantages of Target Costing Approach:

Target costing has the following main advantages or benefits:

1. Proactive approach to cost management.
2. Orients organizations towards customers.
3. Breaks down barriers between departments.

4. **Implementation** enhances employee awareness and empowerment.
5. Foster partnerships with suppliers.
6. Minimize non value-added activities.
7. Encourages selection of lowest cost value added activities.
8. Reduced time to market.

Target costing approach has the following main disadvantages or limitations:

1. Effective implementation and use requires the development of detailed cost data.
2. its implementation requires willingness to cooperate
3. Requires many meetings for coordination
4. May reduce the quality of products due to the use of cheep components which may be of inferior quality.

Role of a Cost Accountant in Target Costing Environment

1. The cost accountant should be able to provide for the other members of the design team a running series of cost estimates based on initial designs sketch, activities based costing reviews of production processes, and "best guess" costing information from suppliers based on estimated production volumes. Essentially in the earliest stages of a design, the cost accountant works with vague costing information and so must be able to provide estimates within a high-low range costs, gradually tightening this estimated cost range as more information becomes available.
2. The cost accountant should also be responsible for any capital budgeting requests generated by the design team since he or she has the knowledge of the capital budgeting process, how to fill out the required forms, and precisely what types of equipment are needed for the anticipated product design. The cost accountant also becomes the key contact on the design team for answers to any questions from the finance staff regarding issues or uncertainties in the capital budgeting proposal.
3. The cost accountant should work with the design team to help it understand the nature of various costs (such as cost allocations based on an activity-based costing system), as well as the cost-benefit trade-offs of using different design or cost operations in the new product.
4. In addition, the cost accountant is responsible for tracking the gap between the current cost of a product design and the target cost that is the design team's goal, providing an itemization of where cost savings have already been achieved and where there has not been a sufficient degree of progress.
5. Finally, the cost accountant must continue to compare a product's actual cost to the target cost after the design is completed, and for as long as the company sells the product. This is a necessary step because management must know immediately if costs are increasing beyond budgeted levels and why these increases are occurring.

Attributable Costing:

Another term to improve Activity Based Costing System is Attributable Costing. It is not a new process of accounting but a shift in the focus of the Cost Analysis. An attributable cost refers to any cost that could be eliminated if a particular activity was discontinued. This type of costs include all costs, whether fixed or variable associated directly with that particular activity and activities' share of allocated cost which would be eliminated if the activity were to be discontinued and capacity reduced accordingly. These costs can be similar to 'avoidable costs'. The appropriate cost concept for dealing with quantitative policy decisions is attributable cost. Shilling Law defined back in 1963 attributable cost as – The cost per unit that could be avoided, on the average, if a product or function (i.e. service to a customer) were discontinued entirely without changing the supporting organization structure.

The key point to be noted here is that the basic supporting structure, with its fixed cost implications, would not be affected by a change in policy that might affect a given activity such as delivery of goods to customers. Therefore, in making policy decisions, the aim is to find the unit cost figures for the activity in question under alternative configurations while treating the basic organizational arrangements as continuing unchanged. In doing so, it will often be the case that some elements within attributable cost will be marginal costs of a fixed nature that are directly attributable to the policy decision for example, hiring an additional warehouse manager to facilitate an improved level of delivery. It is apparent from this that attributable cost involves the utilizing of some fixed costs in addition to variable cost. The logic behind attributable costing is simply that any activity that organization regularly undertakes should either cover all its costs or be phased out. Attributable costing seeks to measure the amount of cost that would be avoided (perhaps after a time) if an organizational activity were to be eliminated or modified following a new policy decision. It is important to stress that attributable cost is not the same as full cost. The primary distinction lies in the indivisibility of most fixed costs. Fixed costs are included within full cost whether divisible or not, whereas attributable cost only includes divisible fixed costs from the view point of specific activities.

Backflush accounting is when you wait until the manufacture of a product has been completed, and then record all of the related issuances of inventory from stock that were required to create the product. This approach has the advantage of avoiding all manual assignments of costs to products during the various production stages, thereby eliminating a large number of transactions and the associated labor.

This system records the transaction only at the termination of the production and sales cycle. The emphasis is to measure cost at the beginning and at the end with greater emphasis on the end or outputs. Since back flushing is usually employed in parallel with JIT, there is no work-in-progress to considered nor, does work –in-progress materially fluctuate. What is essential, however, is an accurate bill materials goods measures of yield generally effective production control and accurate engineering change notice when yields do change.

The principle of a just-in-time system is that production is pulled by customer demand and this in turn pulls the purchasing procedures. Thus, theoretically there are zero stocks of raw materials. Work-in-progress and finished goods. For such a situation to exist there needs to be an excellent system of production planning ad communication with materials suppliers.

Backflush accounting is entirely automated, with a computer handling all transactions. The backflushing formula is:

Number of units produced x unit count listed in the bill of materials for each component

Backflushing is a theoretically elegant solution to the complexities of assigning costs to products and relieving inventory, but it is difficult to implement. Backflush accounting is subject to the following problems:

- **Requires an accurate production count.** The number of finished goods produced is the multiplier in the backflush equation, so an incorrect count will relieve an incorrect amount of components and raw materials from stock.
- ***Requires an accurate bill of materials.*** The bill of materials contains a complete itemization of the components and raw materials used to construct a product. If the items in the bill are inaccurate, the backflush equation will relieve an incorrect amount of components and raw materials from stock.
- **Requires excellent scrap reporting.** There will inevitably be unusual amounts of scrap or rework in a production process that are not anticipated in a bill of materials. If you do not separately delete these items from inventory, they will remain in the inventory records, since the backflush equation does not account for them.
- **Requires a fast production cycle time.** Backflushing does not remove items from inventory until after a product has been completed, so the inventory records will remain incomplete until such time as the backflushing occurs. Thus, a very rapid production cycle time is the best way to keep this interval as short as possible. Under a backflushing system, there is no recorded amount of work-in-process inventory.

Backflushing is not suitable for long production processes, since it takes too long for the inventory records to be reduced after the eventual completion of products. It is also not suitable for the production of customized products, since this would require the creation of a unique bill of materials for each item produced.

The cautions raised here do not mean that it is impossible to use backflush accounting. Usually, a manufacturing planning system allows you to use backflush accounting for just certain products, so you can run it on a compartmentalized basis. This is useful not just to pilot test the concept, but also to use it only under those circumstances where it is most likely to succeed. Thus, backflush accounting can be incorporated into a hybrid system in which multiple methods of production accounting may be used.

The Variants of Backflush Accounting

There are a number of variants of the Backflush system, each differing as to the 'trigger points' at which costs are recognized within the cost accounts and thus associated with products. All variants, however, have the following common features :

- the focus is on output – costs are first associated with output (measured as either sales or completed production) and then allocated between stocks and costs of goods sold by working back.
- Conversion costs (labour and overheads) are never attached to products until they are complete (or even sold) – thus the traditional WIP account doesn't exist. Materials are recognized at different points according to the variant used, but only to the extent of being either stock of raw materials or part of the cost of stock of finished goods. Again, materials are not attached to WIP.

Two variants of the Backflush system are summarized below. Note that in each as conversion costs (labour and overheads) are incurred they will be recorded in a conversion cost (CC) account.

Variant 1

This has two trigger points (TP) :

TP 1 - purchase of raw materials / components. A 'raw and in process (RIP)' account will be debited with the actual cost of materials purchased, and creditors credited.

TP 2 - completion of good units. The finished goods (FG) account will be debited with the standard cost of unit produced and the RIP and CC account will be credited with the standard cost.

Under this variant, then, there will be two stock accounts :

- raw materials (which may, in fact, be incorporated into WIP)
- finished goods

Variant 2

This has only one trigger point – the completion of good units. The FG account is debited with the standard cost of units produced, with corresponding credits to the CC account and the creditors account.

Thus the cost records exclude :

- raw materials purchased but not yet used for complete production
- the creditors for these materials (and any price variance)

and there is only stock account, carrying the standard cost of finished goods stock.

Other variants include those using the sale of complete goods units as a trigger point for the attachment of conversion cost to unit -- thus there is no finished goods account, just a raw materials stock account, carrying the materials cost of raw materials, WIP and finished goods.

It should be seen that as stock of raw materials, WIP and finished goods are decreased to minimal levels, as in a 'pure' JIT system, these variants will give the same basic results.

Backflush Accounting -- example

The following example will be used to illustrate the first two variant outlined above.

The manufacturing cost information for March for a division of XYZ plc is as follows :

Cost incurred in March	₹'000
Purchase of raw materials	4,250
Labour	2,800
Overheads	1,640
Activity in March	Units ('000)
Finished goods manufactured during the period	180
Sales	145
Standard cost per unit	₹
Materials	20
Labour	15
Overhead	9
	44

There were no opening stocks of raw materials, WIP or finished goods. It should be assumed that there are no direct materials variance for the period.

Variant 1

The double entry would be as follows		Dr.	Cr.
		₹'000	₹'000
1.	RIP account	4,250	
	Creditor		4,250
2.	CC account	4,440	
	Cash		2,800
	Cash/ creditor		1,640
3.	FG account (180 X 44)	7,920	
	RIP account (180 X 20)		3,600
	CC account (180 X 24)		4,320
4.	COGS (145 X 44)	6,380	
	FG account		6,380

The ledger would appear as follows

Raw and in process materials

	₹'000		₹'000
Creditor	4,250	FG	3,600
		Bal c/d	650
	4,250		4,250
Bal b/d	650		

Conversion costs

	₹'000		₹'000
Cash/creditor	4,440	FG	4,320
		Bal c/d	120
	4,440		4,440
Bal b/d	120		

Finished goods

	₹'000		₹'000
RIP	3,600	COGS	6,380
CC	4,320	Bal c/d	1,540
	7,920		7,920
Bal b/d	1,540		

Cost of goods sold

	₹'000		₹'000
FG	6,380		

The stock balances at the end of March would be

	₹'000
Raw and in process materials	650
Finished goods	1,540
	2,190

The balance on the Conversion Cost (CC) Account would be carried forward and written off at the end of the year.

Variant 2

The accounting entries where there is only one trigger point (on completion of units) would be simpler.

		DR	CR
		₹'000	₹'000
1.	CC account	4,440	
	Cash		2,800
	Cash/creditors		1,640
2.	FG account (180 X 44)	7,920	
	RIP Account (180 X 20)		3,600
	CC account (180 X 24)		4,320
3.	COGS	6,380	
	FG account		6,380

This variant is thus only suitable for JIT system with minimal raw materials stocks.

7.6 LIFE CYCLE COSTING

Target costing places great emphasis on controlling costs by good product design and production planning, but those up-front activities also cause costs. There might be other costs incurred after a product is sold such as warranty costs and plant decommissioning. When seeking to make a profit on a product it is essential that the total revenue arising from the product exceeds total costs, whether these costs are incurred before, during or after the product is produced. This is the concept of life cycle costing, and it is important to realise that target costs can be driven down by attacking any of the costs that relate to any part of a product's life. The cost phases of a product can be identified as:

Phase	Examples of types of cost
Design	Research, development, design and tooling
Manufacture	Material, labour, overheads, machine set up, inventory, trading, production machine maintenance and depreciation
Operation	Distribution, marketing, advertising, after-sales service costs and warranty claims
End of life	Environmental clean-up, disposal and decommissioning

The terms "cradle to grave" and "womb to tomb" are the different terms which are used in the context of life cycle costing to convey the attempt to capture fully all costs associated with the product during life span. CIMA defines life cycle costing as the practice of obtaining over their life time, the best use of physical asset at the lowest cost of entity.

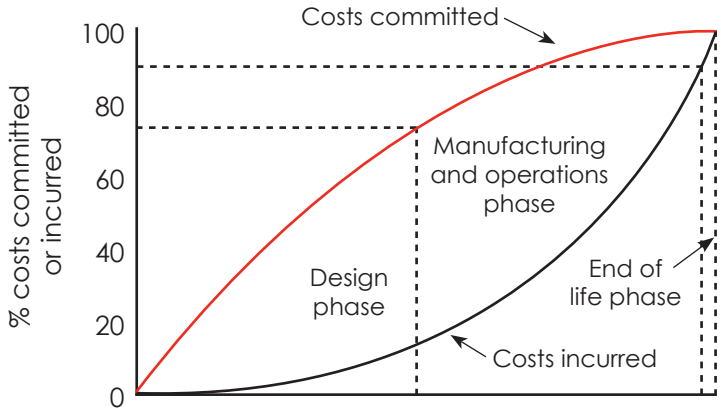
The term 'Life Cycle Cost' has been defined as follows, "it includes the costs associated with acquiring, using, caring for and disposing of physical asset including the feasibility studies, research, design, development, production, maintenance, replacement and disposal as well as support, training and operating costs generated by the acquisition use, maintenance and replacement of permanent physical assets."

Life cycle costing is specially important in industries that face rapid technological or style changes. Periodic external financial statements may make a product appear to be worthwhile, because its development costs were initially expensed. But, in total, the company may have not even have recovered its original investment. Over the product or service life cycle, companies need to be aware of and attempt to control the total cost of making a product or providing a service.

There are four principal lessons to be learned from lifecycle costing:

- All costs should be taken into account when working out the cost of a unit and its profitability.
- Attention to all costs will help to reduce the cost per unit and will help an organisation achieve its target cost.
- Many costs will be linked. For example, more attention to design can reduce manufacturing and warranty costs. More attention to training can reduce machine maintenance costs. More attention to waste disposal during manufacturing can reduce end-of life costs.
- Costs are committed and incurred at very different times. A committed cost is a cost that will be incurred in the future because of decisions that have already been made. Costs are incurred only when a resource is used.

Typically, the following pattern of costs committed and costs incurred is observed:



The diagram shows that by the end of the design phase approximately 80% of costs are committed. For example, the design will largely dictate material, labour and machine costs. The company can try to haggle with suppliers over the cost of components but if, for example, the design specifies 10 units of a certain component, negotiating with suppliers is likely to have only a small overall effect on costs. A bigger cost decrease would be obtained if the design had specified only eight units of the component. The design phase locks the company in to most future costs and it this phase which gives the company its greatest opportunities to reduce those costs.

Conventional costing records costs only as they are incurred, but recording those costs is different to controlling those costs and performance management depends on cost control, not cost measurement.

7.7 KAIZEN COSTING

KAIZEN costing is a cost-reduction system that is applied to a product in production. It comes from the combination of the Japanese characters 'kai' and 'zen' which mean 'change' and 'good,' respectively. The word 'Kaizen' translates to 'continuous improvement' or 'change for the better' and aims to improve productivity by making gradual changes to the entire manufacturing process. Some of the cost-reduction strategies employed involve producing cheaper re-designs, eliminating waste and reducing process costs. Ensuring quality control, using more efficient equipment, utilizing new technological advances and standardizing work are additional elements.

To understand Kaizen costing, one first needs to grasp standard costing methodology. The typical standard costing approach works by designing a product first, and computing costs by taking into account material, labor and overhead. The resulting figure is set as the product cost. The standard cost is set and revised on a yearly basis. Cost deviation analysis involves checking to see whether the projected cost estimates tally with the final figures. Manufacturing procedures are assumed to be static.

In contrast, Kaizen costing is based around improving the manufacturing process on a continual basis, with changes being implemented throughout the year. Cost-reduction targets are set on a monthly basis. The goal here is to reduce the difference between profit estimates and target profits. The cost deviation analysis done in Kaizen costing examines the difference between the target Kaizen costs and the actual cost reduction achieved. The basic idea here is to make tiny incremental cost reductions on a continual basis in a product's life cycle.

Since the goal is to reduce costs on a monthly basis, every department in the company makes an effort to introduce operational changes on a daily basis. The Kaizen approach calls for analyzing every part of the process and generating ideas on how they can be further improved. Kaizen costing takes into account aspects such as time-saving strategies, employee efficiency and wastage reduction while incorporating better equipment and materials.

Once planners have fixed and implemented the product and process designs, interest turns to operating the process in the most efficient way—an activity driven by kaizen costing. Kaizen costing focuses the organization's attention on things that managers or operators of an existing system can do to reduce costs. Therefore, unlike target costing, which planners use before the product is in production, operations personnel use kaizen costing when the product is in production. However, target and kaizen costing are similar in that targets drive them. Whereas target costing is driven by customer considerations, kaizen costing is driven by periodic profitability targets set internally by senior management.

The focus of the cost reduction efforts driven by kaizen costing is incremental improvements to the current production process or product design. These improvements take the form of developing improved setup processes, improving machine performance to reduce waste, and increasing employee training and motivation to encourage employees to identify and implement the incremental daily changes that can improve cost and quality performance. In short, the focus in kaizen costing is the process and not the product itself.

Organizations attack continuous improvement in different ways, and the kaizen costing system will reflect the cost reduction strategy. For example, Olympus Optical Company implemented a kaizen costing system with four components: production costs, costs,of defects, capacity use costs, and overhead expenses. Each subsystem gathered and reported costs that directed attention to areas for improvement.

Some observers have criticized both target and kaizen costing on the grounds that they often place huge stress on employees. Some organizations have responded to this charge and to the effect of using target and kaizen costing techniques by lowering their performance expectations. However, by their nature, which focuses on motivating intense effort at reducing costs, these measures are stressful.

Philosophy

There is a vast difference in the approach of Kaizen theory as compared to our Indian traditional organisations. The major difference in the approach are highlighted in the following table:

Approach to	Traditional Organisation	Kaizen Environment
1. Attitude	Let it go	Continuous improvement
2. Employees	Cost	Asset
3. Information	Restricted	Shared
4. Interpersonal Relationship	Commercial	Human
5. Management Belief	Routine	Change
6. Management culture	Bureacratic	Participative
7. Management Function	Control	Supportive
8. Management Stress	Functional	Cross Functional

Benefits of Kaizen Costing

There are certain benefits of Kaizen Costing which are followed in various Japanese companies which are listed below: -

(i) **Focus on customers :** The Kaizen philosophy has only one prime objective of customers' satisfaction. Kaizen permits no middle ground its either you provide best products and customer satisfaction or not. All the activities should aim at providing customer with whatever he wants and should help the firm long term objective of customers' satisfaction at the same time building up good relationship. It is a responsibility of each and every person working in a Kaizen company to make sure that the product is up to the mark and it satisfies customers need.

(ii) **Make improvements continuously** : There is not a best way to do a thing, there is still a better way. In a Kaizen company, the search for excellence just does not end. We should work on the improvement implemented and see if we can make it even more effective.

(iii) Acknowledge problems openly : Every company has certain problems related to finance, competition, change in demand etc. Kaizen companies are no exception, but by fostering an appropriately supportive, constructive culture it becomes easier for any team to get its problem in the open. The whole organization works as a team to solve the problem. The problems are openly shared by the management with the employees which avoids rumors. It simply means FIGHT WITH YOUR PROBLEMS DON'T RUN AWAYFROM THEM.

(iv) Promote openness : There seems to be less functional ring fencing i.e. only the senior managers have private cabins. Otherwise the workplace is generally open and in many companies even the dress code and canteen for everyone is the same.

(v) Create work teams : Each individual in a Kaizen company belongs to work team headed by a leader. Working in various overlapping teams draws employees into corporate life and reinforces the mutual understanding.

(vi) Cross functional teams : Kaizen states that no individual or team has all the required skill and knowledge to complete a task. Cross-functional teams help in getting all the valuable information's from the view of all the related people. It calls for letting ideas to flow as wide as running on moon.

Reasons for Failure

While in most of the organisations Kaizen System has produced dramatic results/substantial improvements, still it was surprised to notice that the same had failed. While analysing the causes of the failure of the established Kaizen System, the following major reasons have been found contributed to it:

- Lack of interest and supported from Top Management.
- Lack of proper motivation by Management.
- Lack of proper training of Listening Skills, Presentation Skills, Communication Skills etc. to the participants.
- Criticising the efforts of failures by the Group members.
- Ignoring the basic concept 'Improvements is a part of daily routine' by all concerned.
- Lot of work pressure on the participants, especially at the time of year end/handling the crisis situation, resulting sidelining the Kaizen completely.

Illustration 1.

A dealer of perishable product earns a profit of ₹ 3 per kg. if he can sell within two days, but incurs a loss of ₹ 2 per kg., if fails to do so. The estimated demand for the product and the relative probabilities are as given below:

Estimated Demand	Probability
0 kg	5%
1 kg	20%
2 kg	40%
3 kg	25%
4 kg	10%

In order to maximise his profit what should be the quantity of stock that he should hold?

Solution:

(a) **If he stocks 1 kg**

When demand is	0	he incurs loss of	₹ 2
When demand is	1	he makes profit of	₹ 3
When demand is	2	he makes profit of	₹ 3
When demand is	3	he makes profit of	₹ 3
When demand is	4	he makes profit of	₹ 3

(b) **If he stock is 2 kgs.**

When demand is	0	he incurs loss of	₹ 4 (-2-2)
When demand is	1	he makes profit of	Re. 1 (3-2)
When demand is	2	he makes profit of	₹ 6 (3+3)
When demand is	3	he makes profit of	₹ 6 (3+3)
When demand is	4	he makes profit of	₹ 6 (3+3)

(c) **If he stocks 3 kgs**

When demand is	0	he incurs loss of	₹ 6 (-2-2-2)
When demand is	1	he incurs loss of	Re. 1 (3-2-2)
When demand is	2	he makes profit of	₹ 4 (3+3-2)
When demand is	3	he makes profit of	₹ 9 (3+3+3)
When demand is	4	he makes profit of	₹ 9 (3+3+3)

(d) **If he stocks 4 kgs**

When demand is	0	he incurs loss of	₹ 8 (-2-2-2-2)
When demand is	1	he incurs loss of	₹ 3 (3-2-2-2)
When demand is	2	he makes profit of	₹ 2 (3+3-2-2)
When demand is	3	he makes profit of	₹ 7 (3+3+3-2)
When demand is	4	he makes profit of	₹ 12 (3+3+3+3)

Expected value of profit on each of the four situations of holding stocks can be evaluated by giving weightage of probability as follows :–

(a) Stock of 1 kg = $(0.5 \times -2) + (.20 \times 3) + (.40 \times 3) + (.25 \times 3) + (.10 \times 3)$

= -.10 + .60 + 1.20 + .75 + .30 = ₹ 2.75

(b) Stock of 2 kgs = $(.05 \times -4) + (.20 \times 1) + (.40 \times 6) + (.25 \times 6) + (.10 \times 6)$

= -.20 + .20 + 2.40 + 1.50 + .60 = ₹ 4.50

(c) Stock of 3 kgs = (.05 × -6) + (.20 × -1) + (.40 × 4) + (.25 ×9) + (.10 × 9)

= -.30 - .20 + 1.60 + 2.25 + 0.90 = ₹ 4.25

(d) Stock of 4 kgs. = (.05 × -8) + (.20 × -3) + (.40 × 2) + (.25 × 7) + (.10 × 12)

= -.40 - .60 + .80 + 1.75 + 1.20 = ₹ 2.75

Since the expected value is highest in the second case, the dealer should stock 2 kgs to, maximise his profit.

Illustration 2.

V S Ltd. which wishes to improve its competitive position is considering to expedite its delivery time by increasing the levels of finished stocks held.

Depending upon the degree of increase in finished stocks, it estimates that sales now at 3,00,000 units per annum will change as follows:

Probability of new sales at (000) units per annum

		310	320	330	340	Total
If finished Stocks increased by	10%	0.45	0.40	0.15	—	1.00
	15%	0.30	0.45	0.25	—	1.00
	20%	0.15	0.50	0.30	0.05	1.00
	25%	—	0.40	0.40	0.20	1.00

Change resulting from increase in finished stocks would be—

(i) Extra storage accommodation would be required:

If the stocks increase upto and including 10%, construction costs of ₹ 1,80,000 and annual costs of ₹ 22,500 would be involved.

If stocks increase above 10% the construction costs would be ₹ 4,12,500 and the annual costs ₹ 67,500.

The company treats investments of this kind as having life of seven years and requiring a 15% DCF yield.

(ii) Extra handling equipment also be required:

If the stocks increase is upto and including 15%, new equipment costing ₹ 60,000 with addl. running costs of ₹ 8,250 would be required.

If the stocks increase is above 15%, new equipment of ₹ 1,42,500 with annual costs of ₹ 11,250 would be needed.

For this type of investment, the company's criteria are 20% DCF and a life of four years.

(iii) The present value of an annuity of Re. 1 for seven years at 15% is ₹ 4.16 and for four years at 20% is ₹ 2.59

(iv) Additional raw materials and work-in-progress need to be held.

	Raw materials	Work in progress
If finished stocks increase by		
less than 20%	15%	15%
20% or more	25%	25%

The present level of stocks hold are :

Finished stocks	₹ 1,20,000
Raw materials	₹ 20,000
Work in progress	₹ 40,000

(v) Extra warehouse staff would be required:

Finished stock increase	Extra staff cost per annum
10%	₹ 4500
15%	₹ 4700
20%	₹ 5000
25%	₹ 5250

Other background information—

— The average selling price of products is ₹ 45 per unit and the variable costs are ₹ 27 per unit.

— Creditors of raw materials are paid 3 months after delivery.

— The company finances its entire stocks by bank overdraft at a rate of 12% p.a.

— Insurance on stocks is currently ₹ 15,000 p.a. the premium would increase proportionately for all additional stocks.

Required your recommendations with supporting calculations which level of holding finished stocks would be most beneficial to the company.

Solution:

1. Anticipated sales for increase in finished stock by—

Units	Prob.	10%	Prob.	15%	Prob.	20%	Prob.	25%
3,10,000	0.45	1,39,500	0.30	93,000	0.15	46,500	—	—
3,20,000	0.40	1,28,000	0.45	1,44,000	0.50	1,60,000	0.40	1,28,000
3,30,000	0.15	49,500	0.25	82,500	0.30	99,000	0.40	1,32,000
3,40,000	—	—	—	—	0.05	17,000	0.20	68,000
Units	1.00	3,17,000	1.00	3,19,500	1.00	3,22,500	1.00	3,28,000
Net Contribution (45 – 27 = 18)	₹ 57,06,000		₹ 57,51,000		₹ 58,05,000		₹ 59,04,000	

2.	**Additional working capital**	10% (₹)	15% (₹)	20% (₹)	25% (₹)
	(i) Finished stock (₹ 1,20,000)	12,000	18,000	24,000	30,000
	(ii) Raw material (₹ 20,000)	3,000	3,000	5,000	5,000
	(iii) Work in progress (₹ 40,000)	6,000	6,000	10,000	10,000
		21,000	27,000	39,000	45,000
	Less : 25% of raw material on credit	750	750	1,250	1,250
		20,250	26,250	37,750	43,750
3.	**Additional financing charge** @ 12%	2,430	3,150	4,530	5,250
4.	**Insurance charge** $\frac{15,000}{1,80,000} \times 21,000$ etc.	1,750	2,250	3,250	3,750
5.	**Extra warehouse staff**	4,500	4,700	5,000	5,250

6.	**Extra storage cost**				
	Annual Cost	22,500	67,500	67,500	67,500
	Construction Cost $\frac{1,80,000}{4.16}$	43,269	—	—	—
	$\frac{4,12,500}{4.16}$	—	99,159	99,159	99,159
7.	**Extra handling cost**				
	Running Cost	8,250	8,250	11,250	11,250
	Equipment $\frac{60,000}{2.59}$	23,166	23,166	—	—
	$\frac{1,42,500}{2.59}$	—	—	55,019	55,019
	Total additional cost (col. 3+4+5+6+7)	1,05,865	2,08,175	2,45,708	2,47,178
8.	**Increase in Contribution** (18 × 3,00,000)	3,06,000	3,51,000	4,05,000	5,04,000
	Net gain increase	2,00,135	1,42,825	1,59,292	2,56,822

Maximum profit increase due to sales strategies is ₹ 2,56,822 at 25% increase in the level of finished stock.

However in case the sales probabilities given by the Marketing Director are uncertain the increase at 10% level gives the next best alternative.

Illustration 3.

The Stock Control Policy of Vidhata Co. is that each stock is ordered twice a year, the quantum of each order being one-half of the year's forecast demand. The Materials Manager, however, wishes to introduce a policy in which for each item of stock, Re-order Levels and EOQ is calculated.

For one of the items X, the following information is available -

Forecast Annual Demand	3,600 units
Cost per unit	₹100
Cost of Placing an order	₹ 40
Stockholding Cost	20% of the average stock value
Lead Time	1 month
Buffer Stock to cover fluctuations in demand	100 nos.

If the new policy is adopted, calculate for stock item X, - (a) Re-order Level that would be set by the Materials Manager (b) Anticipated reduction in value of the average stock investment (c) Anticipated reduction in total inventory costs in the first and subsequent years.

Solution:

(a) Reorder Level = Safety Stock + Lead Time Consumption

= 100 units (given) + (3,600 units ÷ 12 months) = 100 + 300 = 400 units.

(b) Economic Order Quantity = $\sqrt{\frac{2AB}{C}}$ where

A = Annual Requirement of Raw Materials = 3,600 units

B = Buying or Ordering Cost per order = ₹ 40

C = Carrying or Stockholding Cost p.u per annum = ₹100 x 20% = ₹ 20

On substitution, EOQ = 120 units

Average Stock Quantity under Old Policy = (1,800 units ÷ 2) = 900 units

Average Stock Quantity under EOQ = Safety Stock + (120 units ÷ 2) = 160 units

Reduction in the value of the Average Stock Investment = (900 - 160) x ₹ 100 = ₹ 74,000

(c) Cost Comparison of Old Policy and EOQ

Particulars	**Old Policy**	**EOQ**
Quantity ordered every time	1,800 units	120 units
Number of orders per annum	2 orders	30 orders
Buying Cost at ₹ 40 per order	2x₹40 = ₹ 80	30 x ₹40 = ₹ 1,200
Average Inventory = ½ x Quantity	900 units	160 units (including Safety Stock)
Carrying Cost at ₹ 20 per unit	900 x ₹ 20 = ₹ 18,000	160 x ₹20 = ₹3,200
Total Associated Cost	₹ 18,080	₹4,400

Savings in Cost per annum due to EOQ Policy = ₹ 18,080 - ₹4,400 = ₹13,680

However, for the first year, the Company has to specifically purchase the safety stock also, in addition to the annual consumption requirements. This will be at a cost of ₹100 x 100 units = ₹ 10,000. Hence, savings in the first year will be ₹13,680 - ₹ 10,000 = ₹3,680.

Illustration 4.

After inviting tenders, two quotations are received as follows –

- Supplier Arun - ₹ 4.80 per unit,
- Supplier Bala - ₹ 4.40 per unit plus ₹12,000 fixed charges to be added irrespective of quantity ordered.

Additional Information: Present Stock - 35,000 units, Average Monthly Consumption -10,000 units, Maximum Level - 80,000 units, Minimum Stock - 30,000 units.

Advise with arguments, with which Supplier, the order should be placed and what quantity should be ordered?

Solution:

(i) Since the order is to be placed at the present stock level, Re-order Level = Present Stock = 35,000 units.

(ii) Minimum Level = Re-Order Level Less (Average Usage × Average Lead Time).

Substituting, we have, 30,000 = 35,000 - (10,000 x Avg. Lead Time). So, Lead Time = ½ month or 15 days.

(iii) Maximum Level = ROL + ROQ - (Minimum Usage x Lead Time)

Substituting, we have, 80,000 = 35,000 + ROQ - (10,000 x 1/2). Hence, ROQ (i.e. EOQ) = 50,000 units.

(iv) Cost Comparison for the quantity ordered:

- Supplier Arun: ₹4.80 x 50,000 units = ₹ 2,40,000
- Supplier Bala: (₹4.40 x 50,000 units) + 12,000 = ₹ 2,32,000

Hence, Supplier Bala should be preferred for the order quantity of 50,000 units.

Alternative Analysis: Since purchase costs consist of fixed and variable elements, the Cost Indifference Point (i.e. where both alternatives Arun and Bala have equal costs) is computed first -

$$\text{Indifference Point} = \frac{\text{Change in Fixed Cost}}{\text{Change in Variable Cost p.u.}} = \frac{₹\,12,000}{₹\,0.40} = 30,000 \text{ units}$$

Interpretation of Indifference Point:

Purchase Quantity	Below 30,000 units	At 30,000 units	Above 30,000 units
Least Cost Option	Option with Lower Fixed Cost (Arun)	Both Options (Arun / Bala) have equal cost	Option with lower Variable Cost p.u. (Bala)

Annual Requirement of Raw Material = 10,000 units per month x 12 months = 1,20,000 units. Since the annual purchase quantity is above 30,000 units, Supplier Bala (with the lower Variable Cost p.u.) should be chosen.

Illustration 5.

Senapati Ltd presently has its inventory turnover (based on Cost of Goods Sold ÷ Average Inventory) at 10 times p.a., as compared with the industry average of 4. Average Sales are ₹4,50,000 p.a. Variable Cost of Sales are 70% of Sales and Fixed Costs are ₹10,000 per annum. Carrying Costs of inventory (excluding financing costs) are 5% per annum. Sales force complained that low inventory levels are resulting in lost sales due to Stock-outs. The Sales Manager has made an estimate based on stock-out reports as under -

Inventory Policy	Inventory Turnover	Sales
Current	10	₹4,50,000
A	8	₹5,00,000
B	6	₹5,40,000
c	4	₹5,65,000

On the basis of the above estimates and assuming a 40% tax rate and an after-tax required return of 20% on investment in inventory, which policy would you recommend?

Solution:

Evaluation of Inventory Turnover Policies

Particulars	**Current**	**Policy A**	**Policy B**	**Policy C**
Sales	4,50,000	5,00,000	5,40,000	5,65,000
Less: Variable Costs at 70%	3,15,000	3,50,000	3,78,000	3,95,500
Contribution	1,35,000	1,50,000	1,62,000	1,69,500
Less: Fixed Costs (given)	10,000	10,000	10,000	10,000
Profit before Tax	1,25,000	1,40,000	1,52,000	1,59,500
Less: Tax at 40%	50,000	56,000	60,800	63,800
Profit after Tax	75,000	84,000	91,200	95,700
Cost of Goods Sold (VC + FC)	3,25,000	3,60,000	3,88,000	4,05,500
Inventory Turnover Ratio (given)	10 times	8 times	6 times	4 times
Average Inventory (COGS ÷ T/0 Ratio)	32,500	45,000	64,667	1,01,375
Carrying Cost of Inventory at 5% (a)	1,625	2,250	3,233	5,069
Opportunity Cost at 20% of Capital blocked in Average Inventory (b)	6,500	9,000	12,933	20,275
Total Cost of Inventory Holding (a + b)	8,125	11,250	16,166	25,344
Net Benefit = PAT - Total Cost of Inv.	66,875	72,750	75,034	70,356

Decision: As Net Benefit is maximum under Policy B, it may be chosen. [Alternative assumptions exist]

Illustration 6.

An agriculturist has 480 hectares of land on which he grows potatoes, tomatoes, peas and carrots. Out of the total area of land, 340 hectares are suitable for all the four vegetables but the remaining 140 hectares of land are suitable only for growing peas and carrots. Labour for all kinds of farm work is available in plenty.

The market requirement is that all the four types of vegetables must be produced with a minimum of 5,000 boxes of any one variety. The farmer has decided that the area devoted to any crop should be in terms of complete hectares and not in fractions of a hectare. The only other limitation is that not more than 1,13,750 boxes of any one vegetable should be produced.

The relevant data concerning production, market prices and costs are as under:

	Potatoes	**Peas**	**Carrots**	**Tomatoes**
Annual yield :				
Boxes per hectare	350	100	70	180
	₹	₹	₹	₹
Costs :				
Direct Material per hectare	952	432	384	624
Direct Labour :				
Growing per hectare	1792	1216	744	1056
Harvesting and Packing per box	7.20	6.56	8.80	10.40
Transport per box	10.40	10.40	8.00	19.20
Market price per box	30.76	31.74	36.80	44.55

Fixed expenses per annum :	₹
Growing	1,24,000
Harvesting	75,000
Transport	75,000
General Administration	1,50,000

It is possible to make the land presently suitable for peas and carrots, variable for growing potatoes and tomatoes if certain land development work is undertaken. This work will involve a capital expenditure of ₹ 6,000 per hectare which a Bank is prepared to finance at the rate of interest of 15% p.a. If such improvement is undertaken, the harvesting cost of the entire crop of tomatoes will decrease on an average by ₹ 2.60 per box.

Required :

(i) Calculate, within the given constraints, the area to be cultivated in respect of each crop to achieve the largest total profit and the amount of such total profit before land development work is undertaken.

(ii) Assuming that the other constraints continue, advise the grower whether the land development scheme should be undertaken and if so the maximum total profit that would be achieved after the said development schemes is undertaken.

Solution:

(i) Calculation showing area to be cultivated in respect of each crop to achieve the largest total profit.

	Hectares
Land available for all four vegetables	340
Land available for peas and carrots	140
Total	480
Minimum requirement of each variety	5,000 boxes
Maximum requirement of each variety	1,13,750 boxes

	Potatoes	Peas	Carrots	Tomatoes
Boxes per hectare	350	100	70	180
Cost per hectare	₹	₹	₹	₹
Direct Materials	952	432	384	624
Direct Labour :				
Growing	1,792	1,216	744	1,056
Harvesting	2,520	656	616	1,872
Transport	3,640	1,040	560	3,456
Total V. Costs	8,904	3,344	2,304	7,008
Selling Price per hectare	10,766	3,174	2,576	8,019
Contribution per hectare	1,862	(170)	272	1,011

Peas : Minimum 5,000 Boxes = $\frac{5,000}{100}$ = 50 hectares

Carrots Balance land of 140 – 50 = 90 hectares.

Tomatoes Minimum 5,000 boxes = $\frac{5,000}{180}$ = 28 hectares

Potatoes Balance land of 340 – 28 = 312 hectares

Cultivation plan to achieve largest profit before land development:

	Potatoes	Peas	Carrots	Tomatoes
Hectares	312	50	90	28
	₹	₹	₹	₹
Contribution per hectare	1,862	(170)	272	1,011
Contribution	5,80,944	(8,500)	24,480	28,308
Total Contribution	6,25,232			
Fixed expenses	4,24,000			
Profit	2,01,232			

(ii) Carrots yield a low contribution and this crop is grown in excess of the requirement 5000 boxes. The land that could be released from this crop is 90 – 72 = 18 hectares (5000 boxes need 72 hectares only). This land could be utilised for growing potatoes which yield the largest contribution.

Analysis to show whether land development to be undertaken

After land development the contribution per hectare of tomatoes will be as under :

Present contribution per hectare	₹ 1,011
Saving in harvesting @ 2.60 per box	₹ 468
Revised Contribution	₹ 1,479

Allocation of 18 hectares of land

Crop	Max Sale	Present Production	Addl. Reqt.	Yield per hectare	Additional Hectares to
Potatoes	1,13,750	1,09,200	4,550	350	13

Balance Land = 18 – 13 = 5 hectare allocated to Tomatoes.

Revised Cultivation Plan

	Potatoes	Peas	Carrots	Tomatoes	Total
Hectares	325	50	72	33	480
	₹	₹	₹	₹	₹
Contribution/ hectare	1,862	(170)	272	1,479	
Total Contribution	6,05,150	(8,500)	19,584	48,807	6,65,041
Fixed Expenses					4,40,200
Profit					2,24,841

Capital Expenditure : 18 hectares × 6,000 = ₹ 1,08,000

Interest 1,08,000 × 15/100 = 16,200

Existing fixed expenses = 4,24,000

Total 4,40,200

Conclusion

Since the profit after land development is greater, the company should implement the proposal to develop 18 hectare of land.

Illustration 7.

The Sales Manager of Holders Ltd. is considering two new products, only one of which can be added to the firm's product line. Product X is a sure seller. It is certain that 20,000 units of product X (the firm's maximum capacity) can be manufactured and sold each month with a contribution margin (Expected Value) of ₹ 5 per unit. Product Y with a contribution margin of ₹ 10 per unit is potentially more profitable. However, there is uncertainty about its marketability and following sales forecast has been prepared.

Sales of Y (units)	Probability
5,000	0.25
10,000	0.50
15,000	0.25

Fixed cost for the months ₹ 60,000

Company invites your comments particularly on Risk neutral, Risk averse and Risk seekers decision makers with necessary calculation.

Solution:

Profit if product X is produced

20,000 × ₹ 5	= ₹ 1,00,000
Less: Fixed cost	60,000
Profit if X is produced	40,000

Expected value profit if product Y is produced

Sales (units)	Contribution margin ₹	Fixed cost ₹	Profit ₹	Probability	Expected value of profit ₹
5,000	50,000	60,000	(10,000)	0.25	(2,500)
10,000	1,00,000	60,000	40,000	0.50	20,000
15,000	1,50,000	60,000	90,000	0.25	22,500
Expected Value					40,000

The expected value is calculated by weighting each of the profit levels (i.e. possible outcomes) by its associated probability. In other words, the expected value is the weighted arithmetic mean of the possible outcomes. The expected value of a decision represents the long-run average outcome that is expected to occur if a particular course of action is under taken many times, for example, if the decision to make product 'Y' is repeated on, say hundred occasions in the future, then product 'Y' will be expected to give an average profit of ₹40,000/-. The expected values are the average of the possible outcomes based on management estimates. There is no guarantee that the actual outcome will equal the expected value.

Since the expected values represent a long-run average solution, decision should not be made on the basis of expected values, alone, as they do not enable the decision makers' attitude towards risk to be taken into account. In fact, the expected value calculation implies that management is indifferent to make a decision but this indifference will only apply if the management is neutral to risk. As most business managers are unlikely to be neutral towards risk, and business decisions are rarely repeated, it is unwise for decisions to be made solely on the basis of expected values.

Risk neutral decision makers are apt to consider the two products equally desirable because both have expected value profit of ₹40,000. **Risk-averse decision** makers may prefer product with its guaranteed profit of ₹ 40,000. They will seek to avoid 25% probability of a loss of ₹ 10,000. **Risk-seekers** may prefer product 'Y' they are likely to be attracted by the 25% probability of a profit of ₹ 90,000 despite the possibility of a loss of ₹ 10,000. Therefore in this situation, the ultimate decision will depend on each person's decision preference. Heuristic decision rules include: (i) **most likely outcome** (ii) **Least favourable outcome and** (iii) Most favourable outcome. The first criterion involves choosing the action in which the outcome with the highest probability of occurring is the most favourable. The second criterion involves choosing the action for which the worst possible outcome is the least unavoidable of those available to the decision maker. The third criterion is an optimistic rule and maximises the maximum that can be gained.

Illustration 8.

The Accountant of L. Ltd. is preparing documents for a forthcoming meeting of the budget committee. Currently, variable cost is 40% of selling price and total fixed costs are ₹ 40,000 per year.

The company uses an historical cost accounting system. There is concern that the level of costs may rise during the ensuring year and the Chairman of the budget committee has expressed interest in a probabilistic approach to an investigation of the effect that this will have no historic cost profits. The accountant is attempting to prepare the documents in a way which will be most helpful to the committee members. He has obtained the following estimates from his colleagues.

	Avg. inflation rate over Ensuing year	Probability
Pessimistic	10%	0.4
Most likely	5%	0.5
Optimistic	1%	0.1
		1.0

	Demand at Current Selling prices (₹)	Probability
Pessimistic	50,000	0.3
Most likely	75,000	0.6
Optimistic	1,00,000	0.1
		1.0

The demand figures are given in terms of sales value at the current level of selling prices but it is considered that the company could adjust its selling prices in line with the inflation rate without affecting customer demand in real terms.

Some of the company's fixed costs are contractually fixed and some are apportionments of past costs, of the total fixed costs, an estimated 85% will remain constant irrespective of the inflation rate.

You are required to analyze the foregoing information in way, which you consider will assist management with its budgeting problem. Although you should assume that the directors of L. Ltd. are solely interested in the effect of inflation on historic cost profits, you should comment on the validity on the Accountant's intended approach. As part of your analysis you are required to calculate:

(i) The probability of at least breaking even, and

(ii) The probability of achieving a profit of at least ₹ 20,000

Solution:

Demand Situation	Inflation		Contribution (1)	Fixed cost (2)	Profit/(Loss)	Joint
	Situation	Rate	₹	₹	(1) - (2)	Probability
Pessimistic	Pessimistic	10%	33,000	40,600	(7,600)	0.12
	Most likely	5%	31,500	40,300	(8,800)	0.15
	Optimistic	1%	30,300	40,060	(9,760)	0.03
Most likely	Pessimistic	10%	49,500	40,600	8,900	0.24
	Most likely	5%	47,250	40,300	6,950	0.30
	Optimistic	1%	45,450	40,060	5,390	0.06
Optimistic	Pessimistic	10%	66,000	40,600	25,400	0.04
	Most likely	5%	63,000	40,300	22,700	0.05
	Optimistic	1%	60,600	40,060	20,540	0.01

Notes:

(1) Demand at current selling prices × (1 + inflation rate) × contribution percentage. For example, with ₹ 50,000 demand at current prices. Sales revenue will increase to ₹ 55,000 if the inflation rate is 10%. The contribution margin percentage remains constant at 60% and therefore contribution will be ₹33,000.

(2) ₹ 40,000 fixed costs + (inflation rate × 0.15 fixed costs)

Summary of probability distribution

Probability of loss	=	0.30
Probability of at least breaking even	=	0.70
Probability of at least a profit of ₹ 20,000	=	0.10

Alternatively the entire Probability distribution could be presented

Probability of a loss of more than ₹ 9,000	=	0.03
Probability of a loss of more than ₹ 8,000	=	0.18
Probability of a loss of more than ₹ 7,000	=	0.30
Probability of a profit of at least ₹ 5,000	=	0.70
Probability of a profit of at least ₹ 6,000	=	0.64
Probability of a profit of at least ₹ 7,000	=	0.34
Probability of a profit of at least ₹ 8,000	=	0.34
Probability of a profit of at least ₹ 20,000	=	0.10
Probability of a profit of at least ₹ 22,000	=	0.09
Probability of a profit of at least ₹ 25,000	=	0.04

It should be noted that it is inappropriate to assume that all costs and selling prices will alter in line with each other. Also the existence of stocks will introduce a lag in the system.

Illustration 9.

A company having its Head Office in Centown has three factories situated at Uptown, Middletown and Downtown. The operations of Middletown have been unprofitable for a number of years. The leasehold of Middletown will also expire by the end of the current year.

In view of the continued losses the management has decided to close down the said factory rather than renew the lease. The factory's plant and machinery can be sold at a price higher than the written down value and the surplus funds will be sufficient to cover all termination costs.

The projected profitability of the factories for the next year is as under:

(Rupees in lakhs)

	Uptown	Middletown	Downtown	Total
Sales	400	100	300	800
Variable costs	220	75	195	490
Fixed costs:				
Factory	80	30	40	150
Selling & Admn.	30	5	15	50
Head Office expenses apportioned	25	15	25	65
Profit	45	-25	25	45

The Company however would like to continue to serve the customers now being served by the Middletown if it could do so economically. Accordingly the following proposals were put forward for consideration based on a selling price of ₹ 250 per unit.

(i) Close down Middletown factory and expand the operations of the Downtown factory for which capacity exists there. This proposal will involve the following changes:

  (a) Sales revenue of Downtown factory will increase by 25%

  (b) The factory fixed costs of Downtown factory will increase by 10%

  (c) Fixed selling and administration of the said factory will increased by 5%.

  (d) Variable distribution costs of the additional output will increase by ₹ 4 per unit.

(ii) Close down Middletown factory and expand the operations of the Uptown factory subject to the following changes in case of the latter.

  (a) Sales revenue will increase by ₹ 80 lakhs.

  (b) Factory fixed costs will increase by 20%

(c) Fixed selling & administration costs will increase by 10%

(d) Variable distribution costs in respect of the additional units will increase by ₹ 5 per unit.

(iii) Close down Middletown factory and enter into a long term contract with an independent manufacturer to serve the customers of Middletown factory. The manufacturer will pay a royalty of ₹ 5 per unit to the company. In that event the sales of the area served by the Middletown factory will reduce by 25%.

(iv) Close down Middletown factory and discontinue serving the present customers of that area.

You are required to evaluate each of these proposals and advise the management of the action to be taken in the interest of improving the profitability of the company.

Solution:

(i) Close down Middletown factory and expand Downtown Factory:

(₹ lakhs)

	Uptown	Downtown	Total
Sales	400	375.00	775.00
Variable costs:			
Factory	220	243.75	463.75
Selling (Additional)	—	1.20@	1.20
Total	220	244.95	464.95
Contribution	180	130.05	310.05
Fixed costs:			
Factory	80	44.00	124.00
Selling & Admn.	30	15.75	45.75
Total	110	59.75	169.75
Factory contribution	70	70.30	140.30
H. O. Expenses			65.00
Profit			75.30

@ Sales 3,00,00,000 × $\frac{25}{100}$ = 75,00,000.

No. of units $\frac{75,00,000}{250}$ = 30,000 Selling variable costs 30000 × 4 = 1,20,000.

(ii) Close down Middletown factory and expand Uptown Factory:

(₹ lakhs)

	Uptown	Downtown	Total
Sales	480.00	300.00	780.00
Variable costs:			
Factory	264.00	195.00	459.00
Selling	1.60 @	—	1.60
Total	265.60	195.00	460.60
Contribution	214.40	105.00	319.40
Fixed costs:			
Factory	96.00	40.00	136.00
Selling & Admn.	33.00	15.00	48.00
Total	129.00	55.00	184.00
Factory contribution	85.40	50.00	135.40
H. O. Expenses			65.00
Profit			70.40

@ Sales = ₹ 80,00,000

$$\text{Selling variable cost} = \frac{80,00,000}{250} \times 5 = 32,000 \text{ units} \times 5 = ₹\ 1,60,000$$

(iii) Closedown Middletown factory and subcontract production:

Sales of Middletown factory ₹ 100 lakhs

$$\text{Effective sales } 100 \times \frac{75}{100} = ₹\ 75 \text{ lakhs.}$$

$$\text{Units } \frac{75,00,000}{250} = 30,000 \times 5 = ₹\ 1,50,000$$

(₹ lakhs)

	Uptown	Downtown	Royalty	Total
Sales	400.00	300.00		700.00
Variable costs	220.00	195.00		415.00
Contribution	180.00	105.00		285.00
Fixed costs:				
Factory	80.00	40.00		120.00
Selling & Adm.	30.00	15.00		45.00
Total	110.00	55.00		165.00
Factory Contribution	70.00	50.00	1.50	121.50
HO expenses				65.00
Profit				56.50

(iv) Closedown Middletown factory:

(₹ lakhs)

	Uptown	Downtown	Total
Factory contribution as in (iii) above	70.00	50.00	120.00
Head Office expenses			65.00
			55.00

It will be seen that the alternative to close down Middletown factory and ignore servicing of its customers itself results in profit of ₹ 55 lakhs as against ₹ 45 lakhs if it was continued to operate. However, the 'first' alternative to expand the operations of the Downtown factory along with closure of Middletown factory gives the best profit and the same has to be preferred.

In all the aforesaid computations it is assumed that H. O. expenses will not reduce even marginally if the Middletown factory is closed.

Illustration 10.

Lacquer painters undertake painting job of cars, scooters, buses etc. The paint materials of desired shades are purchased from market and then painted by spray gun in paint shop by skilled painters. The budget for next year is given below:

	₹
Paint Materials 100 kiloliters	15,00,000
Direct Labour 25,000 hours	5,00,000
Variable overheads for 25,000 hours	10,00,000
Total variable costs	30,00,000
Fixed overheads	20,00,000
Total expected costs	50,00,000
Profit 25%	12,50,000
Expected job work revenue	62,50,000

The firm always faces problems in getting paint materials from markets as the customer needs only a particular shade. The skilled labour is also sometimes not available due to rush of jobs.

A customer wants to get his moped painted urgently. It is estimated that one litre paint is sufficient for painting the moped. Four labour hours will be required to complete the job.

Required:

(i) What should be the painting charges if fixed costs are absorbed on the basis of variable costs and profit at 25% on total cost?

(ii) What should be the charges in case the paint material is a limiting factor?

(iii) What should be the charges in case the skilled labour is a limiting factor?

(iv) Which price out of above three would you recommend to the customer and why?

(v) Would your answer to (iv) above differ if the customer has no urgency?

Solution:

(i) If absorption cost approach is used the charges will be as under:

	₹
Paint material 1 litre at ₹ 15 per ltr.	15.00
Direct Labour 4 hours at ₹ 20 per hour	80.00
Variable overheads 4 hours at ₹ 40 per hour	160.00
Total variable costs	255.00
Fixed overheads 2/3 rd of variable cost	170.00
Total cost	425.00
Profit at 25%	106.25
Total painting charges	531.25

(ii) If paint material is a limiting factor, the charges will as under:

Total contribution as per Budget:

Fixed costs	₹	20,00,000
Profit	₹	12,50,000
Required contribution	₹	32,50,000
Contribution per ltr.	₹	32.50

The painting charges will be—

Variable cost as above	₹	255.00
Contribution required	₹	32.50
Total painting charges	₹	287.50

(iii) If skilled labour is limiting factor, contribution per labour hour will have to be calculated. The charges for painting will be variable cost plus contribution for 4 labour hours.

Contribution required as in (ii) above	₹	32,50,000
Contribution per hour on the basis of 25,000 hrs.	₹	130
Contribution for 4 hours	₹	520

Painting charges will be ₹ 255 variable cost plus ₹ 520 as required contribution totalling to ₹ 775.00

(iv) The recommended price will be ₹ 775 if the customer is having urgency. This is higher price based on a limiting factor as well as absorption cost approach. In short run, labour force can't be increased and if new recruits are taken, training will involve sometime.

(v) If the customer has no urgency, ₹ 287.50 can be charged as the material will be available in the market. However, the labour situation may continue as it is and hence the charges should be based on the contribution of labour hours. This is considering an opportunity cost approach.

Illustration 11.

Singular Products Co. Ltd. manufactured and sold in a year 15,000 units of a particular product fetching a sales value of ₹ 15 lakhs. After charging direct material 30% on sales value, direct labour 20% on sales value, variable overheads ₹ 10 per unit, the company earned profit of ₹ 16 2/3 per unit during the year.

The existing equipment can produce a maximum of 20,000 units per annum. In case, the demand exceeds the maximum output, new equipment will be required which will cost ₹ 10 lakhs and it will have a life span of 10 years, with no residual value.

A prospective customer is willing to place an order on the company for 10,000 units per year regularly at 90% of the present selling price, which will be, if accepted, over and above the existing market for 15,000 units.

Irrespective of the fact whether or not the new order materialises, the cost increase with immediate effect are:

(i) 10% in the Direct Materials.

(ii) 25% in the Direct Labour.

(iii) ₹ 50,000 in Fixed Overheads per year.

If the order of additional 10,000 units is accepted, the fixed overhead will increase by another ₹ 50,000 by way of increased administration expenses.

You are required to recommend whether the company should accept the new business at the stipulated price or decline the new offer and make a concerted sales drive to sell the present unused capacity at the present selling price? The sales drive will cost ₹ 60,000 per year.

Ignore the financial charges on the cost of the equipment and assume there is no opening and closing inventories. Variable costs will increase indirect proportion to the output.

Solution:

Present Selling price = ₹ 15,00,000/15,000 = ₹ 100 per unit

Present Cost Structure:

	₹
Direct materials (30% of sales value)	4,50,000
Direct labour (20% of sales value)	3,00,000
Variable overheads (₹ 10 per unit)	1,50,000
	9,00,000
Contribution	6,00,000
Profit (₹ $16^{2}/_{3}$ per unit)	2,50,000
Fixed Overheads	3,50,000

Comparative statement of the proposals (Revised cost basis)

	Present capacity	**Maximum Capacity**	**Present plus 10,000 units**
Units	15,000	20,000	25,000
Sales value	15,00,000	20,00,000	15,00,000
			(+) 9,00,000
			24,00,000
Direct materials (33% on sales value) ($^{10}/_{15}$ x 4,95,000)	4,95,000	6,60,000	4,95,000 (+) 3,30,000
Direct labour (25% on sales value) ($^{10}/_{15}$ x 3,75,000)	3,75,000	5,00,000	3,75,000 (+) 2,50,000
Variable overhead (₹ 10 per unit)	1,50,000	2,00,000	2,50,000
Fixed overhead	3,50,000	3,50,000	3,50,000
	(+)50,000	(+)50,000	(+) 50,000
			(+) 50,000
Sales drive	—	60,000	—
Depreciation on new Equip.	—	—	1,00,000
Total costs	14,20,000	18,20,000	22,50,000
Profit	80,000	1,80,000	1,50,000

It will be advisable for the company not to accept the offer instead to sell the 20,000 units @ ₹ 100 per unit, since the former yields a lower profit.

Illustration 12.

Watchwell T.V. Company, manufacturing various components in their machine shop which are assembled along-with purchased components in an assembly shop. It is proposed by the production manager that an aluminium bracket which is manufactured in Machine shop should be procured from outside party as the cost of production is very high rate of rejections and also due to the recent wages agreement.

The purchase department called quotations for this item. Two parties submitted their quotations as under.

Mr. Black : Basic Price ₹ 5 per 1000 nos.
Excise duty at 12% advalorem.
Sales Tax 15%
Transport at ₹ 1.10 per 1000 nos.
Octroi at 2% on total bill.

Mr. White: Basic Price 0.75 per 1000 nos., (labour charges only.)
Material to be supplied by Watchwell.
Scrap generated in process will not be returned.
Transport at ₹ 0.40 per 1000 nos.
Octroi at 2% on total price excluding materials cost.
Rejection allowance at 2% of gross materials cost.

The company gives you that following cost details of the bracket presently being manufactured.

Materials cost per 1000 nos.	₹ 6.00
Less: scrap allowance	₹ 2.00
Net materials cost for 1000 nos.	₹ 4.00

Conversion cost: The part is manufacturing on a small press-having machine hour rate of ₹ 30 per hour of which 10% is fixed cost. The standard time for production 100 brackets is 0.6 minutes. Rejection is about 3% on works cost, Administration and selling overheads are 10% of works cost. The production Manager has assured that the released press as well as the labour will be employed on alternative job. It is understood from purchase department that the excise duty paid on purchase component will be set-off against excise duty payable on T.V. Sets.

You are required to evaluate both the quotations and compare them with current costs assuming that purchasing and storing as well as handling efforts are same in each case. Also give your recommendation as to the source of supply of the components. If the released capacity of press is not utilised will your recommendation change?

Give your comments and assumptions in the evaluation wherever necessary.

Solution:

PRESENT COSTS OF MANUFACTURE	**₹ for 1000 nos.**
Cost of materials	6.00
Less: Scrap allowance	2.00
Net material Cost	4.00
Conversion cost 0.6 x 30 x 10/60	3.00
Works cost	7.00
Rejection 3%	0.21
Total present cost	7.21

QUOTATION FROM MR. BLACK :	
Basic price	5.00
Excess duty 12%	0.60
TOTAL	5.60
Sales tax @ 15%	0.84
	6.44
Transport cost	1.10
	7.54
Octroi @ 2%	0.15
	7.69
Less: Excise duty credit	0.60
Total price	7.09
QUOTATION FROM MR. WHITE :	
Materials cost (scrap not returned)	6.00
Labour charges	0.75
Transportation	0.40
TOTAL	7.15
Octroi @ 2% on (Labour + transport)	0.02
	7.17
Rejection 2% of ₹ 6/-	0.12
Total price	7.29

The administration and selling overheads being common to all the alternative and therefore do not come into the decision making criteria.

Quotation from Mr. Black is the lowest and also lower than present cost of manufacture and therefore recommended. If the released press is not utilised, than fixed cost i.e. 10% of conversion cost (10% of ₹ 3) i.e. 0.30 is a loss and purchase from Mr. Black, cannot be recommended since gain is only ₹ 0.12 (₹ 7.21 less ₹ 7.09).

Illustration 13.

A company manufacturing electronic equipments is currently buying component A from a local supplier at a cost of ₹ 30 each. The company has under its consideration a proposal to install a machine for the manufacture of the component. Two alternative proposals are available as under:

(a) installation of semi-automatic machine involving an annual fixed expenses of ₹ 18 lakhs and a variable cost of ₹ 12 per component manufactured.

(b) installation of automatic machine involving an annual fixed cost of ₹ 30 lakhs and a variable cost of ₹ 10 per component manufactured.

Required :

(i) Find the annual requirement of components to justify a switch over from purchase of components to (a) manufacture of the same by installing semi-automatic machine and (b) manufacture of the same by installing automatic machine.

(ii) If the annual requirement of the components is 5,00,000 units, which machine would you advice the company to install?

(iii) At what annual volume would you advise the company to select automatic machine instead of semi-automatic machine.

Solution:

		Semi Automatic Machine ₹	Automatic Machine ₹
(i)	Purchase price of the component	30	30
	Variable Cost	12	10
	Saving	18	20
	Fixed costs	18,00,000	30,00,000
	Components required to be produced to justify the installation of the machine	18,00,000 ÷ 18 = 1,00,000	30,00,000 ÷ 20 =1,50,000
(ii)	If annual requirement is 5,00,000 units :		
	Variable costs	60,00,000	50,00,000
	Fixed costs	18,00,000	30,00,000
	Total costs	78,00,000	80,00,000
	Install semi-automatic machine		

(iii) Fixed costs for Automatic machine 30,00,000 (-) Fixed costs for Semi-automatic machine 18,00,000 = Difference 12,00,000

Volume required to justify Automatic machine = 12,00,000/2= 6,00,000 components

Illustration 14.

A Large manufacturing Company engages itself in producing of basic chemicals. The capacity of its plant is 75,000 tonnes per annum but it operates at 80% level in view of paucity of demand. In past the Company ventured to raise production and export the same; but found it not profitable.

The Company is required to import certain chemicals and maintenance spares, the annual requirements in foreign exchange being ₹ 6 crores on a production of 60,000 tonnes. This cost is totally variable. So long Company did not face any problem in procurement of these materials as foreign exchange was always available following normal licensing procedures.

However, on account of recent Government policy it is not possible at all to get foreign exchange for imports. The company has either to export and get entitled to 30% foreign exchange earned to finance its imports or to buy Exim scrips in open market. The Company accepts the premia payable at 50% of the value of the Exim scrips.

Since there is ample scope to produce additional 15,000 tonnes and export the same the management is considering the possibility thereof to finance its imports.

Based on the detailed analysis and behaviour of different cost elements, following cost profile is available:

Cost element	Behaviour of cost elements	₹/Tonne
Raw materials and Chemicals	Fully variable	12,500
Packing/Forwarding	Fully variable	500
Steam, power and other utilities	60% variable	1,500
Wages and Salaries	50% variable	400
Stores, Spares and Maintenance	$^{2}/_{3}^{rd}$ Fixed	600
Overheads	20% variable	500
Depreciation	Fixed	900
Total		16,900
Gross Margin before Interest/Taxes		3,100
Selling Price		20,000

In view of the recent adjustment in Dollar/Rupee Parity, the export price that can be realised FOB Bombay is placed at ₹ 14,000/tonne. Other costs on interest, special export packing and other incidental costs is estimated at ₹ 1,000 per tonne, showing the net realisation on export at ₹ 13,000/tonne.

You are required to advice the management whether (a) to export additional 15,000 tonnes and to entitled to 30% foreign exchange so as to finance its import requirements or (b) to buy Exim scrips at a premium of 50% and continue to operate at 80% capacity as hitherto.

Indicate comparative economics and cost/benefit analysis of both the alternatives. Ignore foreign exchange rate fluctuations.

Also suggest the adjustment to be effected in local prices to retain the same gross margin.

Solution:

Cost Data for 2 capacities

Cost elements	60,000MT (as Given) ₹/tonne	75000MT as adjusted ₹/tonne	Basis for 75000 MT
Raw materials and chemicals	12,500	12,500	Fully variable
Packing forwarding	500	500	- do –
Steam, power, utilities	1,500	1,380	900 V + 0.8 X 600
Wages & salaries	400	360	200 V + 0.8 X 200
Stores, spares and maintenance	600	520	200 V + 0.8 X 400
Overheads	500	420	100 V + 0.8 X 400
Depreciation	900	720	0.8 x 900
Total	16,900	16,400	

Total cost for 75000 tonnes @ ₹ 16400 = 12,300 lakhs

Total cost for 60000 tones @ ₹ 16900 = 10,140 lakhs

Total cost for 15000 tonnes = 2,160 lakhs

∴ Cost for export (₹ 2,160 lakhs ÷ 15,000)	₹ 14,400/tonne
Add specific cost as given	₹ 1,000/tonne
Total Costs	₹ 15,400/tonne
FOB realisation on export	₹ 14,000/tonne
∴ Loss on export	₹ 1,400/tonne
Total Loss on 15000 tonnes to be exported	₹ 210 lakhs
Foreign exchange required for 60,000 tonnes	₹ 600 lakhs
Foreign exchange required for 75,000 tonnes	₹ 750 lakhs
Foreign exchange required for 15,000 tonnes	₹ 150 lakhs
Exim scrips that can be earned is 30% of ₹ 14,000 equalling to ₹ 4,200/tonne exported.	
Exim scrips that can be earned on 15,000 tonnes @ ₹ 4,200	₹ 630 lakhs
Exim scrips that would be used in production for export of 15,000 tonnes @ ₹ 1,000/ tonne	₹ 150 lakhs
Balance exim scrips available for financing imports for production for local market.	₹ 480 lakhs

If the company was not to export, the aforesaid exim scrips of ₹ 480 lakhs would have been bought at 50% premium. This would have costed ₹ 240 lakhs additionally. The loss on export being ₹ 210 lakhs, there is an apparent saving of ₹ 30 lakhs. The proposed quantity may therefore be exported.

	Price to be Adjusted	₹/lakhs
(a)	Loss on exports	210
(b)	(i) Foreign exchange required for production to be sold in India	600
	(ii) Less: available now through exports	480
	(iii) Balance to be procured	120
	(iv) 50% premia would cost	60
	Total Loss (a) + (b)	270
	Sale in the country	60,000 tonnes
	Price revision to be effected	₹ 450/tonne

Illustration 15.

W. Company Ltd. has just been set up in order to manufacture and sell three products – A, B and C. Details of planned production and sales quantities for each of these for the next two years are shown below :

Planned activity – units ('000s)

	Year 1			Year 2		
	A	B	C	A	B	C
Production	30	20	10	30	20	10
Sales	24	16	4	24	10	12

The proposed pattern of production is considered to be the normal long-term pattern but the sales expected in the first two years are not representative of the anticipated long-term position.

It is expected that the sale price and the variable costs per unit will be stable for at least two year, details of these are:

	Sale price (per unit) ₹	Variable costs (per unit) ₹
A	8	2
B	12	4
C	12	3

The manufacturing process requires that all production be subjected to both manual operations and mechanical processing. Details of labour and machine production hours required for each product are:

	Labour hours (per unit)	Machine hours (per unit)
A	2	1
B	3	1
C	2	2

Total fixed production overhead costs will be ₹2,80,000 in each year. The Managing Director wishes to ascertain both the total profit (before administration costs, etc) expected for each of the first two years and the profitability of each product. Accordingly he has asked each of the three applicants for the job of management accountant to produce the information he requires but is surprised that the figures they produced display little similarity. It appears that one candidate has utilized direct costing whereas the other two have utilized absorption costing but with each using a different basis for overhead recovery. Before making a decision as to whom to employ the Managing Director wishes to ascertain which one of the set of figures provided is 'correct' and which two sets are, therefore 'wrong' and so seeks your advice.

Required:

(a) Prepare the three statements the managing Director is likely to have received and which show :

  (i) the total profit (before considering administration costs, etc.) for each of the first two years; and

  (ii) the profitability of each product.

(b) Comment on the reasons for any similarities and / or difference in the three sets of figures provided in (a) above. In your comments suggest any improvement which could be made to the application of the absorption costing methods. Advise the Managing Director which candidate's set of figures provides the 'correct' answer and which are 'wrong'.

(c) It is decided to increase the production of the first year only by 20% in order to provide additional buffer stocks. Calculate the cost to W. Company Ltd. of holding such additional stocks for a full year if the appropriate cost of financing the additional stocks is 12% p.a. (Ignore any obsolescence and costs of storage)

Solution:

(a) With absorption costing two different methods of overhead recovery are used. It is assumed that overheads are recovered on the basis of direct labour hours or machine hours. The calculation of total planned machine hours and direct labour hours is as follows :

	Labour hours (000s)	Machine hours (000s)
Product A	60 (30 x 2)	30 (30 x 1)
Product B	60 (20 x 3)	20 (20 x 1)
Product C	20 (10 x 2)	20 (10 x 2)
	140	70

Fixed overhead recovery rates :

₹ 2 per direct labour hour (₹2,80,000 ÷ 1,40,000 direct labour hours)

₹ 4 per machine hour (₹2,80,000 ÷ 70,000 machine hours)

The absorption product cost calculations are :

Labour hours method	A	B	C
Variable cost	2	4	3
Fixed cost	4 (2 x ₹2)	6 (3 x ₹2)	4 (2 x ₹2)
	6	10	7
Machine hours method			
Variable costs	2	4	3
Fixed cost	4 (1 x ₹4)	4 (1 x ₹4)	8 (2 x ₹4)
	6	8	11

The profit statements are as follows :

	Year 1				Year 2			
	A	B	C	Total	A	B	C	Total
Absorption costing-labour hours recovery								
Sales	192	192	48	432	192	120	144	456
Cost of sales (1)	144	160	28	332	144	100	84	328
Profit	48	32	20	100	48	20	60	128
Absorption costing-machine hours recovery								
Sales	192	192	48	432	192	120	144	456
Cost of sales (1)	144	128	44	316	144	80	132	356
Profit	48	64	4	116	48	40	12	100
Direct costing								
Sales	192	192	48	432	192	120	144	456
Variable cost of sales (1)	48	64	12	124	48	40	36	124
Contribution	144	128	36	308	144	80	108	332
Fixed costs				280				280
Profit				₹28				₹52

Notes:

(1) Units sold x appropriate absorption cost per unit or (units sold x variable cost per unit).

(b) Different profits occur with each method because different amounts of fixed overhead are expensed for the period. The fixed overhead incurred for the period is charged as an expense when the variable (direct) costing method is used, when the absorption costing method is used fixed overhead is included in the stock valuation. With absorption costing, the fixed overhead incurred during the period will be charged as an expense when production equals sales. If production does not equal sales then fixed overhead charged to production will not be equal to the fixed overhead incurred. Therefore absorption costing profits will be different from variable costing profits when this situation occurs.

The two methods of absorption costing allocate different amounts of fixed overheads to products and the proportion of production sold within a period varies between products. Hence the two methods expense a different amount of fixed overhead in each period. Product A produces the same reported profit under both absorption costing methods because both methods of recovering overhead allocate the same fixed overhead per unit to A.

The application of absorption costing techniques can be improved by analyzing the activities into machine - related and labour - related activities and establishing separate cost centers or departments. A machine hour and direct labour hour overhead rate should then be applied to products passing through each department.

There is no single solution to the problem of allocating fixed overhead.

(c) The additional cost of increasing production is the variable cost of the increased production. The cost of the increased production is as follows :

		₹
A	12,000	(6,000 units at ₹2)
B	16,000	(4,000 units at ₹4)
C	6,000	(2,000 units at ₹3)
		34,000

The cost of financing the increased production is ₹4,080 (12 % x ₹34,000). It is assumed that the buffer stocks will be maintained throughout the year.

Illustration 16.

A manufacturing process on a continuous operation an output of 4 kg per hour valued at ₹ 1000 per kg. Process wages cost ₹ 5 per hour and raw materials ₹ 2 per kg. of product. Regular maintenance amounts to ₹ 100 per week.

Breakdowns averaging 25 hours per week occur due to mechanical faults which cost ₹ 1,000 to repair. These could be reduced or eliminated if additional maintenance on the following scale were undertaken:

Breakdown hours per week	0 (₹)	5 (₹)	10 (₹)	15 (₹)	20 (₹)
Maintenance cost	3,200	1,600	800	400	200
Repair Costs	0	300	400	600	800

Process labour during stoppages can be used elsewhere up to 10 hours per week.

Tabulate the information provided to show:

(a) the optimum amount of maintenance to undertake each week ;

(b) the additional revenue obtainable at that level compared with the present situation.

Solution:

We are not concerned in this question with the total hours worked for the total revenue achieved, but only with the maintenance and repair costs (which are to be minimised) ; and with the additional revenue accruing from the saved hours.

We have : Present situation

Breakdown hours per week	25 ₹	20 ₹	15 ₹	10 ₹	5 ₹	0 ₹
Maintenance costs	100	200	400	800	1,600	3,200
Repair cost	1,000	800	600	400	300	0
	1,100	1,000	1,000	1,200	1,900	3,200
To these cost may be added The unproductive wages (breakdown hours less 10)	75	50	25	—	—	—
	1,175	1,050	1,025	1,200	1,900	3,200

(a) The tabulation shows that total costs are minimised when the maintenance undertaken each week is ₹ 400/- This then is the optimum amount to be undertaken.

(b) The additional revenue obtainable at that level compared with the present situation is :

	₹
(1) in respect of additional production 25 – 15 = 10 hours additional production Value ₹ 4000 – (Wages ₹ 50 + Materials ₹ 80/-)	3,870
(1) in respect of maintenance and repair costs ₹ 1,175 – ₹ 1,025	150
	4,020

Illustration 17.

S. V. Ltd. manufactures a product which uses three components viz. A, B and C, one each being required for each unit of the product. The factory is working to its full machine capacity of 56,000 hours per annum. The machines are capable of making all the components.

The product is made in batches of 50 units and the data relating to the current production per batch are as under:

Components	Machine Hours	Variable Costs ₹	Fixed Costs ₹	Total Costs ₹
A	15	375	150	525
B	25	450	175	625
C	30	450	450	900
Assembly		800	325	1,125
Total		2,075	1,100	3,175
Profit				575
Selling Price				3,750

During the next year the machine capacity cannot be increased even though the assembly capacity can be increased as per requirement without increasing its fixed costs. The budget for the next year

envisages an increased production and so the purchase of one of the components or the other has to be considered. The company has received the following quotations for the purchase of the components during the next year.

Per batch of 50 components			
Component	A	B	C
Purchase price (₹)	550	700	850

The company has estimated that its sales could go up by 50% more than the present sales and probably even 75% more if the production capacity was available.

Required:

(i) Determine the production and profits earned by the company during the current year.

(ii) Indicate which of the components should be purchased and in what quantities at the two enhanced levels of output viz (a) increase by 50% of existing production and (b) increase by 75% of existing production during the next year.

(iii) Prepare statements showing the company's profitability at the two volumes of output referred to in (ii) above. Assume no change in machine time, costs and prices.

Solution:

Per batch of 50 Units

	A	B	C	Total
Hours/batch	15	25	30	70
Total Hours available				56,000

Batches produced $\frac{56,000}{70} = 800$

No. of units produced 800 x 50 = 40,000

S. V. Ltd.

Profit Statement

		₹
Sales 800 batches @ ₹ 3,750 per batch		30,00,000
Variable Costs		
A 800 x 375		3,00,000
B 800 x 450		3,60,000
C 800 x 450		3,60,000
Assembly 800 x 800		6,40,000
Total		16,60,000
Contribution		13,40,000
Fixed Costs	A 800 x 150	1,20,000
	B 800 x 175	1,40,000
	C 800 x 450	3,60,000
Assembly	800 x 325	2,60,000
Total		8,80,000
Profit		4,60,000

Production increases

$$50\% = 800 \times \frac{150}{100} = 1{,}200 \text{ batches}$$

$$75\% = 800 \times \frac{175}{100} = 1{,}400 \text{ batches}$$

Component contribution per key factor (per batch)

		A	B	C
Price quoted	₹	550	700	850
Variable Costs	₹	375	450	450
Contribution	₹	175	250	400
Machine Hours		15	25	30
Contribution/ M/c. Hr.	₹	11.67	10.00	13.33
Rank for manufacture		2	3	1

(i) **At 50% increase in volume**

Component	Requirement	Hrs/batch	Production Planned	Hours	Balance Hours
C	1,200	30	1,200	36,000	20,000
A	1,200	15	1,200	18,000	2,000
B	1,200	25	80	2,000	—

Purchase of B 1,200 – 80 = 1,120 batches

S. V. Ltd.

Profit Statement

	₹
Sales 1200 batches x 3750	45,00,000
Variable Costs	
C 1200 x 450	5,40,000
A 1200 x 375	4,50,000
B 80 x 450	36,000
B 1120 x 700 (Purchase)	7,84,000
Assembly 1200 x 800	9,60,000
Total	27,70,000
Contribution	17,30,000
Fixed Costs	8,80,000
Profit	8,50,000

(ii) **At 75% increase in volume**

Component	Requirement	Hrs/batch	Production Planned	Hours	Balance Hours
C	1,400	30	1,400	42,000	14,000
A	1,400	15	933	13,995	5

Purchase: A 1400 – 933 = 467 batches

B 1400 batches

S. V. Ltd.

Profit Statement

	₹
Sales 1400 batches × 3750	52,50,000
Variable Costs	
C 1400 × 450	6,30,000
A 933 × 375	3,49,875
A 467 × 550 (Purchase)	2,56,850
B 1400 × 700 (Purchase)	9,80,000
Assembly 1400 × 800	11,20,000
Total	33,36,725
Contribution	19,13,275
Fixed Costs	8,80,000
Profit	10,33,275

Illustration 18.

Shiplon Products Ltd. manufacturing 3 different products. The relevant data of these products are as under:

Name of the product :	Cream	Pomed	Jelly
Production capacity (units)	5,000	7,000	8,100
Machine hours per unit	1	3	4
Variable cost per unit (₹)	3.00	2.50	3.50
Selling prices (₹ /unit)	4.00	5.50	6.00

The total fixed overheads at current capacity level are ₹ 40,000 per annum.

The company have various alternatives for improving profitability as given below.

(a) To stop the production of Jelly and use the released capacity for producing Pomed. The machines for both the products are common. However cream is produced on a special purpose machine.

(b) To export the total production of Jelly at current price. On export the following additional revenue is expected.

(i) 8% Duty Drawback on export price,

(ii) 12% Cash Compensatory Support against an export scheme of government.

(iii) 5% Replacement Licence which can be sold in market at a premium of 80%.

(c) To replace the conventional machine used for Jelly by a special purpose machine which will reduce the production time from 4 hour to 3 hour per unit. Due to these changes the variable cost of Jelly will be reduced by ₹ 0.50 per unit. The released machine will be used for producing pomed. This proposal will entail an additional burden of fixed cost to the tune of ₹ 32,000 per annum.

Please advise the management about the right choice of an alternative so as maximise profits.

Solution:

Present situation :

	Cream	Pomed	Jelly	Total
No of Units	5,000	7,000	8,100	
Price per unit (₹)	4.00	5.50	6.00	
Sales Value (₹)	20,000	38,500	48,600	1,07,100
Less: Variable cost (₹)	15,000	17,500	28,350	60,850
Contribution (₹)	5,000	21,000	20,250	46,250
Less: Fixed Cost (₹)				40,000
Current profit (₹)				6,250

Proposal (a)

	Cream	Pomed	Total
No of units	5,000	17,800*	
Contribution per unit (₹)	1.00	3.00	
Total Contribution (₹)	5,000	53,400	58,400
Less: Fixed cost (₹)			40,000
Profit (₹)			18,400

* (8.100 × 4) ÷ 3 = 10,800 [10,800 + 7,000 = 17,800]

Proposal (b)

Calculation of revised price and contribution of Jelly :

	Jelly ₹
Export price	6.00
Duty drawback at 8% of 6	0.48
Cash Assistance at 12% of 6	0.72
Replenishment benefit 80% of 5% of 6	0.24
Revised revenue	7.44
Less: variable cost	3.50
Contribution	3.94

Calculation of revised profit:

	Cream	Pomed	Jelly	Total
No. of Units	5,000	7,000	8,100	
Contribution - per unit (₹)	1.00	3.00	3.94	
Contribution (₹)	5,000	21,000	31,914	57,914
Less: Fixed Cost (₹)				40,000
Current profit ₹				17,914

Proposal (c)

	Cream	Pomed	Jelly	Total
No. of Units	5,000	17,800	10,800	
Contribution - per unit (₹)	1.00	3.00	3.00	
Contribution (₹)	5,000	53,400	32,400	90,800
Less: Fixed Cost (₹)				72,000
Current profit (₹)				18,800

The contribution calculation of Proposal (c) has been calculating on the assumption that (a) new machine will increase the production capacity of Jelly to the extent of 8,100 hours (1 hour per unit) and within this time further 8,100/3 = 2,700 units of Jelly could be produced (b) the old machine can be used wholly to produced Pomed to achieve total production of 17,800 units.

Illustration 19.

Novelties Ltd. seeks your advice on production mix in respect of these three products Super, Bright and Fine. You have the following information.

Data for Standard Cost per unit:

	Super ₹	Bright ₹	Fine ₹
Direct Materials	320	240	160
Variable overhead	16	40	24

Direct Labour:

Department	Rate per Hour ₹	Hours	Hours	Hours
A	8.00	6	10	5
B	16.00	6	15	11

From current budget, you have further details as below:

	Super	Bright	Fine
Annual production (Nos.)	5,000	6,000	10,000
Selling Price per unit (₹)	624	800	480
Fixed Overhead : ₹ 16,00,000 Sales department's estimated of maximum possible sales in the coming year (Nos.)	6,000	8,000	4,800

You are also to note that there is a constraint on supply of labour in Department A and its manpower cannot be increased beyond its present level.

Suggest the best production and sales mix from the standpoint of maximum profitability. Prepare statements setting out the profits resulting from the budgeted production and the best alternative suggest by you.

Solution:

Statement of Profit of the budgeted production

	Super	Bright	Fine	Total
Units	5,000	6,000	10,000	21,000
	₹	₹	₹	₹
Sales	31,20,000	48,00,000	48,00,000	1,27,20,000
Direct material	16,00,000	14,40,000	16,00,000	46,40,000
Direct wages :				
Dept A	2,40,000	4,80,000	8,00,000	15,20,000
Dept B	4,80,000	14,40,000	17,60,000	36,80,000
Variable overhead	80,000	2,40,000	2,40,000	5,60,000
Marginal cost	24,00,000	36,00,000	44,00,000	1,04,00,000
Contribution	7,20,000	12,00,000	4,00,000	23,20,000
Less : Fixed overhead				16,00,000
Profit				7,20,000

Statement of Profit from Optimal Poduct Mix:

	Super	Bright	Fine	Total
Units	6,000	8,000	4,800	18,800
	₹	₹	₹	₹
Sales	37,44,000	64,00,000	23,04,000	124,48,000
Direct material	19,20,000	19,20,000	7,68,000	46,08,000
Direct wages:-				
Dept A	2,88,000	6,40,000	1,92,000	11,20,000
Dept B	5,76,000	19,20,000	8,44,800	33,40,800
Variable overhead	96,000	3,20,000	1,15,200	5,31,200
Marginal cost	28,80,000	48,00,000	19,20,000	96,00,000
Contribution	8,64,000	16,00,000	3,84,000	28,48,000
Less: Fixed overhead				16,00,000
Profit				12,48,000

Determination of most profitable product and sales mix:

(i) Limiting factor is labour hours in Dept. A which cannot exceed the present level.

Total hours in Dept A at present:

Super	5,000 × 6	= 30,000 Hrs.
Bright	6,000 × 10	= 60,000 Hrs.
Fine	10,000 × 5	= 50,000 Hrs.
		1,40,000 Hrs.

(ii) Contribution per unit of limiting factor i.e. labour hours:

	Super ₹	Bright ₹	Fine ₹
Unit selling Price	624	800	480
Marginal cost per unit	480	600	400
Contribution per unit	144	200	80
Labour hours in Dept A	6	10	5
Contribution per labour hours (₹)	24	20	16

Contribution per unit of key limiting factor is highest in super, followed by Bright and then Fine and deployment of Labour hours of Dept A should follow this priority, as shown below, for projected sales expectations.

Super	6,000 × 6	36,000 Hrs.
Bright	8,000 × 10	80,000 Hrs.
Fine (Balance)	4,800 × 5	24,000 Hrs.
		1,40,000 Hrs.

While full estimated demand of Super and Bright could be produced, only 4,800 unit of Fine can be produced with the available labour hours.

Illustration 20.

S. U. Ltd, produces three products namely A, B and C. The budgeted production, costs and selling prices for the next year are as under.

	A	B	C
Direct Materials (₹/unit)	24	16	12
Direct Wages			
Dept. Rate/Hour (₹)			
1 ₹ 4 (Hrs/unit)	3	5	2.5
2 ₹ 2 (Hrs/unit)	3	8	6
Budgeted Production units	10,000	12,000	20,000
Maximum possible sales units	12,000	16,000	24,000
Selling Price (₹/unit) Variable overheads	75	105	60

Dept. 1 Recovered at 100% of Direct wages

2 Recovered at 50% of Direct wages

Fixed overheads ₹ 5,00,000 per annum

Direct labour hours in Department 1 is in short supply and the budgeted volume of output envisages full utilisation of the available direct labour hours. In department 2, the company has committed to engage the workers to the extent of the direct labour hours required for the budgeted volume of production. Should a change in the product mix be desired, the company can engage additional direct labour hours required in Department 2 at normal rates. But any portion of the direct labour hours of Department 2 rendered surplus by reason of a change in the present product mix will have to be paid by the company as idle time wages in view of the commitment already made.

Required :

(i) Present a statement showing the budgeted profitability.

(ii) Set optimal product mix and work out the optimum profit after taking into consideration the idle time wages if any payable in Department 2.

(iii) If the company desires to sub-contract the surplus direct labour hours, if any, in Department 2, what minimum charge should be quoted per direct labour hour?

Solution:

(i) Original Budget

	Per Unit			Total			
	A	**B**	**C**	**A**	**B**	**C**	**Total**
Units budgeted				10,000	12,000	20,000	
	₹	₹	₹	₹	₹	₹	₹
Sales	75	105	60	7,50,000	12,60,000	12,00,000	32,10,000
Direct Materials	24	16	12	2,40,000	1,92,000	2,40,000	6,72,000
Direct wages							
Dept 1	12	20	10	1,20,000	2,40,000	2,00,000	5,60,000
Dept 2	6	16	12	60,000	1,92,000	2,40,000	4,92,000
Variable overheads							
Dept 1 100%	12	20	10	1,20,000	2,40,000	2,00,000	5,60,000
Dept 2 50%	3	8	6	30,000	96,000	1,20,000	2,46,000
Total	57	80	50	5,70,000	9,60,000	10,00,000	25,30,000
Contribution	18	25	10	1,80,000	3,00,000	2,00,000	6,80,000
Fixed overheads							5,00,000
Profit							1,80,000

(ii) Optimal plan :

(a) Direct Labour Hours

	Per Unit			Total			
	A	B	C	A Hrs.	B Hrs.	C Hrs.	Total Hrs.
Dept 1	3	5	2.5	30,000	60,000	50,000	1,40,000
Dept 2	3	8	6	30,000	96,000	1,20,000	2,46,000
Contribution/unit	18	25	10				
Direct Labour Hrs. Dept. 1	3	5	2.5				
Contribution/Direct Labour Hr.	6	5	4				

Product	Max. units	Direct Labour Hrs/ Unit	Production	Direct Labour Hrs.	Balance Hrs.	Contribution/ unit	Total Contribution
A	12,000	3	12,000	36,000	1,04,000	18	2,16,000
B	16,000	5	16,000	80,000	24,000	25	4,00,000
C	24,000	2.5	9,600	24,000	—	10	96,000
							7,12,000
Fixed overheads							5,00,000
Profit							2,12,000

(b)

	Per Unit			Total			
	A	B	C	A	B	C	
Production				12,000	16,000	9,600	
Direct Labour Hrs. D2	3	8	6	36,000	1,28,000	57,600	2,21,600

Idle Time 2,46,000 – 2,21,600 = 24,400 Hrs.

Idle Time cost 24,400 × 2 = ₹ 48,800

Adjusted optimum profit 2,12,000 – 48,800 = ₹ 1,63,200

(iii) Sub contracting rate for Dept-2 Direct Labour Hours

	₹
Direct Labour Hrs rate	2.00
Variable overheads 50% of D. wages	1.00
Total	3.00

Minimum rate for sub-contracting ₹ 3/-

Illustration 21.

Trimurthy Co. Ltd. manufactures products A, B and C, standard costs of which are as under:

	A ₹	B ₹	C ₹
Direct material	50	8	64
Direct labour			
Skilled	12	9	6
Unskilled	4	8	20
	66	25	90

The budgeted fixed overheads are ₹ 3 lakhs for the coming year. Skilled labour is paid at ₹ 6 per hour, while unskilled labour is paid at ₹ 4 per hour. Estimate of sales quantity and unit price as budgeted are as under:

Product	Quantity	Sale Price (₹)
A	20,000	120
B	28,000	70
C	12,000	100

There is a constraint on availability of skilled labour hours. There is no possibility of resorting to overtime work due to labour's apathy. 78,000 skilled labour hours are available in the next year which might improve to 85,000 hours during year after next, due to recruitment and training programme contemplated next year. Semi-skilled labour hours are 1,40,000 hours in the coming year.

The Management is not averse to sub-contract the production so as to achieve the sales target if this could maximise profit. Enquiries for sub-contract work elicited the following acceptable sub-contract rates per unit of each of the 3 products.

A: ₹ 69

B: ₹ 28

C: ₹ 92.5

You are required to

(a) Identify the most profitable product mix during the coming year for in-house manufacture only of the products and compute the budgeted profit on this basis; state assumption if any.

(b) Advise on the strategy of sub-contracting any part of production to achieve the proposed sales target as also maximising profit.

Solution:

Skilled labour is a constraint, mix for maximising profit is to be based on availability of skilled labour hours.

(a) (i) Computation of Labour Hours :

	Skilled			Unskilled		
	A	B	C	A	B	C
Wages per unit (₹)	12	9	6	4	8	20
Rate per hour (₹)	6	6	6	4	4	4
Hours required per unit	2	1.5	1	1	2	5

Hours required for Budget Sales :

Product	Units	Hrs. Reqd.		Total Hours	
		Skilled	Unskilled	Skilled	Unskilled
A	20,000	2	1	40,000	20,000
B	28,000	1.5	2	42,000	56,000
C	12,000	1	5	12,000	60,000
Total				94,000	1,36,000
Hours Available				78,000	1,40,000

(ii) Ranking for Production:

	A	B	C
Selling price p. u. (₹)	120	70	100
Variable Cost p. u. (₹)	66	25	90
Contribution p. u. (₹)	54	45	10
Skilled labour hours reqd. per unit (Hrs.)	2	1.5	1
Contribution per lab. hr	27	30	10
Rank	II	I	III

Most Profitable Product-Mix:

Ranked Products	Units	Hours Reqd.	Restricted to Availability	Corresponding units
B	28,000	42,000	42,000	28,000
A	20,000	40,000	36,000	18,000
C	12,000	12,000	—	—

Profitable Product-Mix Statement:

Product	Units	Contribution Per unit	Total Contribution (₹ in lakhs)
B	28,000	45	12.60
A	18,000	54	9.72
			22.32
		Less: Fixed Cost	3.00
		Profit	19.32

Assumption:

(1) There would be no change in fixed cost despite discontinuance/reduction in production.

(2) Sales budget is realistic and is agreeable both with regards to price and quantity.

(3) Drop or reduction in quantities of unprofitable products would have no adverse effect on the business.

(b) Subcontract Profitability

Assuming that sales demand as per budget would be met in full, it would be necessary to subcontract work so that production shortfalls arising out of skilled labour constraint is met through subcontracting. Subcontracting is to be resorted to the least cost to the company.

Priority for Subcontracting:

Product	A	B	C
Variable cost (₹)	66	25	90
Subcontract Price (₹)	69	28	92.5
Extra Cost of subcontracting (₹)	3.0	3.0	2.5
Skilled Lab saved by subcontracting (Hrs.)	2.0	1.5	1.0
Extra cost per Hr. by subcontract	1.5	2.0	2.5
Ranking	I	II	III
Therefore, priority for making	III	II	I

Subcontracting Profitability:

	A	B	C	
Priority for making	III	II	I	
Units in Demand	20,000	28,000	12,000	
Skilled Lab Hrs. reqd (Hrs)	40,000	42,000	12,000	
Hrs. allotted as per ranking subject to total 78000	24,000	42,000	12,000	
Corresponding Units for making	12,000	28,000	12,000	
Contribution/Unit (₹)	54	45	10	
Total Contribution (₹ Lakhs)	6.48	12.60	1.20	= 20.28
Subcontracting (units)	8,000	—	—	
Contribution due to subcontracting per unit (120–69)	51	NA	NA	
Total contribution by subcontracting (₹ lakhs)	4.08	—	—	4.08
Total Contribution (₹ Lakhs) (Making + Subcontracting)				24.36
Less: Fixed Costs				3.00
Profit (₹ Lakhs)				21.36

Profit is higher by 2.04 lakhs (21.36 – 19.32). Hence, it is advisable to resort to subcontract to maximise sale.

Illustration 22.

X Y Z Ltd. has to date spent ₹75,000 on a research project and it expects that when completed in a further year the results of that research can be sold for ₹1,00,000. In trying to decide whether to proceed, the business identifies the additional expenses necessary to complete to research:

Materials:	₹30,000. This materials (already in store and paid for) is very toxic and will have to be disposed of in a sealed containers at a cost of ₹2,500.
Labour:	₹20,000. The research project uses highly skilled labour taken from the production department of the company. If they were working on normal production, the company could earn ₹25,000 additional contributions to profit in the next year after paying the skilled labour.
Research staff:	₹30,000. The research unit will close down after the project has been completed and voluntary retirement pay has already been agreed at ₹12,500.
General Overheads:	₹20,000. The research unit is apportioned a share of the total fixed costs of the business.

The Accountant of the Company has presented the following analysis and recommended against contribution, since the analysis shows that the Company would lose ₹ 25,000 more by continuing the project than by abandoning now.

The Managing Director seeks your opinion as the Group Management Accountant about the analysis presented by the Accountant.

	Abandon now	Complete	
	₹	₹	₹
Sales	—		1,00,000
Costs to date	75,000	75,000	
Additional costs			
Materials		30,000	
Labour		20,000	
Research staff		30,000	
Overheads		20,000	
Loss in contribution		25,000	2,00,000
Net Loss			1,00,000

Solution:

The conclusion is incorrect.

We may note that —

(1) The cost incurred to date i.e. ₹75,000 are sunk costs and can have no bearing on any further decision.

(2) The addl. materials (₹30,000) have already been bought and paid for, so the only cost which will change, is the payment of ₹2,500 disposal cost if the research project does not continue.

(3) The skilled labour will be paid ₹20,000 irrespective of whether the project continues or not either as part of the research work or as normal production. As the cost is the same whatever the decision, it is not relevant. However, the opportunity cost is ₹45,000 if the project continues, for that is the loss of the company due to production foregone i.e. ₹25,000 plus ₹20,000, if the labour is transferred the contribution is greater by the amount of the labour cost. Another way of viewing this is to say that the cost of continuing the project is ₹20,000 labour plus the opportunity cost of ₹25,000 i.e. ₹45,000 in all.

(4) If the project continues the research staff will be paid ₹30,000 but if it ceases that money will be saved. Hence as the cost will depend on the decision, it is relevant cost. However, the decision on voluntary retirement pay (₹12,500) has already been taken and being the same whether the project continues or not, can be ignored.

(5) Apportioned overhead (₹20,000) are irrelevant for these costs will continue to be incurred by the rest of the business whether the research project continues or not.

The following tabulation will reflect the correct situation:

	Complete	
	₹	₹
Sales		1,00,000
Materials	(2,500)	
Labour	45,000	
Research	30,000	72,500
(Loss) Profit		27,500

The company should therefore continue with the project for it will make a profit of ₹27,500 compared with a loss of ₹2,500 if it abandons the project now.

Alternative View:

If the project is abandoned, the company has to spend ₹2,500 for disposing the material.

On the other hand the company can save ₹20,000 labour cost and the labour employed in the project can earn ₹25,000 additional contribution i.e. total savings in respect of skilled labour is ₹45,000.

Similarly, it can save ₹30,000 in respect of research staff which need not to be paid if the project is abandoned.

Thus, total savings, if the project abandoned = ₹ [(2,500) + 45,000 + 30,000] = ₹72,500

However, it will lose ₹1,00,000 in respect of sales, if the project abandoned.

∴ Net Loss if the project abandoned = ₹1,00,000 - ₹72,500 = ₹27,500

The company will incur a loss of ₹27,500, if it abandons the project. Hence, the project should be completed.

Illustration 23.

A multi product company has been producing an electronic component in its department P. The budget of department P for the next year is as under:

Budgeted production and sales 72,000 units

	₹ Per unit
Selling price 200	
Direct Materials	
X 1 kg. Per unit	40
Y 1 kg. Per unit	30
Direct wages	40
Variable overheads	20
Fixed overheads	60
Total	190
Profit	10

Subsequent to the preparation of the budget, the company offered that the setting up of an electronic part in the region where the company is situated has resulted in migration of the majority of the department's workforce and consequently the company is forced to take a decision on closure of the department and abandonment of the budget. The company was however, advised to produce either 24,000 or 48,000 components in the next year by employing contract labour. A few remaining workers will be absorbed by the company within the organization against vacancies. The relevant data are as under:

(a) The cost of contract labour is ₹6 per hour and the standard contract labour time per unit is 10 hours. The contract labour, however, will have to be trained at a fixed cost of ₹40,000

(b) The stock of material X is 72,000 kg. There is no other use for this material. The quantity not used in department P will have to be disposed off. The cost of disposal is ₹4,000 plus Re. 1 per kg. disposed off.

(c) The stock of material Y is 36,000 kg. If this material is not used in department P, a quantity up to 24,000 kg. can be used in another department as substitute for equivalent weight of a material, which currently costs ₹36 per kg. Material Y originally cost ₹30 per kg. and its current market price is ₹40 per kg. If any surplus material Y is sold, it will fetch a realization of ₹20 per kg. sold.

(d) The variable overheads will be 30% higher per unit produced than originally budgeted.

(e) If department P is closed down immediately, the foreman who will otherwise retire at the end of next year, will be asked to retire earlier and he will be paid ₹80,000 as compensation. His salary is ₹6,000 per month.

(f) The only machine used in department P originally cost ₹1,40,000 and it can be currently sold for ₹86,000. This sales value will go down to ₹80,000 at the end of the next year and if the machine is used during the next year for any production activity in the year, the sale value will further decrease by ₹1,000 per every 1,000 units produced.

(g) The fixed overheads are apportionment of general overheads and will not be altered by any decision concerning department P.

(h) The sales manager states that a sales volume of 24,000 units can be achieved if the selling price is set at ₹180 per unit. He further stated that a sales volume of 48,000 units will be achieved if the selling price per unit is reduced to ₹150 and an advertisement expenditure of ₹30,000 is spent.

Required:

(i) Prepare a statement indicating the financial implications of the choice to be made between the following alternatives:

(A) Close down department P immediately.

(B) Operate department P for a further year to produce 24,000 units of the component.

(C) Operate department P for a further year to produce 48,000 units of the component.

(ii) Advise the management of the course of action to be taken.

Solution:

(i)

	Immediate closure	**Produce 24,000 Units**	**Produce 48,000 Units**
Sales			
Units	close	24,000	48,000
Selling price (₹)		180	150
Sales (₹)		43,20,000	72,00,000
Direct Materials			
X: Stock 72,000 kg Disposal			
Fixed cost (₹)	(4,000)	(4,000)	(4,000)
Variable cost (₹)	(72,000)	(48,000)	(24,000)
Y: Stock 36,000 kg			
Used in component (kg)	—	24,000	36,000
Balance available (kg)	36,000	12,000	—
Disposal:			
Use as substitute (kg)	24,000	12,000	—
Sale (kg)	12,000	—	—
Buy substitute:			
Income @ ₹ 36 (₹)	8,64,000	4,32,000	—
Disposal @ ₹ 20 (₹)	2,40,000	—	—

	Immediate closure	Produce 24,000 Units	Produce 48,000 Units
Material Y purchase (₹)	—	—	(4,80,000)
Variable overheads 20 ×1.30 = 26 (₹)	—	(6,24,000)	(12,48,000)
Foreman (₹)	(80,000)	(72,000)	(72,000)
Machine income (₹)	86,000	80,000	80,000
Usage (₹)	—	(24,000)	(48,000)
Net income (₹)	86,000	56,000	32,000
Fixed overheads – Not relevant			
Advertisement (₹)	—	—	(30,000)
Labour contract @ 10×6 = 60 per unit (₹)	—	(14,40,000)	(28,80,000)

Statement of profitability

	Immediate closure (₹)	Produce 24,000 Units (₹)	Produce 48,000 Units (₹)
Income: Sale of production	—	43,20,000	72,00,000
Material Y:			
Substitute	8,64,000	4,32,000	—
Disposal	2,40,000	—	—
Net income from Machine	86,000	56,000	32,000
Total Income	11,90,000	48,08,000	72,32,000
Cost: Material X:			
Disposal Fixed cost	4,000	4,000	4,000
Disposal variable cost	72,000	48,000	24,000
Labour Training		40,000	40,000
Labour cost variable		14,40,000	28,80,000
Material Y purchased			4,80,000
Variable overheads		6,24,000	12,48,000
Salary of foreman	80,000	72,000	72,000
Advertisement	—	—	30,000
Total cost	1,56,000	22,28,000	47,78,000
Excess of income over cost	10,34,000	25,80,000	24,54,000

(ii) Advise to Management:

The company should run department P for one year and produce only 24,000 units.

Illustration 24.

A Company manufacturing agricultural tractors has a capacity to produce 6,000 tractors annually. The capital employed in the project as on date is ₹20 crores. With increasing cost of production and reducing margins, the company is fast narrowing its margin of safety. The return on capital employed fell from 10% in the previous year to 6% in the current year. i.e., the current year profit is 1.20 crores. The company wants to maintain the original cut-off rate of 12% and various possibilities have been examined for this purpose.

The company is at present manufacturing and marketing 6,000 tractors annually though there is imbalance in the plant. The company has the following major production departments with percentage capacity utilisation for the present production: -

Production Department	Capacity utilised
Machine shop	75%
Assembly shop	100%
Heat treatment shop	75%
Induction hardening	50%

The company operates a single shift of 8 hrs per day on an average for 300 days in a year. For technical reasons the plant will have to operate on single shift basis only.

The two alternatives which have emerged after a detailed study are:

(a) To hire out the surplus capacity in the production shop for which constant demand exists. The following income and expenditure projections are drawn out:

	Hire charge per hour	Incremental cost per hour
Machine shop	₹10,000	₹2,000
Heat treatment shop	₹ 7,500	₹1,500
Induction hardening	₹ 5,000	₹1,000

(b) To increase the installed capacity to 8,000 tractors by spending ₹2 crores on additional machinery for the assembly shop. The incremental revenue from the additional sales will be ₹5,000 per tractor. The cost of additional finance will be 12% being the cost of existing capital employed, In addition, tax benefits on an average will work out to 1% of additional investment.

You are required:

(i) To work out the profitability, i.e., average rate of return of the two alternatives; and

(ii) To comment on the advisability of maintaining an imbalance plant from a long-term point of view.

Solution:

Computation of hire charges and return on capital employed

		₹
Machine shop	[2,400×25%×(10,000-2,000)]	48,00,000.00
Heat treatment	[2,400×25%×(7,500-1,500)]	36,00,000.00
Induction hardening	[2,400×50%(4,000)]	48,00,000.00
		1,32,00,000.00
Present profit		1,20,00,000.00
Total profit		2,52,00,000.00
Return on investment	[(2,52,00,000/20,00,00,000)×100]	12.6%

Computation of profit under alternative 2

		₹
Profit from sale of tractors	(5,000×2,000)	1,00,00,000.00
Hire charges		32,00,000.00
Tax benefit (1% on 2 crores)		2,00,000.00
		1,34,00,000.00
Add : existing profit		1,20,00,000.00
Total Profit		2,54,00,000.00
Return on investment	[(2,54,00,000/22,00,00,000)×100]	11.55%

Working notes:

Computation of surplus capacity in the production shop

Machine shop	{[(300x8)x75%]x100/75}	2,400.00
		(no extra capacity)
Heat treatment	{[(300x8)x75%]x100/75}	2,400.00
		(no extra capacity)
Induction	[(300x8)x50%x(8,000/6,000)]	1,600.00
Extra capacity in induction	(1,600x50%)	800 hours
Therefore hire charges (₹)	(800x4,000)	3,200,000.00

As the required cut off rate is 12%, it is better to hire out the balance capacity instead of increasing capacity.

Illustration 25.

A manufacturing company currently operating at 80% capacity has received an export order from Middle East, which will utilise 40% of the capacity of the factory. The order has to be either taken in full and executed at 10% below the current domestic prices or rejected totally.

The current sales and cost data are given below:

Sales	₹16.00 lakhs
Direct Material	₹ 5.80 lakhs
Direct Labour	₹ 2.40 lakhs
Variable Overheads	₹ 0.60 lakhs
Fixed Overheads	₹ 5.20 lakhs

The following alternatives are available to the management:

(I) Continue with domestic sales and reject the export order.

(II) Accept the export order and allow the domestic market to starve to the extent of excess of demand.

(III) Increase capacity so as to accept the export order and maintain the domestic demand by

  (i) Purchasing additional plant and increasing 10% capacity and thereby increasing fixed overheads by ₹65,000 and

  (ii) Working overtime at one and half time the normal rate to meet balance of the required capacity.

You are required to evaluate each of the above alternatives and suggest the best one.

Solution:

Statement showing computation of profit at different alternatives:

(In Lakhs)

	Particulars	I Present Sales 80%	II 40% - Foreign 60% - Domestic	III 40% - Foreign 80% - Domestic
1	Sales (₹)	16.00	19.20 (7.20 + 12.00)	23.20 (7.20+16.00)
2	Variable Cost (₹)			
	Direct Material (₹)	5.80	7.25	8.70
	Direct Labour (₹)	2.40	3.00	3.60
	Variable Overheads (₹)	0.60	0.75	0.90
	Overtime Premium (₹)	—	—	0.15
		8.80	11.00	13.35
3	Contribution (₹)	7.20	8.20	9.85
4	Fixed Cost (₹)	5.20	5.20	5.85 (5.20 + 0.65)
5	Profit (₹)	2.00	3.00	4.00

From the above computation, it was found that the profit is more at the III alternative i.e. accepting the foreign order fully and maintaining the present domestic sales, it is the best alternative to be suggested.

Illustration 26.

Reel and Roll Ltd. manufactures a range of films extensively used in the cinema industry. The films once manufactured are packed in a circular container and stored in specially constructed crates lined with 'Protecto'. These crates are manufactured and maintained by a special department within the company and the department costs last year are as under:

	₹	₹
Direct materials (Including 'Protecto')		1,40,000
Direct Labour		1,00,000
		2,40,000
Overheads:		
Department manager	16,000	
Depreciation of machine	30,000	
Maintenance of machine	7,200	
Rent(portion of warehouse)	9,000	
Other miscellaneous costs	31,500	
		93,700
		3,33,700
Administration overhead (20% of direct costs)		48,000
		3,81,700

Pack Knack Associates have approached the Reel and Roll Ltd., offering to make all the crates required on a four year contract for ₹2,50,000 per annum and/or to maintain them for further ₹50,000 per annum.

The following data are relevant:

(i) The machine used in the department costs ₹2,40,000 four years ago and will last for four more years. It could be currently sold for ₹50,000.

(ii) A stock of 'protecto' was acquired last year for ₹2,00,000 and one-fifth was used last year and included in the material cost. It originally cost ₹1,000 per tonne but the replacement cost is ₹1,200 per tonne; and it could be currently sold for ₹800 per tonne.

(iii) The department has acquired warehouse space for ₹18,000 per annum. It uses only one-half of the space; the rest is idle.

(iv) If the department were closed, the Manager will be transferred to another department but all the labour force will be made redundant and the terminal benefits be met will amount to ₹15,000 per annum. In that event, Pack Knack Associates will undertake to manufacture and maintain the crates.

If the Reel and Roll Ltd., continued to maintain the crates, but left their manufacture to Pack Knack Associates.

(i) The machine will not be required.

(ii) The manager will remain in the department.

(iii) The warehouse space requirements will not be reduced.

(iv) Only 10% of all materials will be used.

(v) Only one worker will be dispensed with and taking the terminal benefit to be met into account, the saving will be ₹ 5,000 per annum.

(vi) The miscellaneous costs will be reduced by 80%.

If Reel and Roll Ltd., continue to manufacture the crates but left their maintenance to Pack Knak Associates;

(i) The machine will be required.

(ii) The manager will remain in the department.

(iii) The warehouse space will be required.

(iv) 90% of all the materials will be required.

(v) The labour force will continue.

(vi) The miscellaneous costs will be reduced by 20%

Assuming that for the four-year period, there is no significant change envisaged in the pattern of other costs, you are required to evaluate the alternative courses of action with supporting figures of cash flows over the four-year period and advise accordingly.

Solution:

Evaluation of the three alternative courses of action

Alternatives	Alternative I (Deptt. is closed and Pack Knack Associates undertake to manufacture and maintain the crates)	Alternative II (Reel and Roll Ltd. continues, to maintain the creates, but leave their manufacture to Pack Knack Associates	Alternative III (Reel and Roll Ltd. continues to manufacture the crates but leave their maintenance to Pack Knack Associates)
Inflows:	₹	₹	₹
(Avoidable costs in terms of cash flows)			
Direct Material other than "Protecto" (WN:1)	1,00,000	90,000	10,000
Direct labour (Working Note 2)	85,000	5,000	---
Maintenance of Machine	7,200	7,200	---
Rent (full)	18,000	---	---
Other Miscellaneous Costs	31,500	25,200	6,300
Total Costs avoided per annum	2,41,700	1,27,400	16,300
Total Costs avoided in 4 years (A)	9,66,800	5,09,600	65,200

		Alternative I		Alternative II	Alternative III
		₹		₹	₹
Outflows:					
Cash Outflow per annuam on account of payment to Pack Knack (Working Note 3)		3,00,000		2,50,000	50,000
Cash outflow in 4 years		12,00,000		10,00,000	2,00,000
Less: Inflows Sale of Machine	50,000		50,000		
Sale of 'Protecto, Stock (Working Not4)					
	1,28,000	1,78,000	1,15,200	1,65,200	12,800
Net Cash Outflow in 4 years (B)		10,22,000		8,34,800	1,87,200
Profit (or Loss) in terms of Cash Flows (A)-(B)		(55,200)		(3,25,200)	(1,22,000)

Recommendation: The above analysis shows that net cash outflows exceed the amount of costs avoided in the three alternative courses of action. Hence, none of the alternatives is profitable. Reel and Roll Ltd. should, therefore, continue to manufacture and maintain the crates.

Working Notes:

1. The total cost of direct materials (including 'protecto'), is ₹ 1,40,000. The cost of protecto used for the last year comes to ₹ 40,000. Thus, cost of direct materials that can be avoided in alternative I comes to (₹ 1,40,000 – 40,000) = ₹ 1,00,000. The cost of direct materials excluding protecto, to be avoided under Alternative 2 and 3 have been calculated on the basis of this amount.

2. Cost of direct labour that can be avoided under Alternative 1: ₹ 1,00,000 – ₹ 15,000 (terminal benefits) = ₹ 85,000.

3. The total cash outflow per annum under alternative 1 will amount to ₹ 2,50,000 + 50,000 = ₹3,00,000.

4. The stock of protecto, in terms of quantity comes to: ₹ 1,60,000 / 1,000 = 160 tonnes.

The amount to be realized from the sale of protecto under different alternatives has been curtained as follows:

Alternative 1:	160 tonnes × ₹ 800	= ₹ 1.28,000
Alternative 2:	160 tonnes × $\frac{9}{10}$ × ₹ 800	= ₹ 1,15,200
Alternative 3:	160 tonnes × $\frac{1}{10}$ × ₹ 800	= ₹ 12,800

5. The sale proceeds of machinery and stock could have alternatively been added to the 'avoided costs' in place of deducting them from cash outflow.

Illustration 27.

A Company manufacturing a highly successful line of cosmetics intends to diversify the product line to achieve fuller utilization of its plant capacity. As a result of considerable research made the company has been able to develop a new product called 'EMO'.

EMO is packed in tubes of 50 grams capacity and is sold to the wholesalers in cartons of 24 tubes at ₹240 per carton. Since the company uses its spare capacity for the manufacturer of EMO, no additional fixed expenses will be incurred. However, the cost accountant has allocated a share of ₹4,50,000 per month as fixed expenses to be absorbed by EMO as a fair share of the company's present fixed costs to the new production for costing purposes.

The company estimated the production and sale of EMO at 3,00,000 tubes per month and on this basis the following cost estimates have been developed.

	₹ per carton
Direct Materials	108
Direct Wages	72
All overheads	54
Total costs	234

After a detailed market survey the company is confident that the production and sales of EMO can be increased to 3,50,000 empty tubes and the cost of empty tubes, purchased from outside will result in a saving of 20% in material and 10% in direct wages and variable overhead costs of EMO. The price at which the outside firm is willing to supply the empty tubes is ₹1.35 per empty tube. If the company desires to manufacture empty tubes in excess of 3,00,000 tubes, new machine involving an additional fixed overheads ₹30,000 per month will have to be installed. Required.

(i) State by showing your working whether company should make or buy the empty tubes at each of the three volumes of production of EMO namely 3,00,000; 3,50,000 and 4,50,000 tubes.

(ii) At what volume of sales will it be economical for the company to install the additional equipment for the manufacture of empty tubes?

(iii) Evaluate the profitability on the sale of EMO at each, of the aforesaid three levels of output based on your decision and showing the cost of empty tubes as a separate element of cost.

Solution:

(i) **Total Cost per tube including EMO:**

Direct Material	108/24	₹ 4.50
Direct Wages	72/24	₹ 3.00
Variable Overheads	[54/24 – 4,50,000/3,00,000]	₹ 0.75

Particulars	Total Cost (₹)	Tube Cost (₹)	Product Cost (₹)
Material	4.50	0.90	3.60
Wages	3.00	0.30	2.70
Variable Overhead	0.75	0.075	0.675
	8.25	1.275	6.975

Statement showing computation of manufacturing cost of 3,00,000 tubes

Cost of making (3,00,000 x 1.275)	₹ 3,82,500
Cost of buying (3,00,000 x 1.35)	₹ 4,05,000

It is better to make the tubes at 3,00,000 level of output.

Computation of Cost for additional tubes:

Particulars	50,000	1,50,000
Cost of Making (₹)	93,750 [(50,000 × 1.275) + 30,000]	2,21,750 [(1,50,000 × 1.275) + 30,000]
Cost of Buying (₹)	67,500 (50,000 × 1.35)	2,02,500 (1,50,000 × 1.35)

From the above, it is better to buy at these levels.

(ii) The level at which it is beneficial to make the tubes over and above 3,00,000 units.

The Company will be justified to install the additional Equipment for the manufacture of Empty tubes at a sales volume of 7,00,000 units.

(iii) **Statement showing computation of Profit at three levels of output:**

	Particulars	3,00,000	3,50,000	4,50,000
I.	Sales [240/24] (₹)	30,00,000	35,00,000	45,00,000
II.	Cost (₹)	20,92,500 (3,00,000×6.975)	24,41,250 (3,50,000×6.975)	31,38,750 (4,50,000×6.975)
III.	Tube Cost (₹)	3,82,500 (3,00,000×1.275)	4,72,500 (3,50,000×1.35)	6,07,500 (4,50,000×1.35)
IV.	Fixed cost (₹)	4,50,000	4,50,000	4,50,000
V.	Total Cost (₹)	29,25,000	33,63,750	41,96,250
VI.	Profit (I – V) (₹)	75,000	1,36,250	3,03,750

Illustration 28.

Shri Kiran manufactures lighters. He sells his product at ₹20 each, and makes profit of ₹5 on each lighter.

He worked 50 per cent of his machinery capacity at 50,000 lighters. The cost of each lighter is as follows:

Direct material	₹ 6
Wages	₹2
Workers overhead	₹5 (50 per cent fixed)
Sales expenses	₹ 2 (25 per cent variable)

His anticipation for the next year is that the cost will be go up as under:

Fixed cost	10%
Direct wages	20%
Material	5%

There will not be any change in selling price. There is an additional order for 20,000 lighters in the next year.

What is the lowest rate he can quote so that he can earn the same profit as the current year?

Solution:

Present profit = 50,000 × 5 = ₹ 2,50,000

Present Fixed cost = 50,000 × (2.5+1.5) = ₹ 2,00,000

Computation of Profit after increase in prices:

	Particulars	Amount (₹)	Amount (₹)
I	Selling Price		20.00
II	Variable Cost		
	Material [6 × 105/100]	6.30	
	Wages [2 × 120 / 100]	2.40	
	Works Overhead	2.50	
	Sales Expenses	0.50	11.70
III	Contribution		8.30
IV	Total Contribution [50,000 × 8.30]		4,15,000
V	Fixed Cost [2,00,000 × 110/100]		2,20,000
VI	Profit		1,95,000

Computation of Selling Price of the order:

Contribution of profit required per unit (55,000/20,000)	₹ 2.75
Add: Variable cost per unit	₹ 11.70
Therefore, Required Selling Price	₹ 14.45

Illustration 29.

Forward and Foundry Ltd. is feeling the effects of a general recession in the industry. Its budget for the coming half year is based on an output of only 500 tonnes of casting a month which is less than half of its capacity. The prices of casting vary with the composition of the metal and the shape of the mould, but they average ₹ 175 a tonne. The following details are from the Monthly Production Cost Budget at 500 tonne levels:

	Core making	Melting and Pouring	Moulding	Cleaning and Grinding
	₹	₹	₹	₹
Labour	10,000	16,000	6,000	4,500
Variable overhead	3,000	1,000	1,000	1,000
Fixed overhead	5,000	9,000	2,000	1,000
	18,000	26,000	9,000	6,500
Labour and O.H. rate per direct labour hour	9.00	6.50	6.00	5.20

Operation at this level has brought the company to the brink of break-even. It is feared that if the lack of work continues, the company may have to lay off some of the most highly skilled workers whom it would be difficult to get back when the volume picks up later on. No wonder, the Works Manager at this Juncture, welcome an order for 90,000 casting, each weighing about 40 lbs., to be delivered on a regular schedule during the next six months. As the immediate concern of the Works Manager is to keep his work force occupied, he does not want to lose the order and is ready to recommend a quotation on a no-profit and no-loss basis.

Materials required would cost ₹ 1 per casting after deducting scrap credits. The direct labour hour per casting required for each department would be:

Core Making	0.09
Melting and pouring	0.15
Moulding	0.06
Cleaning and grinding	0.06

Variable overheads would bear a normal relationship to labour cost in the melting and pouring department and in the moulding department. In core making, cleaning and grinding however, the extra labour requirements would not be accompanied by proportionate increases in variable overhead. Variable overhead would increase by ₹1.20 for every additional labour hour in core making and by 30 paise for every additional labour hour in cleaning and grinding. Standard wage rates are in operation in each department and no labour variances are anticipated.

To handle an order as large as this, certain increases in factory overheads would be necessary amounting to ₹ 1,000 a month for all departments put together. Production for this order would be spread evenly over the six months period.

You are required to:

(a) Prepare a revised monthly labour and overhead cost budget, reflecting the addition of this order.

(b) Determine the lowest price which quotation can be given for 90,000 castings without incurring a loss.

Solution:

Computation of labour and overhead rate

	Core making	Melting & pouring	Moulding	Cleaning & grinding
Labour & overheads (₹)	18,000.00	26,000.00	9,000.00	6,500.00
Labour & overheads per hour (₹)	9.00	6.50	6.00	5.20
No. of hours	2,000.00	4,000.00	1,500.00	1,250.00
Variable overhead per hour (₹)	1.50	0.25	0.67	0.80
Labour rate per hour (₹)	5.00	4.00	4.00	3.60
Hours required p.m. for new order	1,350.00	2,250.00	900.00	900.00
Labour cost required p.m. for order (₹)	6,750.00	9,000.00	3,600.00	3,240.00
Variable overhead cost p.m. for order (₹)	1,620.00	563.00	600.00	270.00

Revised monthly labour and overheads cost budget reflecting the additions of the order

	Core making	Melting & pouring	Moulding	Cleaning & grinding	Total
	₹	₹	₹	₹	₹
Labour	10,000.00	16,000.00	6,000.00	4,500.00	
Labour for the order	6,750.00	9,000.00	3,600.00	3,240.00	
	16,750.00	**25,000.00**	**9,600.00**	**7,740.00**	
Variable overheads	3,000.00	1,000.00	1,000.00	1,000.00	
Variable overheads for the order	1,620.00	563.00	600.00	270.00	
	4,620.00	**1,563.00**	**1,600.00**	**1,270.00**	
Fixed cost	**5,000.00**	**9,000.00**	**2,000.00**	**1,000.00**	
Total	**26,370.00**	**35,563.00**	**13,200.00**	**10,010.00**	85,143.00
Add : additional fixed cost					1,000.00
				Total:	**86,143.00**

Computation of total price for the order

		₹
Material	(15,000×1)	15,000.00
Labour & overheads	(86,143-59,500)	26,643.00
		41,643.00
Total price for the order	**(41,643×6)**	**2,49,858.00**

Illustration 30.

The operating results of B.N. Ltd., for the year 2013 were as under:

Sales mix: Product	Sales Mix %	P/V Ratio%
A	40	20
B	10	6
C	30	12
D	20	10

Total sales value of all the products was ₹80 lacs. Total fixed overheads amounted to ₹10 lacs. Raw material contents of each product represented 50% of the respective variable cost. The forecast for the year 2014 is as under:

(i) The raw material costs will go up by 10%.

(ii) The company has been able to obtain export quota of raw material of the value of ₹ 35 lacs.

(iii) The maximum sale potential of any of the above four products is 40% of the 2013 sale value.

(iv) The Company expects to secure an increase of 5% in the selling prices of all the products uniformly.

Required:

(a) Prepare a statement showing the profitability of 2013.

(b) Set a Product mix to maximise profit in 2014.

(c) Prepare a statement showing the profitability of 2014.

Solution:

Statement showing profit for 2013, computation of contribution per rupee of material and determination of priority for profitability

	A ₹	B ₹	C ₹	D ₹	Total ₹
Sales	32,00,000.00	8,00,000.00	24,00,000.00	16,00,000.00	80,00,000.00
Contribution	6,40,000.00	48,000.00	2,88,000.00	1,60,000.00	11,36,000.00
Fixed cost					10,00,000.00
Profit					1,36,000.00

	A ₹	B ₹	C ₹	D ₹
Variable cost	25,60,000.00	7,52,000.00	21,12,000.00	14,40,000.00
Raw material cost	12,80,000.00	3,76,000.00	10,56,000.00	7,20,000.00
Contribution per rupee of material	0.50	0.13	0.27	0.22
Priority	I	IV	II	III

Statement showing optimum mix under given conditions and computation of profit at that mix

	A	C	D	Total
	₹	₹	₹	₹
(i) Sales	33,60,000.00	33,60,000.00	11,52,242.00	78,72,242.00
	(80×40%×105%)	(80×40%×105%)	(w/n)	
(ii) Variable cost				
(a) Raw material	14,08,000.00	15,48,800.00	5,43,200.00	
(b) Other variable cost	12,80,000.00	14,08,000.00	4,93,818.00	
	26,88,000.00	**29,56,800.00**	**10,37,018.00**	**66,81,818.00**
(iii) Contribution	6,72,000.00	4,03,200.00	1,15,224.00	11,90,424.00
(iv) Fixed cost				10,00,000.00
(v) Profit				**1,90,424.00**

Working notes:

	₹
Available material	35,00,000.00
Less : utilised for	
A [(33.6) × (12.8×1.1)/(32 × 1.05)]	14,08,000.00
C [(33.6) × (10.56×1.1)\(24 × 1.05)]	15,48,800.00
	5,43,200.00

Sales of D to be produced

Let X be sales

[(X × 7.2 × 1.1)/16 × 1.05] =5,43,200

X = ₹ 11,52,242

Illustration 31.

A manufacturing company produces a chemical product which passes through two processes factory and finishing. It has the capacity to process an input of 1,00,000 kgs. of raw material. Normal scrap will be 10% and 5% of input in factory and finishing processes respectively. The realisable value of such scrap is ₹4 and ₹8 per kg. respectively for factory and finishing processes to be credited against the cost of respective process. Relevant cost data for the coming year are:

	Factory Process (₹)	Finishing Process (₹)
Direct wages	6,00,000	5,50,000
Overheads	2,28,000	4,22,900

There are three possible sources of purchase of raw materials:

Supplier	Purchase price per kg. (₹)	Maximum quantity
X	5.00	60,000 kgs.
Y	5.60	80,000 kgs.
Z	5.30	Provided entire quantity of 1,00,000 kgs is ordered, otherwise at ₹ 5.80 per kg.

In each case the company is required to collect the raw materials from the godown of supplier. Variable transport cost depends upon the distance involved. The same are as under:

Supplier	X	Y	Z
Transport cost (per kg)	30 paise	25 paise	25 paise

Fixed transport cost would be ₹ 1,00,000 per annum irrespective of the supplier to be contracted. The output of the finishing process can be sold to three prospective customers, their offer being as follows:

Customer	Price per kg. of output (₹)	Trade discount (%)	Conditions
A	32.50	2	Maximum quantity 40,000 kgs.
B	32.00	2	Maximum quantity 80,000 kgs.
C	30.90	—	Provide the entire output is sold to him.

In case of supplies to customers A and B, the fixed delivery costs will be ₹ 1,500 per month and the variable delivery costs will be 65 paise and 36 paise per kg. respectively.

Customer C will collect the entire output from the warehouse of the company.

You are required to indicate with reasonings:

(i) Choice of supplier with comparative cost tables.

(ii) Choice of customer with comparative tables of net realisations.

Also prepare the statements showing process costs and overall results.

Solution:

(i) **Choice of Suppliers:**

Comparative Cost Tables of Suppliers

Particulars	X	Y	Z	
Quantities to be supplied	up to 60,000 kgs.	up to 80,000 kgs.	less than 1,00,000 kgs.	1,00,000 kgs.
	(₹)	(₹)	(₹)	(₹)
Purchases (Price)	5.00	5.60	5.80	5.30
Variable transport cost (per kg)	0.30	0.25	0.25	0.25
	5.30	5.85	6.05	5.55

Alternatives available

First—To purchase 60,000 kgs. from X and balance 40,000 kgs from Y

Second—To purchase 1,00,000 kg from Z.

Cost of purchase for above alternatives:

Supplier	Quantity (kg.)	Rate (₹)	First Alternative (₹)	Second Alternative (₹)
X	60,000	5.30	3,18,000	—
Y	40,000	5.85	2,34,000	—
Z	1,00,000	5.55	—	5,55,000
Total			5,52,000	5,55,000

Recommendation: First alternative should be opted i.e. purchase 60,000 kg from X and 40,000 kgs. from Y, as the cost of purchase of first alternative is less than the cost of purchase of second alternative.

Note: Fixed transportation cost of ₹ 1,00,000 is to be ignored because it is not influenced by any alternative.

(ii) **Choice of Customer:**

Output to be sold:	
Input in factory process	1,00,000 Kgs.
Less: Normal scrap 10% of input in factory process	10,000 Kgs.
Output of factory process input of finishing process	90,000 Kgs.
Less: Normal scrap in finishing process 5% of input	4,500 Kgs.
Output of finishing Process	85,500 Kgs.

Relevant Cost Data of Selling Price:

Customers	A	B	C
Quantities	Up to 40,000 kgs. (₹)	Up to 80,000 kgs. (₹)	Up to 85,500 kgs. (₹)
Selling Price per kg.	32.50	32.00	30.90
Less: Trade discount (2%)	0.65	0.64	—
Net price	31.85	31.36	30.90
Less: Variable cost of delivery per kg.	0.65	0.36	—
Net realisation except fixed cost of A and B	31.20	31.00	30.90

Alternatives available: Rates of A and B are favourable when compared to C, but selling to A and B will result in fixed cost. Therefore, following two alternatives are available: First : 40,000 kg. to A and 45,500 kg. to B Second: 85,500 kg. to C

Net realisation based on above prices.

First Alternative

Customer	Quantity (Kg.)	Rate (₹)	Amount (₹)
A	40,000	31.20	12,48,000
B	45,500	31.00	14,10,500
			26,58,500
Less: Fixed delivery cost (₹ 1,500 × 12)			18,000
Net Realisation			26,40,500

Second Alternative

Customer	Quantity kg.	Rate(₹)	Amount (₹)
C	85,500	30.90	26,41,950

Recommendation: Entire output should be sold to C as the net realisation as per second alternative is better than that under the first alternative.

(iii) **Statement showing the process costs**

Factory Process:

	Quantity (Kg.)	Rate (₹)	Amount (₹)
Raw materials	1,00,000		5,52,000
Direct wages			6,00,000
Overheads			2,28,000
Fixed overheads			1,00,000
	1,00,000		14,80,000
Less: Wastage 10% @ ₹ 4 per kg.	10,000		40,000
Cost of Factory process transferred to finishing process	90,000	16.00 (14,40,000/90,000)	14,40,000

Finishing Process:

	Quantity (Kg.)	Rate (₹)	Amount (₹)
Transfer from factory process	90,000	16.00	14,40,000
Direct wages			5,50,000
Overheads			4,22,900
	90,000	16.00	24,12,900
Less Wastage 5% @ ₹ 8 per kg.	4,500		36,000
Cost of Factory process transferred to finishing process	85,500	27.80 (23,76,900/85,500)	23,76,900

(iv) **Statement showing overall results for 85,500 kgs**

	Rate (₹)	Amount (₹)
Sale to customer C (as per decision)	30.90	26,41,950
Less: Cost of output	27.80	23,76,900
Net results (Profits)	3.10	2,65,050

Illustration 32.

A Ltd. has a machine whose purchase price is ₹ 1,00,000. Its running cost and resale price at the end of different years are as follows :-

Year	1	2	3	4	5	6
Running cost (₹)	7,500	8,500	10,000	12,500	17,500	27,500
Resale Price (₹)	85,000	76,500	70,000	60,000	40,000	15,000

(i) Obtain the economic life of machine and the minimum average cost.

(ii) The Company has obtained a contract to supply the goods produced by the machine, for a period of five years from now. After this time period, the company does not intend to use the machine. If the company has a machine of this type which is one year old, what replacement policy should it adopt if it intends to replace the machine not more than once?

Solution:

(i) The calculations of average running cost per year during the life of the machine are shown below:-

Calculation of Average Running Cost

Year of service (1)	Running cost (₹) (2)	Cumulative running cost (₹) (3)	Resale price (₹) (4)	Cumulative Depreciation cost (₹) (5) = 1 Lakh – (4)	Cumulative Total cost (₹) (6) = (3) + (5)	Average cost (₹) (7) =(6)/(1)
1	7,500	7,500	85,000	15,000	22,500	22,500
2	8,500	16,000	76,500	23,500	39,500	19,750
3	10,000	26,000	70,000	30,000	56,000	18,667
4	12,500	38,500	60,000	40,000	78,500	19,625
5	17,500	56,000	40,000	60,000	1,16,000	23,200
6	27,500	83,500	15,000	85,000	1,68,500	28,083

As average cost per year of ₹ 18,667 is minimum in 3rd year, so the machine should be replaced at the end of 3rd year.

(ii) The yearly cost of maintaining one year old machine in subsequent years of its life is as follows:-

Year of service	Total cost per year (₹)	Cumulative Total cost (₹)
2	39,500 - 22,500=17,000	17,000
3	16,500	33,500
4	22,500	56,000
5	37,500	93,500
6	52,500	1,46,000

The alternative policies of retaining the old machine and buying the new machine are listed below:

Policy	Total associated cost (₹)
(a) Do not retaining old machine and buy new one for five years	0+1,16,000=1,16,000
(b) Retaining old machine for one year and buy new one for four years	17,000 + 78,500=95,500
(c) Retaining old machine for two years and buy new one for 3yrs	33,500 + 56,000= 89,500
(d) Retaining old machine for three years and buy new one for 2yrs	56,000 + 39,500= 95,500
(e) Retaining old machine for four years and buy new one for one year	93,500 + 22,500=1,16,000
(f) Keep old machine for five years and do not buy new one	1,46,000 + 0=1,46,000

Since total cost associated with policy (c) is lowest among all alternative policies, this policy(c) is optimal policy.

Illustration 33.

The data on the running costs per year and resale price of equipment A whose purchase prices is ₹2,00,000 are as follows :

Year	1	2	3	4	5	6	7
Running cost (₹)	30,000	38,000	46,000	58,000	72,000	90,000	1,10,000
Resale value (₹)	1,00,000	50,000	25,000	12,000	8,000	8,000	8,000

(i) What is the optimum period of replacement ?

(ii) When equipment A is two years old, equipment B which is a new model for the same usage is available. The optimum period for replacement is 4 years with an average cost of ₹ 72,000. Should equipment A changed with equipment B? If so, when?

Solution:

(i) The calculations of average cost per year during the life of the machine :-

Year of service (1)	Running cost (₹) (2)	Cumulative running cost (₹) (3)	Resale price (₹) (4)	Cumulative Depreciation cost (₹) (5) = ₹2 Lakh – (4)	Cumulative Total cost (₹) (6) = (3) + (5)	Average cost per year (7) = (6)/(1)
1	30,000	30,000	1,00,000	1,00,000	1,30,000	1,30,000
2	38,000	68,000	50,000	1,50,000	2,18,000	1,09,000
3	46,000	1,14,000	25,000	1,75,000	2,89,000	96,333
4	58,000	1,72,000	12,000	1,88,000	3,60,000	90,000
5	72,000	2,44,000	8,000	1,92,000	4,36,000	87,200
6	90,000	3,34,000	8,000	1,92,000	5,26,000	87,667
7	1,10,000	4,44,000	8,000	1,92,000	6,36,000	90,857

As average cost per year of ₹ 87,200 is minimum in 5th year, so A should be replaced at the end of 5th year.

(ii) Given, the optimum period for replacement of B is 4 years with an average cost of ₹ 72,000.

As Minimum average cost of B is lower than minimum average cost of A, so A should be replaced by B.

As A is two years old, so total cost per year of A from 3 rd year are as follows:-

Year of service	Total cost per year
3	2,89,000 – 2,18,000 = 71,000
4	3,60,000 – 2,89,000 = 71,000
5	4,36,000 – 3,60,000 = 76,000
6	5,26,000 – 4,36,000 = 90,000
7	6,36,000 – 5,26,000 = 1,10,000

As total cost per year of A is higher in 5th year than the minimum average cost of B (72,000) so A should be replaced at the end of 4th year.

Illustration 37.

The original budget for the K department of H. Ltd. for the forthcoming year was as follows:

Budgeted sales and production – 30,000 units

	Per unit of output (₹)	**Total for 30,000 units ₹ ('000)**
Sales revenue	10.0	300
Manufacturing cost		
Material A (1 litre per unit)	2.0	60
Material B (1 kg per unit)	1.5	45
Production labour	2.0	60
Variable overhead	1.0	30
Fixed manufacturing overhead	2.0	60
	8.5	255
Non-manufacturing costs	1.0	30
Total costs	9.5	285
Budgeted net profit for year	0.5	15

As part of H. Ltd.'s long-term strategic plan the K department was due to be closed at the end of the forthcoming year. However, rumours of the closure have resulted in the majority of K's labour force leaving the firm and this has forced the abandonment of the original budget for the department.

The Managing Director has suggested that the department could be closed down immediately or, by employing contract labour, could be operated to produce 10,000 or 20,000 units in the year. With the exception of the foreman [see Note (v)] the few remaining members of K's production labour force would then be redeployed within the firm.

The following further information is available :

(i) Each hour of contract labour will cost ₹3.00 and will produce one unit of the product. Contract labour would have to be trained at a fixed cost of ₹20,000.

(ii) There are 30,000 liters of material A in stock. This material has no other use and any of it not used in department K will have to be disposed of. Costs of disposal will be ₹2,000 plus Re.0.50 per litre disposed of.

(iii) There are 15,000 kgs of material B in stock. If the material is not used in department K then up to 10,000 kgs could be used in another department to substitute for an equivalent weight of a material which currently costs ₹1.8 per Kg. Material B originally costs ₹1.5 per kg and its current market price (buying or selling) is ₹2.0 per kg. Costs to H. Ltd. of selling any material B will amount to Re.1.00 per kg sold.

(iv) Variable overhead will be 30% higher per unit produced than originally budgeted.

(v) Included in 'Fixed manufacturing overhead' are :

(a) ₹6,000 salary of departmental foreman,

(b) ₹7,000 depreciation of the machine used in the department.

If the department is closed immediately the foreman, who will otherwise retire at the end of the year, will be asked to retire and paid ₹2,000 compensation for agreeing to this.

The only machine used in the department originally cost ₹70,000 and could currently be sold for ₹43,000. This sale value will reduce to ₹40,000 at the end of the year and, if used for any production during the year, will decrease by a further ₹500 per 1,000 units produced.

(vi) All other costs included in 'Fixed manufacturing overhead' and all 'Non-manufacturing costs' are apportionments of general overheads none of which will be altered by any decision concerning the K department.

(vii) The Sales Manager suggests that a sales volume of 10,000 units could be achieved if the unit sales price were ₹9.00. A sales volume of 20,000 units would be achieved if the sales price per unit were reduced to ₹8.00 and an advertising campaign costing ₹15,000 were undertaken.

Required :

(a) Advise H. Ltd. of its best course of action regarding department K, presenting any data in tabular form.

(b) For each of the following separate circumstances show how the advice given in (a) above is altered.

(i) Immediate closure of department K would enable its factory space to be rented out for one year at a rental of ₹8,000.

(ii) The quoted level of efficiency of the contract labour is the average for production of the first 5,000 units and any additional production would reflect the effects of the 90% learning curve which will be experienced. Show also the revised contract labour costs.

Ignore taxation and the time value of money.

Solution:

(a) The question indicates that a choice should be made between the following three alternatives :

(i) Close department K immediately.

(ii) Operate department K for a further year at 10,000 units.

(iii) Operate department K for a further year at 20,000 units.

The relevant information is presented in the following schedule:

Relevant cost savings & revenue	**Immediate closure (₹)**	**10,000 units (₹)**	**20,000 units (₹)**
Sales of production	—	90,000	1,60,000
Material B :			
Saving (2)	18,000	9,000	—
Sale (2)	5,000	—	—
Sale of machine (5)	43,000	35,000	30,000
Total revenue/savings	66,000	1,34,000	190,000
Relevant costs :			
Labour – Training	—	20,000	20,000
Variable costs	—	30,000	60,000
Material A – Disposal fixed cost (1)	2,000	2,000	2,000
Disposal variable cost (1)	15,000	10,000	5,000
Material B – Purchase cost (2)	—	—	10,000
Variable overhead (3)	—	13,000	26,000
Salary of foreman (4)	2,000	6,000	6,000
Advertising	—	—	15,000
Total relevant costs	19,000	81,000	144,000
Excess of savings and revenues over costs	47,000	53,000	46,000

Notes :

(1) Fixed costs of disposing of the materials are common to all alternatives. An alternative presentation is to exclude these fixed costs from the analysis. The disposal variable cost consists of the unused litres of material A for each alternative multiplied by ₹0.50 per litre.

(2) Immediate closure enables 10,000 units to be used as a substitute material thus saving ₹18,000. The remaining 5,000 units are sold to yield net revenue of ₹1 per unit. Production of 10,000 units will result in 5,000 unused units of material B. This results in a saving of substitute materials of ₹9,000 (5,000 x ₹1.80). Production of 20,000 units results in the stock of material B being used. It is also necessary to purchase 5,000 additional units at ₹2 per unit.

(3) Units produced x variable overhead rate of ₹1.30 per unit.

(4) Immediate closure requires that ₹2,000 be paid to the foreman compared with ₹6,000 if the department is not closed.

(5) Sales value new = ₹43,000

Sales value in one year = ₹40,000 – (₹0.50 x production level)

On the basis of the above information H Ltd. should operate the department at a level of 10,000 units for the coming year.

(b)

(i) The excess of savings and revenues over costs for the immediate closure will be increased by ₹8,000 to ₹55,000 (₹47,000 + ₹8,000). The immediate closure will now be the best action in terms of maximizing short term profits.

(ii) A 90% learning curve means that each time production doubles the average time taken to produce each unit fails to 90% of the previous average figure.

Average time per unit for 5,000 units = 1 hour

Average time per unit for 10,000 units = 0.9 hours

Average time per unit for 20,000 units = 0.81 hours

Revised labour cost for 10,000 units = ₹27,000 (10,000 x 0.9 hrs. x ₹3)

Revised labour cost for 20,000 units = ₹48,600 (20,000 x 0.81 hrs x ₹3)

The analysis in part (a) will be altered as follows:

	10,000 units (₹)	20,000 units (₹)
Labour costs without learning effect	30,000	60,000
Labour costs with learning effect	27,000	48,600
Reduction in labour costs	3,000	11,400
Revised net savings/revenue	56,000 (53,000 + 3,000)	57,400 (46,000 + 11,400)

H. Ltd. should now operate department K at 20,000 units activity during the coming year.

Illustration 35.

The management of W Ltd. which is now operating at 50% capacity expects that the volume of sales will drop below the present level of 5,000 units per month. The operating statement prepared for monthly sales shows:

	₹	₹
Sales (5,000 units at ₹ 3 per unit)		15,000
Less: Variable Costs at ₹ 2 per unit	10,000	
Fixed Overheads	5,000	15,000
Net Profit		Nil

It is proposed that the company should suspend production until market conditions improve. The General Manager estimated that a minimum of fixed cost (shut down costs) amounting to ₹2,000 would be necessary in any event. Advise Management at what level of sales it could think of suspending production. If the sales price is ₹2.80, what should be the level of sales for shut down decision?

Solution:

(i) **If selling price is ₹ 3 per unit**

$$\text{Shutdown Point} = \frac{\text{Fixed Cost} - \text{Shutdown Cost}}{\text{Contribution per unit}} \times \text{Selling price}$$

$$= \frac{5,000 - 2,000}{1} \times 3 = ₹9,000 \text{ or } 3,000 \text{ units}$$

Verification

	₹
Sales 3,000 units @ ₹ 3	9,000
Less: Variable Cost 3,000 units @ ₹ 2	6,000
Contribution	3,000
Less: Fixed Cost	5,000
Operating Loss	2,000

Operating Loss = Loss at Shutdown Point

(ii) **If selling price is reduced to ₹ 2.80**

$$\text{Shutdown Point} = \frac{5,000 - 2,000}{0.80} \times ₹2.80 = ₹10,500 \text{ or } 3,750 \text{ units}$$

Illustration 36.

Dry Twigs and Fresh Blossom Ltd. is always discarding old lines and introducing new lines of product and is at present considering three alternative promotional plans for ushering in new products. Various combination of prices, development expenditures and promotional outlays are involved in these plans. High, medium and low forecasts of revenues under each plan have been formulated; and their respective probabilities along with other relevant data are summarized as under:

₹ in lakhs

	Plan I	Plan II	Plan III
Budgeted Revenue with Probability:			
High	30 (.3)	24 (.2)	50 (.2)
Medium	20 (.3)	20 (.7)	25 (.5)
Low	5 (.4)	15 (.1)	0 (.3)
Variable cost as % of Revenue	60%	75%	70%
Initial investment	25	20	24
Life in years	8	8	8

The Company's cost of capital is 12%: the income tax rate is 40%. Investments in promotional programmes will be amortised by the straight line method. The company will have net taxable income in each year, regardless of successes or failure of new products. The present value of annuity of ₹ 1 at 12% for 8 years is 4.9676.

(a) Substantiating with figures make a detailed analysis and find out which of the promotional plans is expected to be most profitable.

(b) In the event the worst happened, which of the plans would result in maximizing profit.

Solution:

(a) **Statement Showing Profitability of Different Plans**

	Plan I	**Plan II**	**Plan III**
Budgeted Revenue Weighted by Probability:			
High	9,00,000	4,80,000	10,00,000
Medium	6,00,000	14,00,000	12,50,000
Low	2,00,000	1,50,000	-
Expected Revenue	17,00,000	20,30,000	22,50,000
Contribution as a % of Revenue	40%	25%	30%
Contribution	6,80,000	5,07,500	6,75,000
Less: Depreciation	3,12,500	2,50,000	3,00,000
Profit before tax	3,67,500	2,57,500	3,75,000
Less: Tax at 40%	1,47,000	1,03,000	1,50,000

Profit after Tax	2,20,500	1,54,500	2,25,000
Add: Depreciation	3,12,500	2,50,000	3,00,000
Average Annual Cash Inflows	5,33,000	4,04,500	5,25,000
P.V Factor at 12% for 8 years	4.9676	4.9676	4.9676
Present Value of Cash Inflows	26,47,731	20,09,394	26,07,990
Initial Investment	25,00,000	20,00,000	24,00,000
Net Present Value (NPV)	1,47,731	9,394	2,07,990
Profitability Index	1.059	1.005	1.087

Plan III has the highest Net present value and Profitability Index and hence, it is the most profitable

(b) **Computation of Maximum Loss Under Different Plans**

	Plan I	**Plan II**	**Plan III**
	₹	₹	₹
Revenue for low forecast	5,00,000	15,00,000	Nil
Contribution as a % of Revenue	40%	25%	30%
Contribution	2,00,000	3,75,000	Nil
Less: Depreciation	3,12,500	2,50,000	3,00,000
Profit before Tax	(1,12,500)	1,25,000	(3,00,000)
Less: Tax	(45,000)	50,000	(1,20,000)
Profit after tax	(67,500)	75,000	(1,80,000)
Add: Depreciation	3,12,500	2,50,000	3,00,000
Annual Cash Inflow	2,45,000	3,25,000	1,20,000
P.V Factor at 12% for 8 yrs	4.9676	4.9676	4.9676
P.V of cash Inflows	12,17,062	16,14,470	5,96,112
Initial Outlay	25,00,000	20,00,000	24,00,000
Net Present value	(12,82,938)	(3,85,530)	(18,03,888)

The above analysis shows that loss is the least under Plan II in case the worst happens and hence on this basis Plan II is the best.

Illustration 37.

An organisation manufactures a product, particulars of which are detailed below:

Annual production	20,000 units
Material cost	₹ 60,000
Other variable costs	₹ 1,20,000
Fixed cost	₹ 40,000
Total cost	₹ 2,20,000
Apportioned investment	₹ 2,00,000

Determine the unit selling price under each of the following strategies:

(i) 20% return on investment;

(ii) 30% mark-up based on total cost;

(iii) 20% profit on net sales price;

(iv) 15% profit on list sales when trade discount is 35%;

(v) 40% mark-up based on incremental cost;

(vi) 50% mark-up based on value added by manufacturer.

Assume that the organisation's tax rate is 52%.

Solution:

Let S be the sales revenue.

(i) 20% on investment

(S – 2,20,000) (1 – 0.52) = 0.20 x 2,00,000

S= 2,20,000 + 40,000/0.48 = 2,20,000 + 83,333.33 = 3,03,333.33

Selling Price per unit = S/20,000 = 3,03,333.33/20,000 = ₹15.17

(ii) 30% mark-up based on total cost:

Selling Price = 1.30 x 2,20,000/20,000 = 2,86,000/20,000 = ₹14.30

(iii) 20% profit on net sales price:

(S – 2,20,000) (1 – 0.52) = 0.20 × S

$$S = \frac{0.48 \times 2,20,000}{(0.48 - 0.20)} = \frac{1,05,600}{0.28} = 3,77,142.86$$

Selling Price = 3,77,142.86/20,000 = ₹18.86

(iv) 15% profit on list price with trade discount of 35%

(S (1 – 0.35) – 2,20,000) (1 – 0.52) = 0.15 S

(0.65 S – 2,20,000) 0.48 = 0.15 S

S = 1,05,600 / 0.162 = 6,51,851.85

Selling Price = 6,51,851.85/20,000

= ₹ 32.59 gross. ₹ 21.18 Net.

(v) 40% mark-up based on incremental cost.

Selling Price = [1.40 (60,000 + 1,20,000) + 40,000]/20,000 = 2,92,000/20,000 = ₹ 14.60

(vi) 50% mark-up based on value added by manufacture:

Value added by manufacture = 2,20,000 – 60,000 = 1,60,000

Value added with 50% mark-up + cost materials = S

S = 1.5 x 1,60,000 + 60,000 = 3,00,000

Selling Price = 3,00,000/20,000 = ₹ 15.00

Illustration 38.

A company has developed a new product which is about to launch on its local market.

The new product will be in competition with a large number of products from some twenty-five to thirty companies and particularly from one product selling at ₹ 65 per unit in quantities of 6,000 per month which represents some 30% of the potential market for this new product.

The company manufactures and sells other products, none of whose local market share is less than 5% or more than 35%. Prices in this local market have been fairly steady for some years.

The new product involves an advanced technology and is demonstratively better in performance and quality than its major competitor. The company believes that it has at least twelve to eighteen months before competitors could achieve a comparable quality of product.

The company estimates that its production costs for the new product will be

Direct material	₹ 12 per unit*
Direct labour	₹ 28 per unit*

The company estimates that its production departments, the following data apply:

Production Department	Unit measurement	Full Cost overhead rate	Normal monthly volume on which full overhead rate is based	Fixed and/ or allocated overhead in full overhead rate	Department time on new product
X	Machine hrs.	₹ 2.40	12,500	₹ 5,000	2.00
Y	Direct labour hrs.	₹ 1.80	15,000	₹ 6,000	1.50
Z	Direct labour hrs.	₹ 0.80	25,000	₹ 7,500	3.00

* All of these estimates are subject to an error of ± 10%

Selling and administration expenses for the new product are expected to be ₹ 20,000 per month and will be virtually unaffected by the price or sales level achieved by the new product.

The company generally sets its selling prices by adding mark-up on factory cost of between 30% and 45% mostly towards the upper end.

You are required to:

(a) advise, with brief explanations, what type of pricing strategy the company should adopt for its new product and

(b) recommend a selling price for the new product, with supporting figures, explaining briefly the reasons for your recommendations.

Solution:

(a) The company is in a position to make "innovated profits". This is because it is technically superior and market advantage is anticipated at twelve to eighteen months. The price can be set at a higher profit margin than normal since customers will (presumably) be prepared to pay a premium for the novelty and enhanced quality of the product. Competition is well disposed and should not be a threat in the early stages. The price charged could be high and progressively reduced when price elasticity of demand increases, capacity expands or competition increased.

The upper level for the price will be affected by—

(i) Any long-term damage to general reputation if customers consider that they are paying unduly high prices.

(ii) The larger the gap between cost and revenue the greater the incentive for competitors to catch up.

(iii) More reasonable prices in the introductory stage of the product life cycle may result in the long-term benefits in terms of company reputation.

(b) price to be set

Fixed overheads included in rates

Dept.	Fixed Overhead	Normal Capacity	Rate
X	₹ 5,000	12,500 machine hours	Re. 0.40 per machine hr.
Y	₹ 6,000	15,000 direct labour hours	Re. 0.40 per direct labour hours
Z	₹ 7,500	25,000 direct labour hours	Re. 0.30 per direct labour hours

Hence Variable overhead per hour are:

Dept.	Full cost element	Fixed rate (Re.)	Variable rate
X	₹ 2.40	0.40	₹ 2.00
Y	₹ 1.80	0.40	₹ 1.40
Z	Re. 0.80	0.30	Re. 0.50

There are additional fixed selling/ administration costs of ₹ 20,000 per month applicable to the new product, therefore, this should be substituted for the allowance for selling/administration costs included in the full cost overhead rate.

Cost estimate—per unit

	₹	₹
Direct materials		12.00
Direct labour		28.00
Overhead:		
Dept X: 2 hours @ ₹ 2.00	4.00	
Dept Y: 1.5 hours @ ₹ 1.40	2.10	

Dept Z: 3 hours @ Re. 0.50	1.50	7.60
		47.60
Add : 10% anticipated maximum error		4.76
Factory cost		52.36
Maximum mark-up 45% of factory cost		23.56
		75.92
Selling cost (on 1,000 units)		20.00
		95.92

The company's potential market is 6,000 unit per month which represents 30% of total potential market.

5% of potential sales will be 1000 per month and 35% of potential sales therefore 7,000 units per month.

Assuming maximum penetration of 7,000 units per month achieved, absorption rate would be (₹20,000/7,000) = ₹ 2.86 compared with ₹ 20 above. The price on this basis would be 75.92 + 2.86 = ₹ 78.78

Therefore a range between ₹ 79 and ₹ 96 recommended perhaps at ₹ 87 midway between these two prices.

Reasons for recommendation are—

(i) all costs would be absorbed even at medium sales

(ii) the range of prices is fairly wide allowing for rebate, promotion costs if necessary.

The price on normal basis would be:

	₹	₹
Direct material		12.00
Direct labour		28.00
Overhead:		
Dept. X (2 × ₹2.40)	4.80	
Dept. Y (1.50 × ₹1.80)	2.70	
Dept. Z (3.0 × Re. 0.80)	2.40	9.90
		49.90
Maximum mark-up (45%)		22.45
		72.35

This shows extra cost upto ₹14.65 (i.e. 87.00 - 72.35) is not unreasonable premium for the better performance and higher technology.

Illustration 39.

Y Ltd. is reviewing the price that it charges for a major product line. Over the past three years the product has had sales averaging 48,000 per year at a standard selling price of ₹ 525. Costs have been rising steadily over the past year and the Company is considering raising this price to 5.75 or ₹ 6.25. The sales manager has produced the following schedule to assist with the decision.

Price	₹ 5.75	₹ 6.25
Estimates of demand		
Pessimistic estimate (Probability 0.25)	35,000	10,000
Most likely estimate (Probability 0.60)	40,000	20,000
Optimistic estimate (Probability 0.15)	50,000	40,000

Currently the unit cost is estimated at ₹ 5.00 as follows:

	₹
Variable Costs	2.50
Direct Materials	1.00
Direct Labour	1.00
Overhead	
Fixed Costs Overhead	0.50
	5.00

The Company considers that the most likely value for unit Variable Cost over the next year is ₹ 4.90 (probability 0.75) but it could be as high as ₹ 5.20 (probability 0.15) and it might even be as low as ₹ 4.75 (probability 0.10). Total fixed costs currently are ₹ 24,000 p.a. but it is estimated that the corresponding total for the coming year will be:

₹ 25,000 with a probability of 0.2

₹ 27,000 with a probability of 0.6

₹ 30,000 with a probability of 0.2

(Demand quantities, unit costs and fixed costs can be assumed to be statistical independent).

Analyse the foregoing information in a way which you consider will assist management with the problem, give your views on the situation and advise on the new selling price. Calculate the expected level of profit that would flow from the selling price that you recommend.

Solution:

Possible contribution		**New price**	
		₹ 5.75	₹ 6.25
	Probability	₹	₹
Most likely	0.75	0.85	1.35
High	0.15	0.55	1.05
Low	0.10	1.00	1.50
	1.00		

Incorporation this with given estimates of demand we have :

At ₹ 5.75 selling price

Demand	**Probability of Demand**	**Alternative contribution per unit**	**Contribution probability**	₹
35,000	0.25	0.85	0.75	5,578
		0.55	0.15	722
		1.00	0.10	875
40,000	0.60	0.85	0.75	15,300
		0.55	0.15	1,980
		1.00	0.10	2,400
50,000	0.15	0.85	0.75	4,781
		0.55	0.15	619
		1.00	0.10	750
		Expected contribution		33,005

At ₹ 6.25 selling price

Demand	Probability of Demand	Alternative contribution per unit	Contribution probability	₹
10,000	0.25	1.35	0.75	2,531
		1.05	0.15	394
		1.50	0.10	375
20,000	0.60	1.35	0.75	12,150
		1.05	0.15	1,890
		1.50	0.10	1,800
40,000	0.15	1.35	0.75	6,075
		1.05	0.15	945
		1.50	0.10	900
		Expected contribution		27,060

Overheads

Alternative Forecasts	Probability	Expected value
₹		₹
25,000	0.20	5,000
27,000	0.60	16,200
30,000	0.20	6,000
		27,200

So expected profit will be

₹ (33,005 – 27,200) = ₹ 5,805 at the ₹ 5.75 price

₹ (27,060 – 27,200) = ₹ (140) at the ₹ 6.25 price.

The above calculation suggests that the ₹ 5.75 selling price should be adopted. This is dependent upon management's attitude to risk, since our analysis is based upon expected values the firm may be prepared to take the high risk involved in attempting to make higher profits from favourable combination at the ₹ 6.25 price.

Illustration 44.

The Park Institute of Correspondence Studies teaches wholly through the correspondence method. This is done by the production of self-study packs which enables students to prepare for professional qualifications.

Each courses of study was sold at the price of ₹15/- last year and a total of 10,000 units were produced and sold. The production costs of the various courses offered by the Institute are the same.

The variable cost of producing a study course last year was:

	₹
Direct Materials	5.00
Direct Labour	6.00
Other direct costs (mainly postage)	0.60
Variable overheads	0.40
Total variable cost	12.00

The fixed overhead for the Institute during the year was ₹20,000/-

During the coming year the costs of the organisation are expected to increase by the following:

	%
Direct Materials	20.00
Direct Labour	16.67
Other direct costs	67.00
Variable overhead	25.00
Fixed overhead	5.00

Market research has shown that when the Institute increases the price of its courses to its students, as long as the increase is kept below 17.5% this is unlikely to have an effect on the number of units sold. However, for every 1% rise in price above a 17.5% increase, the number of units sold can be expected to fall by 2%.

For the coming year you are required to find out:

(a) The selling price of the study courses if the number of study courses sold and the annual profits are to remain as before.

(b) The number of units that the organisation would have to sell if it did not change the price charged for these, but maintained the profit level attained in the previous year.

(c) A brief analysis of a situation where, when prices are changed, the number of units sold is affected. The data provided in the above can be used to illustrate your analysis.

Solution:

(a) Total profit made last year = Contribution – Fixed costs

Contribution per unit = ₹15 –12 = ₹3/-

	₹
Total contribution (₹10,000 x ₹3)	30,000/-
Less: Fixed cost	20,000/-
Profit	10,000/-

New Variable cost:		
Material	5 x 1.2	6.00
Labour	6 x 1.1667	7.00
Other direct costs	0.60 x 1.67	1.00
Variable overhead	0.40 x 1.25	0.50
		14.50

Net contribution required = Profit + Fixed Costs

= ₹10,000 + (₹20,000 x 1.05)

= ₹31,000/-

₹ 31,000 ÷ 10,000 units = ₹ 3.1/unit

∴ The selling price = Variable cost + Contribution

= ₹14.50 + ₹3.10 = ₹17.60

This is an increase of ₹2.60 on the previous price of ₹15/-, i.e. a 17.33% increase, which is below 17.5%, the threshold above which price elasticity of demand becomes relevant.

(b) Number of units to be sold = $\frac{\text{Fixed costs + profit}}{\text{Contribution/unit}} = \frac{\text{Fixed costs + profit}}{\text{Old selling price - New variable cost}}$

$= \frac{₹21,000 + ₹10,000}{₹15 - ₹14.50} = 62,000$ units

(c) Price elasticity of demand is the responsiveness of quantity demand of goods or services to any change in prices.

When quantity demanded increases less than proportionately as price falls, causing total revenue to decrease, the product is described as inelastic.

However, when quantity demanded increase more than proportionately to decreases in price, causing total revenue to increase, the product is called elastic, e.g.

A 17.5% price increase on ₹15 = ₹17.625

If the price charged is slightly below this figure, say ₹17.62, then there is no effect on demand and total revenue = 10,000 units on ₹15 = ₹17.77, quantity demanded crops by 2% from 10,000 to 9,800 units. Total revenue = 9,800 units x ₹17.77 = ₹1,74,146, i.e., product is inelastic.

Price elasticity of demand is an integral part of a firm's policy.

Illustration 41.

A company manufactures Product M in addition to other products by using the same machines in Department A and B. The cost data are as under:

Direct Material	P 4 kg @ ₹ 6/- per kg used in Dept. A
	Q 8 kg @ ₹ 2.50 per kg added in Dept. B
Direct Labour	2 Hours @ ₹ 4/- per hour in Dept. A
	3 Hours @ ₹ 3/- per hour in Dept. B

Overheads:

Basic of overheads recovery	**Dept. A per rupee of direct material P** ₹	**Dept. B per direct labour hour** ₹
Recovery rates at 8% of practical capacity		
Variable	0.80	2.00
Fixed	2.20	3.00
Depreciation component of fixed overhead rate	0.80	0.10
Other relevant data :		
Net plant and equipment value	70,00,000	1,20,000
Total depreciation per month	80,000	1,000

The working capital requirement of product M based on a target volume of output of 1,000 units per month is estimated at ₹ 1,24,000 per annum.

Required

(A) Indicate the bottom line selling price of Product M assuming that :

(i) Price is adequate to ensure contribution equivalent to 30% on investment made.

(ii) The product is a new product about to be introduced in the market.

(B) Calculate the selling price in a situation where Product is well established in the market so as to yield return of 18% on investment.

Solution:

		Dept. A ₹		**Dept. B** ₹	**Total**
Direct Material: P	4 × 6	24			24.00
Q			8 × 2.50	20	20.00
Direct Labour	2 ×4	8	3 × 3	9	17.00
Variable overheads	24 × 0.8	19.20	3 ×2	6	25.20
Total variable costs					86.20
Fixed overheads	24 × 2.20	52.80	3 × 3	9	61.80
Total Cost					148.00
Net fixed assets		70,00,000		1,20,000	
Depreciation p.a.		9,60,000		12,000	
Depreciation per unit of Product M		24 × 0.8 = 19.20		3 × 0.10 = 0.30	
Net Fixed assets Employed for 12,000 Units of production p. a.		70,00,000 ÷ 9,60,000 × 19.20 × 12,000 = ₹16,80,000		1,20,000 ÷ 12,000 × 0.30 × 12,000 = ₹ 36,000	

Total net fixed assets for 'M'	16,80,000 + 36,000	17,16,000
Working capital		1,24,000
Total assets employed		18,40,000

(A) **Bottom line selling prices**

Contribution equivalent to 30% on investment = $18,40,000 \times \frac{30}{100} = 5,52,000$

Contribution per unit $= \frac{5,52,000}{12,000} = ₹46$

Price

(i) To ensure contribution equivalent to 30% ROI Variable cost + contribution ₹132.20
86.20 + 46.00

(ii) When the product is new to be introduced Minimum to cover variable costs ₹86.20

(B) **For product well established in market and to yield 18% ROI of ₹ 18.40 lakhs :**

$$\text{Selling Price} = \text{Full cost + ROI} = 148 + \frac{18,40,000}{12,000} \times 0.18$$

$$= ₹\ 148 + ₹\ 27.60$$
$$= ₹\ 175.\ 60$$

Illustration 42.

P.H Ltd. manufactures Product 'S' in departments A and B which also manufactures other products using the same machines. The particulars per unit of the Product 'S' are as under:

Direct Materials :	M 8 kg. at ₹3 per kg. used in Dept. A	
	P 4 kg. at ₹5 kg. used in Dept. B	
Direct Labour:	2 hours at ₹12 per hours in Dept. A	
	3 hours at ₹10 per hour in Dept. B	
Overheads :	Dept A	Dept. B
Methods of Recovery	Direct Labour Hours	Direct Labour Hours
Overheads Rates		
Fixed	₹6.00 per hour	₹3.00 per hour
Variable	₹5.00 per hour	₹2.00 per hour
Value of Plant & Machinery	₹16 lacs	₹8 lacs

Variable selling and distribution overheads relating to Product 'S' amount to ₹20,000 per month. The product requires a Working Capital of ₹3,00,000 at the target volume of 1,000 units per month occupying 25% of the practical capacity.

Required:

(i) Using the return on investment pricing formula, find the price of Product 'S' to yield a contribution to cover 24% rate of return on investment.

(ii) If product 'S' is a well established product in the market, what should be the basis of fixation of Price. Set the minimum price of that basis.

(iii) If product 'S' is a new product about to be launched in the market, what should be the basis of fixation of price. Set the minimum price on that basis.

Solution:

PH LTD.

Statement showing pricing formula under different parameters

(i) Basis of Return on Investment formula

		₹
Direct Materials: M	8 kg. x 3	24.00
P	4 kg. x 5	20.00
Direct Labour: Department A	2 hrs. x 12	24.00
Department B	3 hrs. x 10	30.00
Variable overheads: Department A	2 hrs. x 5	10.00
Department B	3 hrs. x 2	6.00
Variable selling and distribution overheads	20,000 ÷ 1,000	20.00
Total Variable costs		134.00

Total hours for 1,000 units/month

Dept.	A	1,000 × 2	2,000
	B	1,000 × 3	3,000
			5,000 = 25% capacity

$\therefore$ 100% capacity = $\frac{5,000}{25} \times 100$ = 20,000 hrs. per month

= 2,40,000 hrs per annum

Fixed capital employed Dept.	A	₹16,00,000
	B	₹8,00,000
		₹24,00,000

Return @ 24% = 24,00,000 × $\frac{24}{100}$ = ₹5,76,000

Contribution per hr. $\frac{5,76,000}{2,40,000}$ = ₹2.40

Working capital 3,00,000

Return @ 24% = 3,00,000 × $\frac{24}{100}$ = ₹72,000

$\frac{72,000}{12,000}$ = ₹6 per unit

Total contribution

	₹
Fixed capital 5 hrs x 2.40	12.00
Working capital	6.00
Total	18.00

Selling price = VC + C = 134 + 18 = ₹ 152 per unit.

(ii) Basis that the product is well established

	₹
Variable cost	134.00
Fixed costs :	
Dept. A 2 hrs × 6	12.00
B 3 hrs × 3	9.00
Total	155.00

If the product is well established, the total cost should form the basis for price fixation.

Minimum price ₹155 per unit.

(iii) Basis that product is a new launch

If the product is a newly introduced product, variable cost should form the basis for price fixation.

Minimum price ₹134 per unit.

Illustration 43.

A company has developed two types pocket T.V. sets operated on battery and having liquid crystal display. Model 'Sunny' is having single channel and model 'Delux' is having multi-channels. The management of the company asked their accountant to recommend prices for these new products which will fetch a margin of 20% on selling price. The accountant has collected following data for 1st year of production.

	Sunny	Delux
(1) Maximum Production and Sale/units	2,500	1,500
(2) Variable Cost per unit ₹:		
Direct Materials	300.00	500.00
Direct Labour	100.00	200.00
(3) Attributable fixed overheads ₹ lakh	2.50	3.00
(4) Labour Hours per units	20.00	40.00
(5) Machine Hours per unit	30.00	15.00

The marketing department is contemplating to sell the entire output produced during the year. The other common fixed overheads relating to these products are ₹8.58 lakhs p.a. The management wants to have a statement of costs, revenue and profit for both the products. The accountant, accordingly prepared two statements, one with common fixed costs absorbed on labour hour basis and another with common fixed costs absorbed on machine hour basis. However, he is not able to decide as to which one is correct for deciding price of the products.

Required:

(a) Present the statement showing annual costs, reven ue and profit for each product using both the bases that were used by the accountant for absorbing common fixed overheads.

(b) Which set of prices would you recommend?

(c) Do you think that cost plus pricing decision is valid for a newly developed product?

Solution:

(a) Statement showing cost, revenue and profits

	Basis of Recovery			
	Labour hour		Machine hour	
	Sunny	Delux	Sunny	Delux
Products and sale units	2,500	1,500	2,500	1,500
	Figures in ₹ lakhs			
Variable costs:				
Direct material	7.50	7.50	7.50	7.50
Direct Labour	2.50	3.00	2.50	3.00
Attributable fixed cost	2.50	3.00	2.50	3.00
Common fixed overheads	3.90	4.68	6.60	1.98
Total cost	16.40	18.18	19.10	15.48
Cost and profit per unit	₹	₹	₹	₹
Cost per unit	656	1,212	764	1,032
Profit 20%	164	303	191	258
Selling price per unit	820	1,515	955	1,290

Working of common fixed costs:

	Labour hour	Machine hour
Hours of Sunny	50,000	75,000
Hours of Delux	60,000	22,500
Total hours	1,10,000	97,500
Total common fixed overheads	8,58,000	8,58,000
Rate per hour (₹)	7.80	8.80
Recovery per unit: Sunny (₹)	156.00	264.00
Delux (₹)	312.00	132.00

(a) The price arrived based on the two bases of absorption i.e. labour and machine hour rates show wide variation. If the demand for both the products is stable, then the total revenue or profit based on any one of those methods will remain same. However, in case the demand is fluctuating, the pricing has to be based on maximum volume saleable or based on maximum contribution per labour hour per machine hour whichever is higher.

(b) There are advantages and disadvantages of cost plus pricing. The advantages are:

(i) It is consistent with absorption cost methods,

(ii) Price justification is possible while dealing with customers,

(iii) No need for forecasting of demand,

(iv) Costs incurred are fully recovered.

One has to be weight the merits and demerits of the method while pricing the product in the market first time.

Illustration 44.

A company manufactures three products from an intermediate produced in its own plant. The downstream units at full capacity operations requires one lakh kilos of intermediate. However, in view of certain constraints, this output would be affected by 25%. Intermediate is charged to user divisions at ₹ 10 per kilo inclusive of its variable cost of ₹ 8 per kg.

Following particulars are furnished:

Downstream	A	B	C
Capacity (kgs.)	60,000	40,000	20,000
Intermediate required (kgs.)	66,000	20,000	14,000
Variable cost (₹ /kgs.)	14	8	9
Fixed cost (₹ /kgs.)	3	5	3
Profit (₹ /kgs.)	3	2	4
Total Price (₹ /kgs.)	20	15	16

It is further given that:

(i) Constraints would prevail throughout the year and no other arrangement is possible to meet shortage;

(ii) Company had an opening stock of 7,500 kgs. and minimum stock of 2,500 kgs. has to be maintained in any case; and

(iii) For economic operations plants have to be operated at a minimum of 70% capacity.

Required:

(1) To suggest the most profitable mix.

(2) To compute the loss suffered as a result of main plant operating at 75% capacity and

(3) To refix the price of the products so as to retain the same profit.

Solution:

(1)

Production	**A**	**B**	**C**
Full capacity (kgs)	60,000	40,000	20,000
Intermediate Required (kgs)	66,000	20,000	14,000
Consumption factors	1.10	0.50	0.70
Contribution (₹ /Kgs.)	6.00	7.00	7.00
Contribution per kilo of intermediate (₹ / kg.)	5.45	14.00	10.00
Ranking	III	I	II
Requirement of intermediate for Minimum operating capacity 70%	46,200	14,000	9,800
Total at minimum	70,000 kgs		

As against this, quantity available is —

(a)	From opening inventory	5,000 kgs.
(b)	From production @ 75% capacity	75,000 kgs.
	Total	80,000 kgs.

For product mix quantity available is 10,000 kgs.

On the basis of ranking this has firstly to be used in B. For balance 30%, B would require 6,000 kgs. of intermediate, leaving balance of 4,000 kgs. would be used in C to get a production of 5,714 kgs.

Optimum product mix as under —

A (minimum of 70%)		42,000 kgs.
B (max capacity)		40,000 kgs.
C minimum of 70%	14,000 kgs.	
Plus additional as above	5,714 kgs.	19,714 kgs.

(2) Computation of losses

(a) Loss of contribution on finished production :

A 18,000 kgs. @ ₹ 6	₹ 1,08,000
C 286 KGS. @ ₹ 7	₹ 2,002
Total (a)	₹ 1,10,002

(b) Loss of contribution of intermediate

Capacity		1,00,000 kgs
Production loss	25%	25,000 kgs.
Total Cost		₹10/kgs
Variable Cost	₹	8 / kg
Contribution	₹	2 / kg
On 25,000 kg	₹	50,000

Loss would therefore be ₹ 1,10,002 plus ₹ 50,000 = ₹ 1,60,002

(3) Revision of prices

Loss as above	₹ 1,60,002
Total intermediate used	80,000 kgs
Loss per kg.	₹ 2

This will be recovered on the basis of consumption norms. Price revision would be as under:

	Existing Price	Increase ₹ /Kg.	Total
A	20	2.20	22.20
B	15	1.00	16.00
C	16	1.40	17.40

Illustration 45.

The financial controller of ACE Ltd. has prepared the following estimates of working results for the year ended 31st March, 2013:

Direct Material	(₹/unit)	16.00
Direct Wages	(₹/unit)	40.00
Variable Overheads	(₹/unit)	12.00
Selling Price	(₹/unit)	125.00
Fixed Expenses	(₹)	6,75,000 per annum
Sales	(₹)	25,00,000 per annum

During the year 2013-14, it is expected that the material prices and variable overheads will go up by 10% and 5% respectively. As a result of re-engineering of business processes, the overall direct labour efficiency will increase by 12%, but the wage rate will go up by 5%. The fixed overheads are also expected to increase by ₹1,25,000.

The Vice-President-Manufacturing states that the same level of output as obtained in 2012-13 should be maintained in 2013-14 also and effort should be made to maintain the same level of profit by suitably increasing the selling price.

The Vice-President-Marketing states that the market will not absorb any increase in the selling price. On the other hand, he purposes that publicity involving advertisement expenses as given below will increase the quantity of sales as under:

Advertisement expenses (₹)	80,000	1,94,000	3,20,000	4,60,000
Additional unit of sales	2,000	4,000	6,000	8,000

Required:

(a) Present an income statement for 2013-14.

(b) Find the revised price and the percentage of increase in the price for 2013-14, if the views of the Vice-President-Manufacturing are accepted.

(c) Evaluate the four alternative proposals put forth by the Vice-President-Marketing. Determine the best output level to be budgeted and prepare an overall income statement for 2012-13 at the level of output.

Solution:

Working Notes:

(1) **Number of units produced and sold for the year ended on 31st March, 2013**

$$= \frac{\text{Total sales revenue upto 31st March, 2013}}{\text{Selling price p.u.}} = \frac{₹\ 25,00,000}{125\ \text{p.u.}} = 20,000\ \text{units}$$

(2) **Statement of variable cost per unit**

Year	2012-13 ₹	2013-14 ₹
Direct Material	16	17.60 (₹16+10%×₹16)
Direct Wages	40	37.50 (₹40×100/112×105/100)
Variable overheads	12	12.60 (₹12+5%×₹12)
Variable cost per unit	68	67.70

(3) **Contribution per unit during 2013-14**

= selling price per unit-Variable cost p.u. = ₹125 - ₹67.70= ₹57.30

(4) **Profit in 2012-13**

Contribution per unit = S.P-V.C= ₹125-₹68=₹57 p.u.

		(₹)
Total contribution	(20,000 unit×₹57 p.u)	11,40,000
Less: Fixed expenses		6,75,000
profit		4,65,000

(a) Income statement for the year 2013-14

		(₹)
Sales revenue	(20,000 units ×₹125)	25,00,000
Less: Variable cost	(20,000 units ×₹67.70)	13,54,000
Total contribution		11,46,000
Less: Fixed expenses		8,00,000
Profit		3,46,000

(b) Statement for determining revised price and percentage of increase in the price for 2013-14 based on views of Vice-President-Manufacturing

		(₹)
Variable cost	(20,000 unit ×₹67.70)	13,54,000
Fixed expenses		8,00,000
Profit		4,65,000
Desired sales revenue		26,19,000
Revised selling price (per unit)	(₹26,19,000/20,000 units)	130.95

$$\text{Percentage increase in selling price} = \frac{₹\ 130.95 - ₹\ 125}{₹\ 125} \times 100 = 4.76\%$$

(c) Evaluation of four alternative proposals of Vice-President-Marketing (₹)

Additional units of sales:	2,000	4,000	6,000	8,000
Total contribution	1,14,600	2,29,200	3,43,800	4,58,400
	(2,000 units ×₹57.30)	(4,000 units ×₹57.30)	(6,000 units ×₹57.30)	(8,000 units ×₹57.30)
Advertisement expenses	80,000	1,94,000	3,20,000	4,60,000
	34,600	35,200	23,800	(1,600)

Evaluation of four alternatives: Since the additional profit is maximum at the additional sales of 4,000 units, therefore the second alternative is adjudged as the best out of the four alternatives proposed by the Vice- President –Marketing. Hence the concern should produce and sell 24,000 units during the year 2013-14.

Overall Income Statement for 2013-14

Output and sales			24,000 units
Sales revenue	(24,000 units ×₹125)		30,00,000
Less: Variable cost	(24,000 units ×₹67.70)		16,24,800
Contribution			13,75,200
Less: Advertisement expenses		1,94,000	
Fixed expenses		8,00,000	9,94,000
Profit			3,81,200

Illustration 46.

Somesh of Agra presently operates its plant at 80% of the normal capacity to manufacture a product only to meet the demand of Government of Tamil Nadu under a rate contract.

He supplies the product for ₹4,00,000 and earns a profit margin of 20% on sales realizations. Direct cost per unit is constant.

The indirect costs as per his budget projection are:

Indirect costs	20,000 units (80% capacity) (₹)	22,500 units (90% capacity) (₹)	25,000 units (100% capacity) (₹)
Variable	80,000	90,000	1,00,000
Semi-Variable	40,000	42,500	45,000
Fixed	80,000	80,000	80,000

He has received an export order for the product equal to 20% of its present operations. Additional packing charges on this order will be ₹1,000.

Arrive at the price to be quoted for the export order to give him a profit margin of 10% on the export price.

Solution:

Computation of Direct Cost

		per Unit (₹)
Selling price	(₹4,00,000/20,000 units)	20
Less: Profit Margin	(@ 20% on selling price i.e, on ₹20)	4
Total Cost		16
Less: Indirect costs	(₹2,00,000/20,000 units)	10
Direct Cost		6

Statement showing differential cost for production of additional 4,000 units

Production Units	Present 20,000	Proposed 24,000	Differential 4,000
	(₹)	(₹)	(₹)
Direct Cost (@₹6 per unit)	1,20,000	1,44,000	24,000
Indirect costs:			
Variable cost (@₹4 per unit)	80,000	96,000	16,000
Semi-variable	40,000	44,000	4,000
Fixed	80,000	81,000	1,000
Total costs	3,20,000	3,65,000	45,000

Quotation for the Export Order (with a desired profit of 10% on Export price)

	(₹)
Differential cost	45,000
Add: Profit (10% of Export price or 1/9th of cost)	5,000
Export Price to be quoted	50,000

Export Price to be quoted per unit = ₹50,000/4,000 units = ₹12.50

Illustration 47.

A company has finished the following cost data :

	₹/unit
Direct Materials	11.20
Direct wages	3.00
Variable overheads	0.80
Fixed factory overheads	₹ 6,60,000 p.a.
Fixed Selling and Administration overheads	₹ 3,60,000 p.a.
Annual sales	4,00,000 units
Capital employed in fixed assets	₹ 9,00,000

Capital employed in current asset 50% of sales

Determine the selling price per unit to yield 20% return on capital employed.

Solution:

Capital employed = Fixed Assets + current Assets = ₹ 9,00,000 + 50% of sales.

Profit = 20% of capital employed.

= 0.2 (9,00,000 + 50% of sales) = 1,80,000 + 10% of sales

	₹
Variable cost = 4,00,000 × 15	60,00,000
Fixed costs 6,60,000 + 3,60,000	10,20,000
Total costs	70,20,000

Sales = cost + profit = 70,20,000 + 1,80,000 + 10% of sales

∴ 90% of sales = 72,00,000

100% of sales $= \frac{72,00,000}{90} \times 100 =$ ₹ 80,00,000

Selling Price $= \frac{80,00,000}{4,00,000} =$ ₹ 20 per unit

Illustration 48.

A company has prepared the following budget for the year:

	Levels of activity	
	60%	**80%**
	₹	₹
Raw materials	30,00,000	40,00.000
Direct wages	18,00,000	24,00,000
Factory overheads	32,00,000	36,00,000
Total	80,00,000	1,00,00,000

The policy of the company is to charge 25% on variable costs to cover profit.

Raw material is in short supply and the company wants to utilise its available supply of raw materials in an optimum manner. Planned operating capacity is 80%.

The company has to execute a job as per details given below:

Raw materials	₹40,000
Direct wages	₹30,000

You are required to quote the price of the job in accordance with the policy of the company.

Solution:

Segregation of overheads into fixed and variable:

	Activity	Overheads
	80%	36,00,000
	60%	32,00,000
Difference	20%	4,00,000
or, for	1%	20,000 (V)

At 80% activity, the variable cost would have been 80 x 20,000 = ₹16,00,000, but the total costs at 80% level is ₹36,00,000. Hence the fixed cost are (₹36,00,000 – ₹16,00,000) i.e. ₹20,00,000.

Variable overhead as % of direct wages 16,00,000/24,00,000 x 100 = $6\frac{2}{3}\%$

At 80%:	₹
Direct materials	40,00,000
Direct wages	24,00,000
Variable overheads	16,00,000
Total variable cost	80,00,000
Profit 25% of ₹ 80,00,000	20,00,000

Contribution = Fixed costs + Profit = 20,00,000 + 20,00,000 = ₹40,00,000

Raw material is in short supply:

Contribution /Raw materials = ₹40,00,000 /₹40,00,000 = 100%

Product pricing -

	₹
Direct materials	40,000
Direct labour	30,000
Variable overhead 66 2/3% of direct wages	20,000
Contribution 100% of direct materials	40,000
Selling price	1,30,000

Illustration 49.

A manufacturer has three products A, B and C. Currently sales, cost and selling price details and processing time requirement are as follows:

Particulars	**Product A**	**Product B**	**Product C**
Annual Sales (units)	6,000	6,000	750
Selling price (₹)	20	31	39
Unit cost (₹)	18	24	30
Processing time required per unit (Hrs.)	1	1	2

The firm is working at full capacity (13,500 processing hours per year). Fixed manufacturing overheads are absorbed into unit costs by a charge of 200% of variable costs. This procedure fully absorbs the fixed manufacturing overhead.

Assuming that:

(I) Processing time can be switched from one product line to another.

(II) The demand at current selling price is

Product A	Product B	Product C
10,000 units	8,000 units	2,000 units

(III) The selling prices are not to be altered.

You are required to calculate, the best production programme for the next operating period and to indicate the increase in net profit that this should yield. In addition identify the shadow price of processing hour.

Solution:

Given that the fixed manufacturing costs are absorbed into the unit costs by charge of 200% of variable cost. It, therefore, means that variable cost is one third of total unit cost.

Computation of contribution per processing hour

	Product A	**Product B**	**Product C**
Selling price	20	31	39
Variable cost	6	8	10
Contribution per unit	14	23	29
Processing per unit (Hrs)	1	1	2
Contribution per processing hour	14	23	14.50
Ranking	3	1	2

Computation of contribution as per existing programme

Product	**Output**	**Hours used**	**Contribution (₹)**
A	6,000	6,000	84,000
B	6,000	6,000	1,38,000
C	750	1,500	21,750
			2,43,750

Computation of contribution as per optimal programme

Product	**Output**	**Hours used**	**Contribution (₹)**
B	8,000	8,000	1,84,000
C	2,000	4,000	58,000
A	1,500	1,500	21,000
			2,63,000

The above analysis shows that contribution and profit will increase by ₹19,250 (i.e, ₹2,63,000-₹2,43,750) if the optimal production programme is implemented.

An additional hour of processing would be used to increase the production of Product A by one unit. This will increase contribution by ₹14. Hence, the shadow price (or opportunity cost) of one scare processing hour is ₹14.

Illustration 50.

Megatron Ltd. has entered into a collaboration agreement with Kozuki of Japan for import of TV Kit in completely knocked down (CKD) condition. The terms of agreement are as under:

(a) Megatron will import 40% items by value (in terms of FOB price of complete T.V. set) and balance 60% will be locally manufactured / purchased.

(b) For all non-standard items which are to be produced locally, Kozuki will provide drawings.

(c) Megatron will pay a lump sum of ₹30 lakh for supply of technical know-how and drawing.

(d) Megatron will also pay a royalty at 10% of selling price fixed by it for sale in the local market less landed cost of imported Kit, less cost of standard items purchased locally.

(e) Megatron will send a six monthly return to Kozuki showing No. sets sold, sale value, standard components costs, landed cost of CKD, etc.

Considering the above terms and additional information given below, calculate the selling price that should be fixed for local sale so as to get 20% profit on selling price (Round off the answer to nearest rupee).

(a) Agreement expires on production of 3 lakhs sets.

(b) FOB price quoted is 1,20,000 yen.

(c) Insurance and freight ₹ 200 per CKD.

(d) Customs Duty at 140% of CIF price. However, effective rate of duty is only 40% as per Government notification.

(e) Estimated cost of 60% items to be manufactured/procured locally, will be 1.5 items as compared to cost of manufacture by Kzuki. The quoted price by Kozuki contains 20% margin on cost.

(f) The ratio of standard and non-standard parts is 2:3 (in terms of rupee value).

(g) Assembling and other overhead costs will be ₹1,000 per set.

(h) Exchange rate is ₹5 per 100 yen.

Solution:

Computation of landed cost of CKT kit:

FOB price		Yen 1,20,000
		₹
FOB price in rupees	(1,20,000/20)	6,000
FOB price of import content	6,000 x 40%	2,400
(+) Freight & insurance		200
CIF value		2,600
(+) Customs duty @40%		1,040
Landed cost of imported CKD kit		3,640

Cost estimate of locally manufactured items:

		₹
FOB price of local purchase	6,000 x 60%	3,600
(-) Profit	3,600 x (1/6)	600
		3,000
Cost of in business manufacture:	3,000 x 1.50	4,500
Cost of standard part	[4,500 x (2/5)]	1,800
Non- standard part	[4,500 x (3/5)]	2,700

Computation of cost & selling price:

		₹
Landed cost of imported CKD kit		3,640
Cost of indigenous manufacture		4,500
Assembling and other OHs costs		1,000
Cost of technical know – how	(30,00,000/3,00,000)	10
		9,150
(+) Royalty		685
		9835
(+) Return	[9835 x (1/4)]	2,459
Selling price		**12,294**

Working notes:

Let X be the selling price

$\Rightarrow$ 9,150 + (X – 3,640 – 1,800) 10% + X (1/5) = X

$\Rightarrow$ X = ₹ 12,294/-

Illustration 51.

In a purely competitive market, 10,000 pocket transistors can be manufactured and sold and a certain profit is generated. It is estimated that 2,000 pocket transistors need be manufactured and sold in monopoly market to earn the same profit;

Profit under both the conditions is targeted at ₹2,00,000. The variable cost per transistor is ₹100 and the total fixed cost is ₹37,000.

You are required to find out the unit selling price both under monopoly and competitive conditions.

Solution:

Under Monopolistic Conditions

Suppose x is the selling price per unit

Sale = 2,000x

Variable cost = 2,000 × ₹100 or, ₹2,00,000

Fixed cost = ₹37,000

Desired profit = ₹2,00,000

$\therefore$ Sales – Variable cost = Fixed cost + Desired profit

or, 2,000x-2,00,000 = 37,000+2,00,000

or, x = (4,37,000÷2,000) or, ₹218.50 per unit

Under Competitive Conditions

Suppose y is the selling price per unit

Sale = 10,000y

Variable cost = 10,000 × ₹100 or, ₹10,00,000

Fixed cost = ₹37,000

Desired profit = ₹2,00,000

∴ Sales – Variable cost = Fixed cost + Desired profit

or, 10,000y-10,00,000 =2,37,000

or, y = (12,37,000÷10,000) or, ₹123.70 per unit

(1) Under monopolistic conditions selling price per unit is ₹218.50.

(2) Under competitive conditions selling price per unit is ₹123.70.

Illustration 52.

You have just taken up the position as the first full-time accountant for a jobbing engineering company. Previously the accounting work had been undertaken by the company's auditors who had produced the following summarised profit and loss statement for the financial year which ended on 31st March of this year:

	₹	₹	₹
Sales			24,00,000
Direct material		10,00,000	
Direct labour-Grinding Dept.	2,00,000		
Direct labour-Finishing Dept.	2,60,000	4,60,000	
Production overhead-Grinding	1,75,000		
Production overhead-Finishing	2,08,000	3,83,000	
Administration costs		1,18,500	
Selling costs		1,92,000	21,53,500
Net profit			2,46,500

The sales manager is currently negotiating a price for an inquiry for a job which has been allotted number '878' and he has been given the following information by his staff:

Preferred price to obtain a return of $16\frac{2}{3}$ % on selling price	₹22,656
Lowest acceptable	₹18,880

These prices have been based on the following estimated costs for proposed job no. '878':

	₹	₹
Direct material		9,000
Direct labour-Grinding Dept. 400 hours @ ₹ 5	2,000	
Direct labour-Finishing Dept. 300 hours @ ₹ 6	1,800	3,800
		12,800
Add: 47.5% to cover all other costs		6,080
Total cost		18,880

The sales manager seeks your advice about the validity of the method he is using to quote for job '878'.

The company is currently busy with a fairly full order book but the Confederation of British Industry has forecast that a recession is imminent for the engineering industry.

You are required to criticise the method adopted for estimating the costs which are used as the basis for quoting prices for jobs and to suggest a better method of estimating job costs and to calculate a revised job cost and price based on the information available.

Solution:

The predominant mistake in estimating cost for the job is the application of absorbing all types of Over Heads. It is the general practice to recover production overhead on the basis of Overhead rate for Direct Labour Hour of the department, to recover Administration Over Head at certain percentage on Factory Cost and to recover selling Over Heads as percentage of Cost of production.

In view of the above, the major mistake is recovery of Over Head at a flat rate of 47.5%. If the cost is estimated on the above lines the revised job cost and price for job No. 878 would be as follows:

Labour Hours as per Profit & Loss Statement:

Grinding Department 2,00,000/5 = 40,000

Finishing Department 2,60,000/6 = 43,333

Calculation of Production Overhead rate per Labour Hour:

Grinding Department 1,75,000/ 40,000 =4.375

In Finishing Department 2,08,000/ 43,333 = 4.8

Percentage of Administration Overhead on Factory Cost = 1,18,500/18,43,000 x 100 = 6.43%

Percentage of Selling Overhead on Cost of Production = 1,92,000/19,61,500 x 100 = 9.788%

Computation of Revised Job Cost and Price:

		₹
Direct Material		9000
Direct Labour:		
Grinding Department	400 x 5 = 2,000	
Finishing Department	300 x 6 = 1,800	3800
Prime Cost		12,800
Add: Production Overhead:		
Grinding Department	400 x 4.375 = 1,750	
Finishing Department	300 x 4.800 = 1,440	3190
Works Cost		15,990
Add: Administration Overhead 6.43% on works cost		1,028
Cost of Production		17,018
Add: Selling Overhead @ 9.788% on Cost of Production		1,666
Cost of Sales		18,684
Add: (1/6th of sales i.e., 1/5th of cost)		3,737
Selling Price		**22,421**

Illustration 53.

S.V.Ltd budgets to make 1,00,000 units of product P. The variable cost per unit is ₹ 10. Fixed costs are ₹6,00,000.

The finance Director suggested that the cost-plus approach should be used with a profit mark-up of 25%.

However, the Marketing Director disagreed and has supplied the following information:

Price per unit	Demand
(₹)	(Unit)
18	84,000
20	76,000
22	70,000
24	64,000
26	54,000

As Management Accountant of the Company analyse the above proposals and comment.

Solution:

Calculation of selling price as per Finance Director's approach

	₹
Variable Cost	10
Fixed Cost (6,00,000/1,00,000)	6
Total Cost	16
Add: Profit mark up 25%	4
Selling Price	20

Evaluation of marketing Director's Proposal:

Selling Price	Contribution per unit	No. of units	Total contribution	Fixed Cost	Profit
₹	₹		₹	₹	₹
18	8	84,000	6,72,000	6,00,000	72,000
20	10	76,000	7,60,000	6,00,000	1,60,000
22	12	70,000	8,40,000	6,00,000	2,40,000
24	14	64,000	8,96,000	6,00,000	2,96,000
26	16	54,000	8,64,000	6,00,000	2,64,000

At the selling price of ₹ 24 per unit, the profit is maximum and hence that price must be fixed for the product.

Illustration 54.

Hitech Ltd. makes two products Crown and Peak. Both the products use the same labour force, the size of which is restricted to 38,000 hours per month. Crown needs two hours per unit to make whereas Peak needs one hour. The estimated manufacturing and selling expenses etc. are as follows:

	Crown		Peak	
Nos. per month	6,000	8,000	20,000	24,000
Costs per month (₹)	8,50,000	10,50,000	16,00,000	18,40,000

The company is considering pricing options in a highly competitive market. It has estimated sales demand at various selling prices as under:

Crown		Peak	
Selling Price per unit (₹)	Sales Demand per month (Nos.)	Selling Price per unit (₹)	Sales Demand per month (Nos.)
138	6,000	81.50	20,000
136	7,000	81.00	21,000
134	8,000	80.50	22,000
132	9,000	80.00	23,000
130	10,000	78.00	24,000
127	11,000	76.00	25,000

Required:

(a) What would be the profit maximizing selling price and monthly sales quantity for each product, if direct labour was available in unlimited supply?

(b) Given the restriction of 38,000 hours per month, what is the profit maximizing sales price and quantity for each product?

Solution:

$$\text{Variable Cost/unit} = \frac{\text{Change in Cost}}{\text{Change in Volume}}$$

Variable production & selling cost:

$$\text{For Crown} = \frac{₹10,50,000 - 8,50,000}{8,000 - 6,000} = ₹100 \text{ per unit}$$

$$\text{For Peak} = \frac{₹18,40,000 - 16,00,000}{24,000 - 20,000} = ₹60 \text{ per unit}$$

Fixed production / selling expenses:

For Crown = ₹2,50,000

For Peak = ₹4,00,000

(a) There is no shortage of labour hours and the option is product and price mix to profitability

Crown				Peak			
Unit Price (₹)	Unit Contribution (₹)	Volume	Total Contribution (₹)	Unit Price (₹)	Unit Contribution (₹)	Volume	Total Contribution (₹)
138	38	6,000	2,28,000	81.50	21.50	20,000	4,30,000
136	36	7,000	2,52,000	81.00	21.00	21,000	4,41,000
134	34	8,000	2,72,000	80.50	20.50	22,000	4,51,000
132	32	9,000	2,88,000	80.00	20.00	23,000	4,60,000
130	30	10,000	3,00,000	78.00	18.00	24,000	4,32,000
127	27	11,000	2,97,000	76.00	16.00	25,000	4,00,000

The profit maximizing budget would be to sell 10,000 units of Crown @ ₹130/unit and 23,000 units of Peak @ ₹80/unit.

Profit = (3,00,000+4,60,000) – (2,50,000+4,00,000) = ₹1,10,000

Hours required = 10,000 × 2 + 23,000 × 1 = 43,000 hours

(b) If the labour force restricted to 38,000 hours, the profit maximizing will be possible with allocation of labour on the basis of the contribution per labour hour.

Crown				Peak			
Unit Price (₹)	**Total Incremental Contribution (₹)**	**Incremental Labour Hours**	**Incremental Contribution/ Labour Hours (₹)**	**Unit Price (₹)**	**Total Incremental Contribution (₹)**	**Incremental Labour Hours**	**Incremental Contribution/ Labour Hours (₹)**
138	38	6,000	2,28,000	81.50	21.50	20,000	4,30,000
136	36	7,000	2,52,000	81.00	21.00	21,000	4,41,000
134	34	8,000	2,72,000	80.50	20.50	22,000	4,51,000
132	32	9,000	2,88,000	80.00	20.00	23,000	4,60,000
130	30	10,000	3,00,000	78.00	18.00	24,000	4,32,000
127	27	11,000	2,97,000	76.00	16.00	25,000	4,00,000

The allocation of key factor i.e. labour hours is on the basis of Incremental Contribution/Labour hour as given below:

Product	Price per unit (₹)	Incremental volume units	Incremental labour hours	Incremental Contribution (₹)
Peak	81.50	20,000	20,000	4,30,000
Crown	138.00	6,000	12,000	2,28,000
Crown	136.00	1,000	2,000	24,000
Peak	81.00	1,000	1,000	11,000
Crown	134.00	1,000	2,000	20,000
Peak	80.50	1,000	1,000	10,000
Total Peak		22,000	38,000	7,23,000
Total Crown		8,000		

Profit = ₹7,23,000 - ₹6,50,000 = ₹73,000

Illustration 55.

A company manufactures two types of herbal product, A and B. Its budget shows profit figures after apportioning the fixed joint cost of ₹15 lacks in the proportion of the numbers of units sold. The budget for 2014 indicates:

Particulars	A	B
Profit (₹)	1,50,000	30,000
Selling price/unit (₹)	200	120
P/V Ratio (%)	40	50

You are required to advice on the best option among the following, if the company expects that the number of units to be sold would be equal.

(a) Due to change in manufacturing process, the joint fixed cost would be reduced by 15% and the variable would be increased by 7.5%.

(b) Price of A could be increased by 20% as it is expected that the price elasticity of demand would be unity over the range of price;

(c) Simultaneous introduction of both the options, viz, (a) and (b) above.

Solution:

Working Notes

(1) **Contribution per unit of each product**

	Product	
	A	B
Contribution per unit	80	60
(sales ×P/V Ratio)	(₹200 × 40%)	(₹120 × 50%)

(2) **Number of units to be sold**

We know that:

Total contribution-Fixed cost=Profit

Let x be the number of units of each product sold, therefore:

x (80+60) - ₹15,00,000 = ₹1,50,000+₹30,000

or, x=12,000 units

(a) **Option**: Increase in profit due to change in a manufacturing process there is reduction in joint fixed cost and increase in variable costs.

	(₹)
Revised contribution from 12,000 units of A due to 7.5% increase in variable cost [12,000 units (₹200-₹129)]	8,52,000
Revised contribution from 12,000 units of B due to 7.5% increase in variable cost [12,000 units (₹120-₹64.50)]	6,66,000
Total revised contribution	15,18,000
Less: Fixed cost (₹15,00,000 -15% × ₹15,00,000)]	12,75,000
Revised profit	2,43,000
Less: Existing profit	1,80,000
Increase in profit	63,000

(b) **Option**: Increase in profit when the price of product A increased by 20% and the price elasticity of its demand would be unity over the range of price

Budgeted revenue from product A (in ₹)	(12,000 units × ₹ 200)	24,00,000
Revised demand (in units)	(₹ 24,00,000/ ₹ 240)	10,000
Revised contribution (in ₹)	[10,000 units × (₹ 240 - ₹ 120)]	12,00,000
Less: Existing contribution (in ₹)	(12,000 units × ₹ 80)	9,60,000
Increase in profit (contribution) (in ₹)		2,40,000

Note: Since price elasticity of demand is1, therefore the revenue in respect of products will remain same.

(c) **Option**: Increase in profit on the simultaneous introduction of above two options

		(₹)
Revised contribution from product A	[10,000 units (₹ 240 - ₹ 129)]	11,10,000
Revised contribution from product B	[12,000 units (₹ 120 - ₹ 64.50)]	6,66,000
Total revised contribution		17,76,000
Less: Revised fixed cost		12,75,000
Revised profit		5,01,000
Less: Existing profit		1,80,000
Increase in profit		3,21,000

Advice: A comparison of increase in profit figures under above three options clearly indicates that the option (c) is the best as it increases the profit of the concern by ₹3,21,000.

Note: the budgeted profit/(loss) for 2014 in respect of product A and B should be ₹2,10,000 and (₹30,000) respectively instead of ₹1,50,000 and ₹30,000.

Illustration 56.

Prava Ltd., is preparing to submit a bid for a ball-bearing order. Sunil, controller of the Bearings Division of Prava, has asked Mohan, the cost analyst, to prepare the bid. To determine price, Prava's policy is to mark up the full costs of the product by 15%. Sunil tells Mohan that he is keen on winning the bid and that the price he calculates should be competitive.

Mohan prepare the following costs for the bid:

	₹	₹
Direct materials		4,00,000
Direct manufacturing labour overhead costs		1,00,000
Design and parts administration	50,000	
Production- order	45,000	
Setup	70,000	
Materials-handling	55,000	
General and administration	80,000	
Total overhead costs		3,00,000
Full product costs		8,00,000

All direct costs and 30% of overhead costs are incremental costs of the order.

Sunil reviews the numbers and says, "Your costs are way too high. You have allocated too much overhead costs to this job. You know our fixed overhead is not going to change if we win this order and manufacture the bearings. Rework your numbers. You have got to make the costs lower."

Mohan verifies his numbers are correct. He knows that Sunil wants this order because the additional revenues from the order would lead to a big bonus for Sunil and the senior division Managers. Mohan knows that if he does not come up with a lower bid, Sunil will be very upset.

Required:

(1) Using Prava's pricing policy and based on Mohan's estimates, calculate the price Prava should bid for the ball-bearings order.

(2) Calculate the incremental costs of the ball-bearing order. Why do you think Prava uses full costs of the product rather than incremental costs in its pricing decisions?

(3) Evaluate whether Sunil's suggestion to Mohan to use lower cost numbers is unethical. Would it be unethical for Mohan to change his analysis so that a lower cost can be calculated? What steps should Mohan take to resolve this situation?

Solution:

Ethics and Pricing.

(1) Prava prices at full product costs plus a mark-up of 15% = ₹8,00,000 + 15% of ₹8,00,000 = ₹8,00,000 + ₹1,20,000 = ₹9,20,000

(2) The incremental costs of the order are as follows:

	₹
Direct material	4,00,000
Direct manufacturing labor	1,00,000
30% of overhead costs 30% ×₹3,00,000	90,000
Incremental costs	5,90,000

Any bid above ₹5,90,000 will generate a positive contribution margin for Prava. Prava may prefer to use full product costs because it regards the new ball- bearing order as a long-term business relationship rather than a special order. For long-run pricing decisions, manager prefer to use full product costs because it indicates the bare minimum costs they need to recover to continue in business rather than shut down. For a business to be profitable in the long run, it needs to recover both its variable and its fixed product costs. Using only variable cost may tempt the manager to engage in excessive long-run price cutting as long as prices give a positive contribution margin. Using full product costs for pricing thereby prompts price stability.

(3) Not using full product costs (including an allocation of fixed overhead) to price the order, particularly, if it is in direct contradiction of company policy, may be unethical.

Mohan should indicate to Sunil that the costs were correctly computed and that determining prices on the basis of full product costs plus a mark-up of 15% are required by company policy. If Sunil still insists on making the changes and reducing the costs of the order, Mohan should raise the matter with Sunil's superior.

Illustration 57.

Read and Reckon Ltd. is introducing a new type of pocket calculator in the market and is now deciding on its production plans pricing policy. The standard variable cost of the new product will be ₹50 per unit, the same as that of the old model withdrawn from the market. The fixed costs that have to be borne works out to ₹10,50,000. Three alternative selling price – ₹70, ₹ 80, ₹90 per unit are discussed. The Sales Manager has estimated for each selling price an optimistic, a pessimistic and a most likely demand figure and associated probabilities for each of these. For the ₹90 selling price the figures are

	Annual demand units	Probability of demand
Pessimistic	20,000	0.20
Most likely	35,000	0.70
Optimistic	40,000	0.10

On the cost side, it is clear the standard variable cost of ₹50 is an ideal which has been achieved in practice. An analysis of the past 20 months shows that an adverse variance of ₹10 arose on 4 occasions, an adverse variance of around ₹5 arose on 14 occasions and a variance of around zero arose on two occasions. There is no reason to think that the pattern for the new product will differ significantly from this.

(a) From the above calculated the expected annual profit for a selling price of ₹90.

(b) A summary of the result of an analysis of the data for the other two selling prices – ₹70 and ₹80 is as under:

	Prices	
	₹70	₹80
Probability of a loss :		
Greater than or equal to :		
₹ 5 lakhs	0.02	0
₹ 3 lakhs	0.07	0.05
₹ 1 lakh	0.61	0.08
0	0.61	0.10
Probability of a profit:		
Greater than or equal to :		
0	0.39	0.91
₹ 1 lakh	0.33	0.52
₹ 3 lakhs	0.33	0.04
₹ 5 lakhs	0	0.01
Expected profit (Loss)	(55,750)	68,500

With the help all these data, compare the three selling price and give your recommendation regarding the selling price to be adopted. Substantiate your recommendation.

Solution:

(a)

	Demand	**Prob.**	
Pessimistic	20,000	0.20	4,000
Most Likely	35,000	0.70	24,500
Optimistic	40,000	0.10	4,000
Expected demand in units			32,500

Variable Cost	**Prob.**	₹
50	0.10	5.00
55	0.70	38.50
60	0.20	12.00
Expected variable cost		55.50

	₹
Contribution [(90 – 55.50) x 32,500 units]	11,21,250
Fixed cost	10,50,000
Expected Profit	71,250

(b)

Demand	Unit contribution ₹	Total Contribution ₹ '000	Probability
20	30	600	(0.2) (0.2) =0.04
20	35	700	(0.2) (0.7) =0.14
20	40	800	(0.2) (0.1) =0.02
35	30	1,050	(0.7) (0.2) =0.14
35	35	1,225	(0.7) (0.7) =0.49
35	40	1,400	(0.7) (0.1) =0.07
40	30	1,200	(0.1) (0.2) =0.02
40	35	1,400	(0.1) (0.7) =0.07
40	40	1,600	(0.1) (0.1) =0.01

	Price		
Probability of a loss	₹ 70	₹ 80	₹ 90
Greater than or equal to :			
₹ 5 lakhs	0.02	0	0
₹ 3 lakhs	0.07	0.05	0.18 *
₹ 1 Lakh	0.61	0.08	0.20
0	0.61	0.10	0.34
Probability of a Profit			
Greater than or equal to :			
0	0.39	0.91	0.80
₹ 1 lakh	0.33	0.52	0.66
₹ 3 lakhs	0.03	0.04	0.15
₹ 5 lakhs	0	0.01	0.01
Expected Profit (Loss)	(55,750)	68,500	71,250

*Working for 0.18

If total contribution is ₹ 6 lakhs & fixed costs are ₹ 10.50 lakhs, then loss = ₹ 4.50 Lakhs

If total contribution is ₹ 7 lakhs & fixed costs are ₹ 10.50 lakhs then loss = ₹ 3.50 Lakhs

Both cases losses are > ₹ 3 lakhs therefore probability = 0.04 +0.14 =0.18 – Similarly for other figures.

From the above table, it is seen that although the selling price of ₹ 90 yields the highest profit it carries a 0.34 probability of not making any profit. However, the selling price of ₹ 80 yields almost as much profit as the highest price and has a probability of only 0.10 of not making any profit. It is therefore the best of the alternatives selling price of ₹ 80 is recommended.

Price Indifference Point

A Price Indifference Point is that level of sales at which a firm's net income is same between two pricing alternatives. The price indifference point indicates the volume of sales at which the new price gives a profit equal to the profit of old sales volume and price. In case, sales volume at new price is lower than sales volume at old price when there is price indifference point, firm should reject the price increase since firm's profit will decrease. In contrary to this, if the expected sales volume with price increase is greater than the price indifference point, profit will increase. Price indifference point's concept is very useful in short-term decision making situations.

Illustration 58.

Samnin Ltd. is selling 30,000 units of a product at ₹50 per unit. Fixed cost is ₹3,00,000 and variable cost if ₹25 per unit. The company proposes to increase selling price to ₹55 per unit. You are required to calculate Price Indifference Point and also suggest whether the company should implement this pricing proposal if it anticipated sale of 17,000 units.

Solution:

Present profit = Sales - Total Variable Cost - Fixed cost =Contribution - Fixed cost

= ₹ [30,000(50 - 25) - 3,00,000] = ₹4,50,000 – 3,00,000 = ₹1,50,000

$$\text{Price Indifference Point} = \frac{\text{Fixed Cost + Old Profit}}{\text{New price – Variable Cost}} = \frac{3,00,000 + 1,50,000}{55 - 25} = 15,000 \text{ units}$$

As the anticipated sale of 17,000 units is more than Price Indifference Point of 15,000 units, the proposal should be accepted as it will lead to higher profit than the old profit ₹1,50,000. This can be shown as follows:

Profit = Contribution – Fixed cost = ₹ [17,000(55 - 25) – 3,00,000] = ₹2,10,000

Illustration 59.

A hospital operates a separate department for private patients. The department has 60 beds and the hospital charges a fee of ₹170 per day per patient. The patients will however make their own arrangement for payments of physician's fees. During 2014, the hospital collected a total revenue by way of fees of ₹28,12,650. The actual expenses incurred were as under:

	Allocation basis	
	Patient days	**Bed capacity**
	Variable (₹)	**Fixed (₹)**
Food	4,40,000	
Staff other than nurses		24,000
Laundry	2,40,000	
Laboratory & Pharmacy	5,20,000	
Maintenance	74,000	
General Administration		4,74,000
Others	49,600	
	13,23,600	4,98,000

Besides, rent of premises in which the department is housed is ₹8,00,000 p.a. During next year it is expected that the aforesaid fixed and variable expenses will go up by 10%. The rent will increase to ₹10,00,000.

The requirement of nursing staff is as under:

Annual patient days.	**No. of nurses**
Less than 8,000	3
8,000 – 10,000	4
11,000 – 12,000	5
Over 12,000	8

The average salary of nursing staff which was ₹13,000 per nurse p.a. in 2014 will increase to ₹14,000 per nurse p.a. in 2015.

Because of the insufficient demand, the hospital is contemplating to close the department.

Required :

(i) Present a statement of

(a) actual profitability for 2014,

(b) projected profitability for 2015.

(ii) Calculate the break-even patient days of occupancy for 2015.

(iii) What increase in fees is required to break-even at 2014 patient days of occupancy in 2015?

Solution:

(i) Maximum Bed days = 365 × 60 = 21,900

Collections = 28,12,650

Bed days occupancy = 28,12,650/170 = 16,545

Variable costs = 13,23,600/16,545 = 80

Contribution/bed day = 170 – 80 = 90

Increase next year = 80 × 110/100 = 88

(a) Profitability 2014 -

Contribution (16,545 × 90)	14,89,050
FC: Staff & Gen. Adm.	4,98,000
Nurses (8 ×13,000)	1,04,000
Rent	8,00,000
	14,02,000
Profit	87,050

(b) Profitability 2015 –

Contribution [16,545 × (170 – 88) i.e. 16,545 × 82]	13,56,690
FC staff & Gen. Adm. (4,98,000 × 110/100)	5,47,800
Nurses (8 × 14,000)	1,12,000
Rent	10,00,000
	16,59,800
Loss	30,3,110

(ii) BEP assuming a minimum of 3 Nurses –

FC Admn.	5,47,800
Rent	10,00,000
Nurses (3 × 14,000)	42,000
	15,89,800

BEP 15,89,800 ÷ 82 = 19,388 patient days

Since it exceeds 12,000 patient days, 8 nurses have to be employed

Hence, BEP = 16,59,800 ÷ 82 = 20,241 patient days

20,241/365 = 55 bed

55 bed occupancy/ day is required.

(iii) If demand is same as in 2014 i.e., 16,545 patient days, the fees have to be increased:

Contribution required = ₹16,59,800 ÷ 16,545 = ₹ 100.32.

Fee should be VC + C = 88 + 100.32 = ₹188.32.

Illustration 60.

For quoting consultancy fee, it has been decided to provide for Bonus at 20% of the fee, payable to the officers and have a profit mark-up at 25% on the total cost inclusive of such bonus. For a particular assignment, the cost has been estimated at ₹75,000. Compute the fee that should be charged, to provide for the aforesaid two elements.

Solution:

Let consultancy fees be ₹x

Bonus payable at 20% of the fees will be ₹0.2x

Total cost would be ₹75,000 + 0.2x

Profit mark up being 25% on cost,

Fees to be quoted would be ₹ (75,000 + 0.2x) x 1.25

$\therefore$ X = 1.25 (75,000 + 0.2x)

$\therefore$ X = 93,750 + 0.25x

$\therefore$ X – 0.25x = 93,750

$\therefore$ 0.75x = 93,750

$\therefore$ X = ₹1,25,000

Fees will be constituted of:

	₹
Cost	75,000
Bonus	25,000
Profit	25,000
Total	1,25,000

Illustration 61.

In order to develop tourism, Reliable Airline has been given permit to operate three flights to and fro in a week between City A and City B. The airline operates a single aircraft of 160 seats capacity. The normal occupancy is estimated at 60% throughout the year of 52 weeks. The one way fare is ₹7,000.

The costs of operation of flights are:

Fuel cost variable ₹95,000 per flight

Food served on board on non-chargeable basis ₹130 per passenger

Fixed costs:

Aircraft lease	₹ 3,50,000 per flight
Crew, landing charges etc.	₹ 72,000 per flight
Commission	5% of fare applicable for all bookings

Required:

(i) Calculate the net operating income per flight.

(ii) The airline expects that its occupancy will increase to 108 passengers per flight if the fare is reduced to ₹6,720. Advise whether this proposal should be implemented.

(iii) A travel agency firm proposes to charter the aircraft for return trip (to and fro) in each month on payment of a fixed charge of ₹5 lacs per flight. The travel agency firm will meet the fuel and food costs. Should the airline accept this proposal?

Solution:

(i) No. of passengers = 160 x 60% = 96

		₹
Fare collection 96 x 7,000		6,72,000
Variable costs-		
Fuel		95,000
Food (96 x 130)		12,480
Commission 5%		33,600
Total variable costs		1,41,080
Contribution per flight		5,30,920
Fixed costs:		
Lease	3,50,000	
Crew	72,000	4,22,000
Net income per flight		1,08,920

(ii)

		₹
Fare collection	108×6,720	7,25,760
Variable costs-		
Fuel		95,000
Food 108 x 130		14,040
Commission @ 5%		36,288
		1,45,328
Contribution		5,80,432

There is an increase in contribution by ₹49,512.

Hence the proposal is acceptable.

(iii)

	₹
Contribution in (i) per flight	5,30,920
Present income	5,00,000
Loss	30,920

Hence, the proposal is not acceptable.

Illustration 62.

A company operates a hotel. It is spread over six floors of a building excluding the ground floor with a restaurant in the sixth floor. On the ground floor, the hotel operates a sports centre including a swimming pool and a shopping arcade.

The hotel has a capacity of 100 single rooms and 20 double rooms. The average occupancy of both single and double rooms is expected to be 80% throughout the year of 365 days. The rent for double room has been fixed at 125% of the rent of a single room. Cost are as under :

Variable costs :	Single rooms ₹220 each per day.
	Double rooms ₹350 each per days
Fixed costs :	Single rooms ₹120 each per day
	Double rooms ₹250 each per day.

The income and costs relating to the service centres are as under:

(a) Restaurant :

Estimated average sales per days ₹25,000

Contribution 30% of sales

Fixed costs ₹8,00,000 per annum.

(b) Sports centre :

Average number of persons expected to use the centre per day is 50.

Average contribution per day per person is ₹15.

Fixed costs ₹4,00,000 per annum.

(c) Shopping arcade :

Average contribution per month ₹35,000

Fixed costs ₹4,00,000 per annum.

Required:

(i) Calculated the rent chargeable for single and double rooms per day in such a way that the hotel earns a margin of safety of 20% on hire of rooms.

(ii) Evaluate the profitability of the three services centres and work out the total profit of the hotel per annum based on the rent recommended by you in (i) above.

(iii) The hotel wants to reserve the normal occupancy of ten single rooms for its regular customer by allowing a discount of 10% on room rent. What increase in occupancy ratio is required in respect of the remaining rooms to earn the same envisaged in (ii) above.

(iv) An associate company wishes to take the entire complex hotel on lease for a total rent of ₹175 lacs for five years. The associate company is prepared to pay the entire lease rent in advance. Taking the capital recovery factor for 10% of return for 5 years at 3.79, advise the management of the hotel company whether or not leasing arrangement should be entered into.

Solution:

(i) Occupancy :

Single rooms $100 \times 365 \times \frac{80}{100} = 29,200$

Double rooms $20 \times 365 \times \frac{80}{100} = 5,840$

	₹	₹
Variable costs :		
Single rooms (29,200 x 220)	64,24,000	
Double rooms (5,840 x 350)	20,44,000	84,68,000
Fixed costs :		
Single rooms (29,200 x 120)	35,04,000	
Double rooms (5,840 x 250)	14,60,000	49,64,000
Total cost:		1,34,32,000

Margin of Safety 20% Break even point 80%

Sales at BEP = Total costs = ₹1,34,32,000

Total revenue = $\frac{1,34,32,000 \times 100}{80}$ = ₹1,67,90,000

	₹
Single rooms (29,200 x 1)	29,200
Double rooms (5,840 x 1.25)	7,300
National single rooms/ days	36,500

Rent per day per single room = $\frac{1,67,90,000}{36,500}$ = ₹460

Rent per day per Double room = ₹460 x 1.25 = ₹575

(ii) Restaurant :

(a) Sales day ₹25,000 contribution 30%

∴ Total contribution = ₹ 25,000 × $\frac{30}{100}$ = ₹7,500 per day

	₹
Contribution p.a. 7,500 x 365	27,37,500
Fixed costs p.a.	8,00,000
Profit	19,37,500

(b) Sports centre

No. of persons / day

Total contribution / day 50 = ₹15

Total contribution / day = 50 x 15 = ₹750

	₹
Total contribution / annum (750 x 365)	2,73,750
Fixed overheads	4,00,000
Loss	1,26,250

(c) Shopping arcade

Av. Contribution per month ₹ 35,000

		₹
Av. Contribution per annum (₹ 35,000 x 12)		4,20,000
Fixed expenses		4,00,000
Profit		20,000
Profit Statement:		
	₹	₹
Hotel accommodation Rent	1,67,90,000	
Less: Costs	1,34,32,000	33,58,000
Restaurant		19,37,500
Sports centre		(1,26,250)
Shopping arcade		20,000
Total		51,89,250

(iii) Reservation 10 rooms × 365 × 80% = 2,920

Rent = 2,920 x 460 = ₹13,43,200

Discount 10% = ₹1,34,320

Total contribution of remaining rooms

Single	90 x 365 x 80% x (460 – 220)	₹ 63,07,200
Double	20x 365 x 80% x (575 – 350)	₹ 13,14,000
Total		76,21,200

Increase in contribution required

76,21,200 + 1,34,320 = ₹77,55,520

$$\% \text{ occupancy} = \frac{77,55,520}{76,21,200} \times 80 = 81.41$$

(iv) Total profit per annum 51,89,250

Capital recovery factor 3.79

As, Discounted income for 5 years ₹1,96,67,257 is less than rent of ₹1,75,00,000 lease should not be accepted.

Illustration 63.

A mineral is transported from two mines-'P' and 'Q' and unload a plots in a railway station. Mine P is at a distance of 15 kms. and Q is at a distance of 20 kms. from railhead plots. A fleet of Lorries of 5 tonne carrying capacity is used for the transport of mineral from the mines. Records reveal that the Lorries average a speed of 30 kms. per hour, when running and regularly take 15 minutes to unload at the railhead. At mine 'P' loading time average 35 minutes per load while at mine 'Q' loading time average 25 minutes per load. Drivers' wages, depreciation, insurance and taxes are found to cost ₹30 per hour operated. Fuel, oil, tyres, repairs and maintenance cost ₹20 per kms.

Draw up a statement, showing the cost per tone-kilometer of carrying mineral from each mine.

Solution:

Working Note:

(i) **Calculation of operating time**

Particulars	Mine P	Mine Q
Loading time	35	25
Unloading time	15	15
Running time to and fro	60	80
Total operating time (minutes)	110	120
Total operating time (hours)	1 hour 50 minutes	2 hours

(ii) **Calculation of effective ton-kms**

Mine P	5 tonnes×15 kms	75 tonne-kms
Mine Q	5 tonnes×20 kms	100 tonne-kms

(iii) **Calculation of Fixed cost**

Drivers' wages depreciation insurance and taxes cost p.h		₹30.00
Mine P	₹30×1 hours 50 minutes	₹55.00
Mine Q	₹30× 2 hours	₹60.00

(iv) **Calculation of Running and maintenance cost**

Fuel, oil, tyres, repairs and maintenance

Per km	₹20	
Mine P	30 km×₹20	₹600
Mine Q	40 km×₹20	₹800

Statement showing cost per ton-km. of carrying Mineral from each mine

Particulars		Mine P	Mine Q
Fixed cost per trip		55.00	60.00
Running and maintenance cost		600.00	800.00
Total cost per trip	(i)	655.00	860.00
Effective tonne-kms.	(ii)	75	100
Cost per tonne-kms.	(i)/(ii)	₹8.73	₹8.60

Illustration 64.

Seva Health Centre runs an Intensive medical care unit. For this purpose, it has hired a building at a rent of ₹50,000 per month with the understanding that it would be bear the repairs and maintenance charges also. The unit consists of 25 beds and 5 more beds can be comfortably accommodated when the occasion demands. The permanent staff attached to the unit is as follows:

2 Supervisors, each at a salary of ₹5,000 per month; 4 nurses, each at a salary of ₹3,000 per month and 2 ward boys, each at a salary of ₹1,500 per month.

Though the unit was open for the patients all the 365 days in a year, scrutiny of account in 2014 revealed that only for 120 days in a year, the unit had the full capacity of 25 patients per day and for another 80 days, it had on an average 20 beds only occupied per day. But there were occasion when the beds were full, extra beds were hired at a charge of ₹50 per bed per day and this did not come to more than 5 beds extra above the normal capacity on any one day. The total hire charges for extra beds incurred for the whole year amount to ₹20,000.

The unit engaged expert doctors from outside to attend on the patients and the fees were paid on the basis of the number of patients attended and time spent by them and on average worked out to ₹20,000 per month in 2014.

The other expenses for the year were as under:

	₹
Repairs and maintenance	93,600
Food supplied to patients	4,44,000
Janitor and other services for them	1,12,500
Laundry charges for their bed linen	1,28,000
Medicines supplied	5,30,000
Cost of oxygen, x-ray etc., other than directly borne for treatment of patients	4,50,000
General administration charges allocated to the unit	1,50,000

Required:

(1) If the unit recovered overall amount of ₹1,000 per day on an average from each patient, what is the profit per patient day made by the unit on 2014.

(2) The unit wants to work on budget for 2015, but the number of patients requiring intensive medical care is a very uncertain factor. Assuming that same revenue and expenses prevail in 2014, in the first instance, workout the number of patient days required by the unit to break-even.

Solution:

(1) Number of patient-days in 2014

25 beds×120 days	3,000
20 beds×80 days	1,600
Extra bed-days [(Total hire charges of extra beds/charges per bed per day) (₹20,000/50)]	400
Patient days	5,000

In order to calculate contribution, the profit per patient-day and the break-even point, it is necessary to classify the different costs into fixed and variable categories. It will be seen that while most of the items can be easily classified as fixed or variable, problem arises in respect of two items, viz. janitor and other services for the patients and the cost of oxygen, x-ray, etc. The cost of janitor and other services is variable on the presumption that they are related to number of patient-days. On the other hand, cost of oxygen, x-ray, etc. has been taken as a fixed cost since it has been stated that this cost is other than cost directly borne for treatment of patients.

Statement of Profit

		₹	₹
Income received	(₹1,000×5,000 patient-days)		50,00,000
Variable costs:			
Food		4,44,000	

Janitor services		1,12,500	
Laundary		1,28,000	
Medicines		5,30,000	
Doctor's fees	(₹20,000×12)	2,40,000	
Hire charges for extra bed		20,000	14,74,500
Contribution			35,25,500
Fixed costs:			
Salaries	(2×5,000+4×3,000+2×1,500)×12	3,00,000	
Rent	(50,000×12)	6,00,000	
Repairs and maintenance		93,600	
General administration		1,50,000	
Cost of oxygen, x-ray etc.		4,50,000	15,93,600
Profit			19,31,900

Profit per patient day = ₹19,31,900 ÷ 5,000 = ₹386.38

(2) Break-even point = $\frac{\text{Fixed Cost}}{\text{Contribution}}$ × Gross Income = $\frac{15,93,600}{35,25,500}$ × 50,00,000 = ₹22,60,105

or, = $\frac{22,60,105}{1,000}$ = 2,260 patient-days

Illustration 65.

In view of increasing cost of operating own fleet of cars, your company is presently considering two proposals viz;

(a) To hire cars with drivers from an agency @₹800 per car per month. The company will bear the cost of petrol, oil and tyres.

(b) The executive will be given ₹25,000 interest free loan repayable in 5 years to buy his own car. The company will, however, provide him free petrol and ₹500 per month for maintenance and driver's wages.

If the present cost of a car is ₹50,000 and monthly average running is ₹2,000 kilometres, find out the most economic way with the help of the following data:

	Paise per km.
Petrol	65
Oil	8
Tyre	7
Repair	10
Tax and insurance ₹560 per year. Driver's wages and bonus ₹720 per month	
Life of a car	5 years
Resale value at the end of 5th year	₹10,000
Assume interest @18% per annum	

Solution:

Statement showing comparative cost of operation per car per month

(km.2,000)

Items of cost	Company's own car ₹	Hired car ₹	Executive car ₹
Petrol	1,300.00	1,300.00	1,300.00
Oil	160.00	160.00	-
Tyre	140.00	140.00	-
Repair	200.00	-	-
Taxes and insurance	46.67	-	-
Wages and bonus	720.00	-	-
Depreciation $\left(\frac{50,000-10,000}{5}\right)\times\frac{1}{12}$	666.67	-	-
Hire charges	-	800.00	-
Maintenance allowance	-	-	500.00
Interest on loan	-	-	375.00
Total cost	3,233.34	2,400.00	2,175.00
Cost per km.	1.62	1.20	1.09

This cost will still go up, because company would have earned interest, if it had invested ₹50,000 elsewhere. On the basis of above analysis, third alternative is recommended.

Illustration 66.

A city municipality arranges for the removal of its garbage by means of motor vehicular transport. The following vehicles are maintained.

No. of vehicles	Specification
30	5-tonne Lorries
40	3-tonne Lorries
50	2-tonne Lorries
20	4-tonne Lorries

On an average, each lorry makes 5 trips a day and in each trip covers an average distance of 6 kms. Each Lorry carries garbage weighing only 50% of its capacity. Taking an annual average, 10% of the Lorries are laid up for repairs every day. The conservancy work is carried on daily.

The following are the monthly charges incurred on the conservancy transport:

Items of cost	Monthly charges	₹
Salary of the superintendent, Motor vehicle deptt.		1,800
Salaries of 4 transport foreman	₹600 each	
Wages of drivers	100 each for 200 drivers	
Wages of labourers	80 each for 300 labourers	
Consumable stores		20,000

Petrol		80,000
Lubricants		10,000
Replacement of tyres, tubes and other parts and accessories		6,000
Garage rent and rate (adjusted in the books of the municipality)		2,500
Gas and electric charges		800
Miscellaneous expenses		15,000

There is a repair workshop attached to the Motor vehicles Department which also carries out repairs for office cars and other vans and vehicles, 50% of the superintendent salary is debited to the workshop, and the stipulated charges to be borne by the conservancy Transport Department for the services of workshop are ₹15,000 a month.

Assuming that a month consists of 30 days, calculate the cost per tone-km. for removable of garbage.

Solution:

Statement of Operating cost

(Tonne-kms.1,82,250)

	₹	₹
Fixed Expenses:		
Salary of superintendent	900	
Salary of foremen(₹600×4)	2,400	
Wages of Drivers(₹100×200)	20,000	
Wages of labourers(₹80×300)	24,000	
Consumable stores	20,000	
Lubricants	10,000	
Garage rent and rates	2,500	
Gas and electric charges	800	
Miscellaneous Expenses	15,000	95,600
Variable Expenses:		
Petrol	80,000	
Replacement of tyres, tubes, etc.	6,000	
Service charges of repairs workshop	15,000	1,01,000
Total expenses		1,96,600

Cost per tonne-kms: $\frac{₹\ 1,96,600}{1,82,250}$ or ₹1.08

Calculation of tonne-kms:

(30×5) + (40×3) + (50×2) + (20×4) = 150 + 120 + 100 + 80 = 450 tonnes

$450 \times 5 \times 6 \times \frac{50}{100} \times \frac{90}{100} \times 30 = 1,82,250$ tonne-kms.

Illustration 67.

From the following data pertaining to year 2013-14 prepare an operating cost sheet showing the cost of electricity generated per k.w.h. by Chandra Thermal Power Station:

Total units generated	10,00,000 kwh	Lubricants, Spares and stores	₹40,000
Operating labour	₹50,000	Plant supervision	₹30,000
Repairs and maintenance	₹50,000	Administration overheads	₹20,000

Coal consumed per kwh. for the year is 2.5 kg @ Re. 0.02 per kg.

Charge depreciation @10% on capital cost of ₹ 2,00,000.

Solution:

Operating Cost Statement

(Units generated 10,00,000 kwh)

	Total ₹	Per kwh. Re.
Fixed Expenses:		
Plant supervision	30,000	
Administration overheads	20,000	
	50,000	0.05
Variable Expenses:		
Operating labour	50,000	0.05
Repairs and maintenance	50,000	0.05
Lubricants, Spares, Stores,	40,000	0.04
Coal consumed		0.05
Depreciation		0.02
Cost per kwh. (26 paise)		0.26

Illustration 68.

Prativa is a public school having 20 buses each playing in different directions for the transport of its school students. In view of large number of students availing of the bus service, the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The workload of the students has been so arranged that in the morning, the first trip picks up senior students and the second trip playing an hour later picks up junior students. Similarly, in the afternoon, the first trip takes the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus, one way is 16 kms. The school works 24 days in a month and remains closed for vacation in May and December. The bus fee, however, is paid by the students for all the 12 months in a year. The details of expenses for the year 2012-13 are as under:

Driver's salary-payable for all the 12 months	₹5,000 per month per driver months
Cleaner's salary payable for all the 12 months	₹3,000 per month per cleaner months (one cleaner has been employed for every five buses)
Licence fees, taxes etc.	₹2,500 per bus p.a.
Insurance premium	₹15,000 per bus p.a.

Repairs and maintenance	₹16,000 per bus p.a.
Purchase price of the bus	₹15,00,000 each
Life of the bus	16 years
Scrap value	₹1,00,000
Diesel cost	₹50 per litre

Each bus gives an average of 10 kms per litre of diesel. The seating capacity of each bus is 60 students. The seating capacity is fully occupied during the whole year.

The school follows differential bus fees based on distance travelled as under:

Students picked up and dropped within the range of distance from the school	Bus fee	Percentage of students availing the facility
4 kms.	25% of Full	15%
8 kms.	50% of Full	30%
16 kms.	Full	55%

Ignore interest. Since the bus fees has to be based on average cost, you are required to:

(1) Prepare a statement showing expenses of operating a single bus and the fleet of 20 buses for a year:

(2) Work out average cost per student per month in respect of:

(a) Students coming from a distance of upto 4 kms. from the school ,

(b) Students coming from a distance of upto 8 kms. from the school,

(c) Students coming from a distance of upto 16 kms. from the school.

Solution:

(1) Calculation of Run-Kms of each bus per annum

=no. of trips× Distance per trip× No. of days ×No. of months

=4×32×24×10 = 30,720 kms. P.a.

Consumption of diesel per bus per annum

=(30,720 kms./10 kms. Per litre) × ₹50 per litre = ₹1,53,600

Calculation of equivalent students

Bus capacity of 2 trip = 120 students

Students picked up with range of 4 kms, 8 kms and 16 kms (equivalent to 1/4th for students)

(Equivalent students)

4 kms.	(120 students×15/100)	18
8 kms.	(120 students×30/100×2/1)	72
16 kms.	(120 students×55/100×4/1)	264
Total student equivalent to 25% fare students		354

Statement showing the Expenses of operating a single Bus and fleet of 20 Buses for a year

Particulars		Per bus	20 Buses
Running cost:			
Diesel	(a)	1,53,600	30,72,000
Repairs and maintenance	(b)	16,000	3,20,000
Fixed costs:			
Drivers salary		60,000	12,00,000
Cleaners salary		7,200	1,44,000
Licence fee, taxes etc.		2,500	50,000
Insurance		15,000	3,00,000
Depreciation		87,500	17,50,000
	(c)	1,72,200	34,44,000
Total operating expenses	(a)+(b)+(c)	3,41,800	68,36,000

(2) Computation of average cost per student per month

a) Distance upto 4 kms. $= \frac{₹\ 3,41,800}{354 \text{ student} \times 12 \text{ months}} = ₹80.46$

(b) Distance upto 8 kms. = ₹ 80.46×2 = ₹160.92

(c) Distance upto 16 kms. = ₹ 80.46×4 = ₹321.84

Illustration 69.

(a) The Holiday hotel has 40 bed-room with a maximum occupancy of 490 sleeper nights per week. Average occupancy is 60% throughout the year. Meals provided to guests have been costed and the average food cost per person per day is as follows:

	₹
Breakfast	3.60
Lunch	11.00
Dinner	13.40
Direct wages and staff meals per week as under:	
Restaurant and kitchen	3,430
House keeping	1,952
General	1,760

Direct expenses per annum are ₹45,760 for housekeeping and ₹52,000 for the restaurant. Indirect expenses amount to ₹3,41,120, which should be apportioned on the basis of floor area. The floor areas are:

Bed rooms	3,600 sq. metres
Restaurant	1,200 sq. metres
Service area	600 sq. metres

A net profit of 10% each must be made on the restaurant taking and accommodation takings. You are required to calculate what inclusive terms per person should be charged per day. Show the split between meals and accommodation charges.

(b) There is also a proposal to take on hire an adjoining building available and convert it into a pastry shop. The annual cost estimates are:

Rates and taxes	₹12,000
Wages	₹54,000
Replacement of utensils	₹2,400
Depreciation of fixed assets	₹3,600
Fuel cost	10% of the cost of pastries

Sales are expected to average ₹1,50,000 per annum, the monthly figures varying according to season. Prices shown on the tags are arrived at by marking the costs up by150%. Calculate the estimated annual profit. Also draw an estimate to cost and profit for the first month when the sales are expected to be ₹15,000.

Solution:

(a) Statement showing the daily hotel tariff per person

	Sleeper nights per week
Capacity per week	490
Actual utilized capacity (60% occupancy)	294

Particulars	**Cost per week**		
	Total ₹	**Meal** ₹	**Accommodation** ₹
Food cost (294×₹28)	8,232.00	8,232.00	-
Direct wages and staff meals:			
Restaurant and kitchen	3,430.00	3,430.00	-
House keeping	1,952.00	-	1,952.00
General (apportioned in the ratio of direct wages (i.e, 3430:1952)	1,760.00	1,121.66	638.34
Direct expenses:			
Restaurant ₹52,000÷52 weeks	1,000.00	1,000.00	-
House keeping ₹45,760÷52 weeks	880.00	-	880.00
Indirect expenses: ₹3,41,120÷52 weeks=₹6,560 per week. ₹6,560 is apportioned on the basis of floor area			
Restaurant and Service 6,560×(1,800÷5,400)	2,186.67	2,186.67	-
Bed-rooms 6,560×(3,600÷5,400)	4,373.33	-	4,373.33
Total cost per week	23,814.00	15,970.33	7,843.67
Profit(1/10th of sales or 1/9th of cost)	2,646.00	1,774.48	871.52
Total selling price for 294 sleeper nights	26,460.00	17,744.81	8,715.19
Daily rate per person (Rounded off to the nearest rupee)	90	60	30

The daily tariff rate for Holiday Hotel should be fixed at ₹90 per day consisting of ₹60 for food and ₹30 for accommodation.

(b) Estimated profit if adjoining building is taken on hire for pastry shop:

It is given that price shown on the tags are arrived by marking the costs up by 150%.

	₹
Suppose the cost of pastry is	100
Mark up	150
Selling price	250
If selling price is ₹250, then the cost=100	
If selling price is ₹1,50,000, then the cost=(100÷250)×1,50,000	60,000
Cost of pastry per annum	60,000
Fuel cost(10% cost of pastry)	6,000
Wages	54,000
Rates and taxes	12,000
Replacement of utensils	2,400
Depreciation of fixed assets	3,600
Total cost of sales per annum	1,38,000
Selling price per annum	1,50,000
Profit	12,000

Estimate of cost and profit and for one month:

When expected sale will be ₹15,000

	₹
Cost of pastry (15,000×100)÷250	6,000
Fuel cost (10% of cost of pastry)	600
Wages-treating it as 100% variable: (54,000×15,000)/1,50,000	5,400
Rates and taxes(period cost) 12,000/12	1,000
Replacement of utensils 2,400÷12	200
Depreciation 3,600÷12	300
Cost of sales for one month	13,500
Selling price	15,000
Profit	1,500
Note: If wages is treated as period cost, the revised prof1, it will be:	
Wages as arrived above	5,400
Less: Wages (treating assured) 54,000÷12	4,500
Impact of decrease in wages	900
Add: Profit as arrived above	1,500
Revised profit	2,400

Illustration 70.

A lodging home is being run in a small hill station with 50 single rooms. The home offers concessional rates during six-off-season months in a year. During this period, half of the full room rent is charged. The management's profit margin is targeted at 20% of the room rent. The following are the cost estimates and other details for the year ending 31st march, 2014 (assume a month to be of 30 days):

(a) Occupancy during the season is 80%, while in the off-season is 40% only;

(b) Expenses:

	₹
(i) Staff salary(excluding room attendents)	12,75,000
(ii) Repairs to buildings	3,30,000
(iii) Laundary and linen	2,40,000
(iv) Interior and tapestry	1,87,000
(v) Sundry expenses	1,10,000

(c) Annual depreciation is to be provided for buildings at 5% and on furniture and equipments at 15%, on straight-line basis.

(d) Room attendants are paid ₹50 per room-day on the basis of occupancy of the rooms in a month.

(e) Monthly lighting charges are ₹420 per room, except in four months of winter when it is ₹150 per room and this cost is on the basis of full occupancy for a month.

(f) Total investments in the home is ₹100 lakhs of which ₹80 lakhs related to buildings and balance for furniture and equipments.

You are required to work out the room rent chargeable per day both during the season and the off-season months, on the basis of the above information.

Solution:

(i) Calculation of No. of rooms days in a year

		Room days
Season's occupancy	(50 rooms×6 months×30 days p.m.×80/100)	7,200
Off-season's occupancy	(50 rooms×6 months×30 days×40/100)	3,600
Total room days in a year		10,800

(ii) Calculation of Lighting charges

Lighting charges ₹420 per room p.m. for 8 months=₹420/30 days=₹14 per room day

Lighting charges ₹150 per room p.m. for 4 months =₹150/30 days=₹5 per room day

		₹
During season for 6 months	(7,200×14)	1,00,800
During season for 2 months	(3,600×2/6)×14	16,800
During season for 4 months	(3,600×4/6)×5	12,000
Total lighting charges p.a.		1,29,600

Computation of Estimated costs for the year ending 31-3-2014

		₹	₹
Salary			12,75,000
Repairs			3,30,000
Laundary and linen			2,40,000
Interior decoration			1,87,000
Depreciation			

		₹	₹
Buildings	(₹80,00,000×5/100)	4,00,000	
Furniture and equipments	(₹20,00,000×15/100)	3,00,000	7,00,000
Attendants' salary	(10,800 room days @₹50)		5,40,000
Lighting charges			1,29,600
Sundry expenses			1,10,000
Total estimated cost p.a.			35,11,600

Total full Room Days p.a.

		Room days
Season		7,200
Off-season	(3,600 room days×50%)	1,800
Total full room days p.a.		9,000

		₹
Cost per room day	(₹35,11,600/9,000 room days)	390.18
Add: Profit	(20% of rent or 25% of cost)	97.54
Room Rent		487.72

Room rent to be charged during season = ₹487.72 per room day

During off-season = (₹487.72×50%) = ₹243.86 per room day

Illustration 71.

A Cement Company transports its requirements of limestone from a quarry situated at a distance of 6 km from the factory. Presently the company engages transport contractors for the purpose. The company has invited tenders from transport contractors and the lowest quotation received ₹18 per tonne of limestone.

The management is concerned about the increasing cost of transport and has therefore, under its consideration, a proposal for the purchase of a fleet of trucks for being used departmentally for the transport of limestone. You have been furnished with the following data to examine the feasibility of the proposal.

(i) The company has two options regarding of trucks. They are (a) buy 10 tonne capacity trucks or (b) buy 8 tonne capacity trucks.

(ii) Operating cost data :

	10 Tonne capacity Trucks	8 Tonne capacity Trucks
Purchase price of each truck (₹)	4,30,000	4,00,000
Life in years	5	5
Scrap value at the end of 5th year of life (₹)	82,000	40,000
Km. per litre of diesel	3	4
Repairs and maintenance per annum per truck (₹)	47,100	38,400
Road tax per quarter per truck (₹)	600	600
Miscellaneous fixed expenses per month (₹)	3,000	3,000
Oil and sundries per 100 km run (₹)	10	10

(iii) Each truck will make 5 trips (to and fro) on an average for 24 days per month.

(iv) Cost of diesel ₹10 per litre.

(v) Salary of drivers ₹1,600 per month.

Two extra drivers will be employed to work as relievers.

(vi) Other staff required

One Mechanic @ ₹2,000 per month

One Fitter @ ₹1,600 per month

One Supervisor @ ₹3,200 per month.

(vii) The capacity of the cement plant is 24,000 tonnes per month of limestone crush.

Required:

(i) Present a comparative cost sheet on the basis of the aforesaid data showing the transport cost per tonne of operating 10 tonne and 8 tonne capacity trucks at full capacity utilisation of the cement plant for an average month by classifying the expenses into (a) varying with Km run (b) varying with number of trucks and (c) fixed, and suggest the best alternative out of the three choices available namely (a) selection from two capacity trucks and (b) hiring of transportation.

(ii) Apart from cost analysis as in (i) above, what other factors may be considered by the management before accepting the proposal for purchase of trucks.

Solution:

(i)

	10 Tonne capacity Trucks	8 Tonne capacity Trucks
(a) Total trips per day	5	5
(b) No. of days per month	24	24
(c) Total trips per month (a × b)	120	120
(d) Tonnes carried per truck	1,200	960
(e) Capacity to be handed p.m. tonnes	24,000	24,000
(f) No. of trucks required (e ÷ d)	20	25
(g) No. of drivers (including relievers)	22	27
(h) Total km run per truck per month (120 × 6 × 2)	1,440	1,440
(i) Km per liter of diesel	3	4
(j) Diesel required (litres) [(h)×(f)÷(i)]	9,600	9,000

Monthly Cost Sheet

	10 Tonne capacity	**8 Tonne capacity**
No. of Trucks	20	25
	₹	₹
A. Varying with Km run		
Diesel @ ₹10 per ltr.	96,000	90,000
Oil and sundries ₹10 per 100 KM	2,880	3,600
Total	98,880	93,600

B. Varying with No of trucks run		
Repairs & Maintenance $\left(\frac{47,100\times 20}{12}\right)$, $\left(\frac{38,400\times 25}{12}\right)$	78,500	80,000
Road Tax $\left(\frac{600}{3}\times 20\right)$, $\left(\frac{600}{3}\times 25\right)$	4,000	5,000
Drivers' salary (1600 × 22), (1600 × 27)	35,200	43,200
Depreciation For 10 tonnes truck = $\left(\frac{4,30,000-82,500}{5\times 12}\right)\times 20$ For 8 tonnes truck = $\left(\frac{4,00,000-40,000}{5\times 12}\right)\times 25$	1,16,000	1,50,000
Total	2,33,700	2,78,200
C. Fixed		
Supervisor	3,200	3,200
Mechanic	2,000	2,000
Fitter	1,600	1,600
Miscellaneous expenses	3,000	3,000
Total	9,800	9,800
Grand Total	3,42,380	3,81,600
Tonnage hauled	24,000	24,000
Cost/Tonne	14.27	15.90

Cost/Tonne	10 tonne trucks	₹14.27
	8 tonne trucks	₹15.90
	Hire charges	₹18.00

Hence buy 10 tonne trucks.

(ii) Before taking final decision on purchase of trucks, one factor that may have to be given weightage is that we have assumed consistent operation of all the 20 trucks for 24 days in a month, transporting 24,000 tonnes without default, for a period of five years. This aspect must be considered on the basis of past record of hiring trucks on day to day basis over a three years period so that optimum calculations on saving get properly weighed down.

Second issue is that an immediate investment of ₹86 lakhs in purchase of 20 trucks has to be made. This could be totally from own resources or totally out of borrowings or could be partly either way. For own investment technique of discounted cash flow is to be applied while in case of borrowings, current interest cost as also initial cost of procuring the same has to be provided out of savings from year to year apart from meeting normal schedule of loan repayments. Net savings works out to ₹10.74 lakhs per annum on hauling of 24,000 tonnes for 12 months, in comparison to hiring of trucks

Third issue is to compare return on investment of own funds made for procurement of trucks either fully or in part vis-à-vis return in alternate outlets. That is opportunity costs of capital will have to be given consideration.

Decision will be made after considering all the above factors.

Illustration 72.

SV Ltd. has setup a treatment plan at Kaval Town. The Company purchases the basic raw material namely raw KAB and arranges for the sales of the finished product KAB after treatment in its plant.

The treatment plant has a capacity of 60,000 tonnes per annum of raw KAB. The variable costs of treatment of raw KAB are ₹4/- per tonne and the fixed costs amount to ₹6,00,000 per annum. There is no loss in process.

The Company owns a fleet of vehicles having a capacity to handle 260 lakhs tonne kilometre of raw KAB. The fixed costs of the transport net work of the company is ₹10,50,000 per annum and the variable costs amount to 8 paise per tonne-kilometre. The Company can also provide another transport service to its customers at 16 paise per tonne-kilometre variable and ₹45,000 per annum fixed. Facilities for hiring transport of incoming and outgoing goods are also available outside at a cost of 18 paise per tonne-kilometre.

The Company has three sources of purchase of Raw KAB as per details given below:

(i) The data relating to outputs, costs and distances of the three sources are :

	Sources		
	Beetown	**Ceetown**	**Deetown**
Capacity of raw KAB (tonnes per annum)	9,000	27,000	45,000
Distance of the towns from Kaval Town in kms.	250	250	500
Costs of extraction of raw KAB :			
Variable costs (₹/tonne)	90	120	68
Fixed Cost (₹ per annum)	24,000	80,000	96,000

(ii) The sources at Beetown being the subsidary of the Company has an offer from outside party for the purchase of its entire output of raw KAB at ₹ 108/- per tonnes from source.

(iii) Ceetown has its own arrangement for the sales of its output of Raw KAB but is prepared to offer the left over quantity of 8,000 tonnes per annum to the Company at a cost of ₹ 120/- per tonne.

(iv) The Deetown sources can supply its entire quantity of raw KAB to the Company.

(v) Expected Sales quantity & price:

Customer	Quantity of sales Tonnes/ annum	Price/ tonnes (₹)	Delivery terms	Distance from the Company's treatment Plant Kaval (Km.)
NA	6,000	200	At customer's site	8
NB	6,000	188	Ex-factory Kaval	—
NC	15,000	168	Ex-factory Kaval	—
ND	9,000	150	Ex-factory Kaval	—
NE	10,000	192	At customer's site	22
NF	9,000	220	At customer's site	15
NG	9,000	200	At customer's site	26

You are required to :--

(a) Evaluate the alternative proposal for purchase of raw KAB, sales of the treated product KAB and transportation plans for incoming and outgoing goods with a view to maximising the profitability.

(b) Prepare a statement showing the profitability of the proposal recommended by you.

Solution:

(a) (i) Choice of mode of transport for inward move of Raw Materials.

	₹
Per Ton variable Cost (own transport)	0.08
Fixed Cost Share for Full use $\left[\frac{10,50,000}{2,60,00,000}\right]$	0.04
Total Cost	0.12

This is less than outside rate of ₹ 0.18/Tonne or ₹ 0.16/Tonne

Hence internal transport is to be used to the maximum extent.

(ii) Computation of Contribution/tonne of each source.

Sources of R/M	Beetown	Ceetown	Deetown
Variable Cost/Tonne	90	120	68
Processing Cost	4	4	4
Transport Cost	20	20	40
Total Variable Cost	114	144	112
Minimum Expected Selling price	150	150	150
Contribution /Tonne	36	6	38

(iii) Availability of Raw Material (Source wise)

(a)Complete production of Deetown	45000 units	(1st Choice)
(b)Complete production of Beetown	9000 units	(2nd choice)
(c)Balance from Ceetown	6000 units	(balance)
	60,000 units	

To check in transport limitation of 260 lakhs TKM

Deetown → 45000 x 500	225.0 lakhs TKM
Beetown → 9000 x250	22.5 lakhs TKM
Ceetown → 6000 x 250	15.0 lakhs TKM
	262.5 lakhs TKM > 260

Hence 2,50,000 Tonne/KM should be moved by external transport. But total variable cost comes to 120+4+0.18 x 250 = 169 > 150 the minimum selling price. Demand above this selling price is only 64,000 –9,000 = 55,000 tonnes p.a. and hence external transport is prohibited and production plan is reduced to the extent of 1000 units of Ceetown.

Revised production plan	Deetown	45,000
	Beetown	9,000
	Ceetown	5,000
		59,000

(iv) Cost of Raw Material

	Variable	Fixed
Deetown	45,000 x 68 = 30,60,000	96,000
Beetown	9,000 x 90 = 8,10,000	24,000
Ceetown	5,000 x 120 = 6,00,000	—
	44,70,000	1,20,000
Total	₹45,90,000	

(v) Cost of Transport (inward) = 0.08 x 2,60,00,000 + 10,50,000 = 31,30,000

(vi) Cost of Processing = 59,000 x 4 + 6,00,000 = 8,36,000.

(vii)

(a) Sales Realisation			(b) Cost of outward Transport	
NA	6,000 x 200	12,00,000	8 x 0.16 x 6000	7,680
NB	6,000 x 188	11,28,000		
NC	15,000 x 168	25,20,000		
ND	[9,000-(64,000-59,000)] x 150 i.e. 4,000 x 150	6,00,000		
NE	10,000 x 192	19,20,000	22 x 0.16 x 10,000	35,200
NF	9,000 x 220	19,80,000	15 x 0.16 x 9,000	21,600
NG	9,000 x 200	18,00,000	26 x 0.16 x 9,000	37,440
				1,01,920
			Fixed Cost	45,000
Total		1,11,48,000	Total	1,46,920

(b) Profitability Statement:

	₹	₹
Realisation from Sales		1,11,48,000
Expenses :		
Cost of Raw Material	45,90,000	
Inward Transport	31,30,000	
Processing Cost	8,36,000	
Outward Transport	1,46,920	87,02,920
		24,45,080

Illustration 73.

Samec Ltd hires an air-conditioned theatre to stage plays on week-end evenings, One play is staged per evening. The following are the seating arrangements:

(i) VIP Rows - the first 3 rows of 30 seats per row, priced at 350 per Seat.

(ii) Middle Level - the next 18 rows of 20 seats per row, priced at ₹ 250 per Seat.

(iii) Last Level - 6 rows of 30 seats per row, priced at ₹150 per Seat.

For each evening, a Drama Troupe has to be hired at ₹72,000, Rent has to be paid for the Theatre at ₹15,000 per Evening and Air Conditioning and other Stage Arrangement Charges work out to ₹7,000 per Evening. Every time a play is staged, the Drama Troupe's friends and guests occupy the first row of the VIP Class, free of charge, by virtue of passes granted to these guests. The Troupe ensures that 50% of the remaining seats of the VIP Class and 50% of the seats of the other two classes are sold to outsiders in advance, and the money is passed on to Samec Ltd. The Troupe also finds for every evening, a sponsor who puts up his advertisement banner near the stage and pays Samec Ltd. a sum of ₹11,500 per evening. Samec Ltd. supplies snacks during the interval free of charge to all the guests in the hall, including the VIP Free Guests. The Snacks Cost ₹50 per person. Samec Ltd. sells the remaining tickets and observes that for every 1 seat demanded from the Last Level, there are 3 seats demanded from the Middle Level and 1 seat demanded from the VIP Level. You may assume that in case any level is filled, the Visitor buys the next higher or lower level, subject to availability.

Required:

(1) You are required to calculate the number of seats that Samec Ltd. has to sell in order to break-even and give the category-wise total seat occupancy at BEP.

(2) Instead of the given pattern of demand, if Samec Ltd. finds that the demand for VIP, Middle and Last Level is in the ratio 2:2:5, how many seats in each category will Samec Ltd. have to sell in order to break-even?

Solution:

(1) Basic Computations

Particulars	VIP	Middle	Last
Gross Seats	3 x 30 = 90	18 x 20 = 360	6 x 30 = 180
Less: Free Seats	1 x 30 = 30	Nil	Nil
Net Saleable Seats	60	360	180
Less: Firm Booking by Troupe	50% of 60 = 30	50% of 360 = 180	50% of 180 = 90
Seats available for sale by Samec Ltd.	30	180	90
Net Contribution per person	₹350 - ₹50 = ₹ 300	₹250 - ₹50 = ₹200	₹150 - ₹ 50 = ₹100
Contribution earned from Firm Booking	30 x ₹300 = ₹ 9,000	180 x ₹200 = ₹36,000	90x₹ 100=₹9,000
	₹54,000		

(2) Fixed Costs to be recovered for BEP

(a) Drama Troupe Hire		₹ 72,000	
(b) Rent for the Theatre		₹ 15,000	
(c) Air Conditioning and other Stage Arrangement Charges		₹7,000	
(d) Snacks for VIP Free Guests (not charged) = 30 persons x ₹50		₹1,500	₹ 95,500
Less: Recovery by way of Sponsor	₹ 11,500		
Contribution from Firm Booking (WN 1)	₹ 54,000		₹ 65,500
Net Fixed Costs to be recovered			₹ 30,000

(3) BEP at different seats mix

Particulars	VIP	Middle	Last	Total
(a) Contribution per person	₹300	₹200	₹100	
(b) Given Demand Ratio	1	3	1	
(c) Overall Contribution Ratio (a x b)	300	600	100	
(d) Apportionment of ₹ 30,000 as per above ratio	₹ 9,000	₹ 18,000	₹ 3,000	₹ 30,000
(e) BEP Number of Seats (d ÷ a)	30	90	30	150
This is compared with WN 1 Seats available for sale by Samec Ltd., and found feasible. Hence, it is a valid BEP.				
(f) Revised Demand Ratio	2	2	5	
(g) Revised Overall Contribution Ratio (a x f)	600	400	500	
(h) Apportionment of ₹ 30,000 as per revised ratio	₹12,000	₹8,000	₹10,000	₹30,000
(i) Required BEP Number of Seats (h ÷ a)	40	40	100	
(j) Seats available for sale by Samec Ltd.	30	180	90	
(k) Balance seats not available for sale (i - j)	10	NA	10	
(l) Contribution lost on above seats (a x k)	3,000		₹1,000	₹4,000
(m) Additional Seats to make good above Contribution Lost		$\frac{₹\ 4,000}{₹\ 200} = 20$		
(n) Revised BEP (however not in 2 : 2 : 5 Ratio)	30	40+20=60	90	180

Illustration 74.

Templeton Ltd. produces and markets a range of consumer durable appliances (Big and Small). It ensures after sales service through SD Ltd. Big Appliances are serviced at customer's residence while Small Appliances are serviced at SD's Workshop.

The Material supplied to SD is charged at Cost plus 10%. SD charges Customers at 25% over the above price. For Labour, the Company receives 10% of the rate fixed for work done under the after sales service agreement and 15% of the rate fixed in case of jobs not covered under the agreement from SD. 60% by value of the total work undertaken by SD was for Big Appliances and rest accounted for Small Appliances during the previous year.

Templeton Ltd. decides to carry out all or some of the work itself and has chosen one area in the first instance. During the previous year, it earned a profit of ₹2,00,000 as detailed below from SD for the area chosen:

	Material	Labour
Under After-Sales Service Agreement	₹60,000	₹90,000
For jobs not covered under the Agreement	₹20,000	₹30,000

The Company forecasts the same value of work in that area for the ensuing period. The following three options are under consideration of the Management:

(1) Set up a Local Service Centre to provide service for Small Appliances only. Existing System to continue for Big Appliances.

(2) Set up a Local Service Centre to provide service for Big Appliances only. Existing System to continue for Small Appliances.

(3) Set up a Local Service Centre to provide service to all appliances. The existing system then stands withdrawn.

The Relevant Costs for carrying out jobs under the above options are as under - (in ₹ 000s)

Particulars	Option - 1	Option - 2	Option - 3
Heat, Rent, Light, etc.	120	50	130
Management Costs	100	50	100
Service Staff Costs	220	320	600
Transport Costs	20	200	200

You are required to find out the most profitable option.

Solution:

Working Note:

(1) Computation of value of work done (Revenue)

Profit earned by Templeton Ltd. (both on % basis and amount basis) is given. Hence, Total Value of Work Done (i.e. Revenue) can be estimated as under -

Nature of Coverage under Service Agreement	**Covered**		**Not Covered**	
Particulars	%	₹	%	₹
Material Cost to Templeton	100.0%		100.0%	
Add: Templeton Ltd. Profit on billing to SD Ltd. (10% on above)	10.0%	Given= 60,000	10.0%	Given 20,000
Material Cost to SB	110.0%		110.0%	
Add: SD Profit on billing to Customers (25% on above)	27.5%		27.5%	
(a) Value / Revenue towards Material Cost	137.5%	8,25,000	137.5%	2,75,000
Templeton Ltd. Profit on Labour	10.0%	Given 90,000	15%	Given 30,000
(b) Value / Revenue towards Labour Cost	100.0%	9,00,000	100.0%	2,00,000
(c) Total Revenue (a + b)		17,25,000		4,75,000

(d) Grand Total Revenue = ₹17,25,000 + ₹4,75,000 = ₹22,00,000

(e) Of the above, the break-up between Big Appliances and Small Appliances will be 60% and 40%.

So, Revenue towards Big Appliances = 60% of ₹22,00,000 = ₹13,20,000.

Revenue towards Small Appliances = 40% of ₹22,00,000 = ₹ 8,80,000.

Profit Statement under various options (in ₹)

Particulars	**Option 1**	**Option 2**	**Option 3**
(a) Income			
Big Appliances	60% of Present 2,00,000=1,20,000	(WN 1e) 13,20,000	13,20,000
Small Appliances	(WN 1e) 8,80,000	40% of Present 2,00,000 = 80,000	8,80,000
Total	10,00,000	14,00,000	22,00,000
(b) Expenditure			
Materials	$\frac{₹\ 8,25,000 + ₹\ 2,75,000}{137.5\%} \times 40\%$ = 3,20,000	$\frac{₹\ 8,25,000 + ₹\ 2,75,000}{137.5\%} \times 60\%$ = 4,80,000	3,20,000 + 4,80,000 = 8,00,000
Heat, Rent, Light	1,20,000	50,000	1,30,000

Management Costs	1,00,000	50,000	1,00,000
Service Staff Costs	2,20,000	3,20,000	6,00,000
Transport Costs	20,000	2,00,000	2,00,000
Total	7,80,000	11,00,000	18,30,000
(c) Profit (a - b)	2,20,000	3,00,000	3,70,000

Conclusion: Option 3 should be preferred due to higher profits.

Illustration 75.

A local Government authority owns and operates a leisure centre with numerous sporting facilities, residential accommodation, a cafeteria and a sports shop. The summer season lasts for 20 weeks including a peak period of 6 weeks corresponding to the school holidays. The following budgets have been prepared for the next summer season:

Accommodation:

60 single rooms let on a daily basis.

35 double rooms let on a daily basis at 160% of the single room rate.

Room rate:

Fixed costs ₹ 29,900.

Variable costs ₹ 4 per single room per day and ₹6.40 per double room per day

Sports centre:

Residential guests each pay ₹ 2 per day and casual visitors ₹ 3 per day for the use of facilities.

Fixed costs ₹15,500.

Sports Shop:

Estimated contribution Re.1 per person per day.

Fixed costs ₹ 8,250.

Cafeteria:

Estimated contribution ₹1.50 per person per day.

Fixed costs ₹12,750.

During the summer season the centre is open 7 day a week and the

Following activity levels are anticipated.

Double rooms fully booked for the whole season.

Single rooms fully booked for the peak period but for the balance period only 80% room occupied.

Capacity during the rest of the season.

30 casual visitors per day on average.

You are required to:

(a) Calculate the charges for single and double rooms assuming that the authority wishes to make a ₹10,000 profit on accommodation.

(b) Calculate the anticipated total profit for the leisure centre as a whole for the season.

(c) Advise the authority whether an offer of ₹ 2,50,000 form a private leisure company to operate the centre for five years is worth while, assuming that the authority uses a 10% cost of capital and operations continue as outlined above.

Solution:

Computation of usage of room days

		₹
Single room		
(60x7x6)	2,520.00	
(60x7x14x80%)	4,704.00	
		7,224.00
Double room (35x7x20)		4,900.00
i) Total sale value of accommodation		
Variable cost		
Single room (7224x4)	28,896.00	
Double room (4900x6.40)	31,360.00	60,256.00
Fixed cost		29,900.00
Required profit		10,000.00
		100,156.00

Let 'S' be the room rent of single room and 1.6'S' is the rent of double room. Therefore

7224S+4900(1.6S) = 100156

or, 7224S + 7840S =100156

or, S = 100156/15064

Double room Rent = (6.65 × 1.6) = 10.64

(ii) Statement showing computation of total profit of leisure centre: ₹

a. Accommodation			10,000.00
b. Sports Centre:			
Total	[(7224x2)+(4900x2x2)+(30x7x20x3)]	46,648.00	
Less : Fixed Cost		15,550.00	31,098.00
c. Sports Shop:			
Contribution	[(7224x1)+(4900x2x1)+(30x7x20x1)]	21,224.00	
Less : Fixed Cost		8,250.00	12,974.00
d. Cafeteria			
Contribution	[(7224x1.5)+(4900x2x1.5)+(30x7x20x1.5)]	31,836.00	
Less : Fixed Cost		12,750.00	19,086.00
			73,158.00

(iii) Present values

Present value compound factor @ 10% for 5 years	3.79
P.V. of profit for 5 years (73,158 x 3.7906)	₹ 2,77,312.71

As the present value of profit for 5 years is ₹ 277500, which is more than the lease rent of ₹ 250000, it is not worthwhile to give leisure centre for lease.

Illustration 76.

A large Company is organised into several manufacturing divisions. The policy of the company is to allow the Divisional managers to choose their sources of supply and when buying from or selling to sister divisions, to negotiate the prices just as they will for outside purchase or sales.

Division X buys all of its requirements of its main raw material R from Division Y. The full manufacturing cost of R for Division Y is ₹88 per kg at normal volume.

Till recently, Division Y was willing to supply R to Division X at a transfer price of ₹80 per kg. The incremental cost of R for Division Y is ₹76 per kg. Since Division Y is now operating at its full capacity, it is unable to meet the outside customers' demand for R at its market price of ₹100 per kg. Division Y therefore threatened to cut off supplies to Division X unless the latter agree to pay the market price for R.

Division X is resisting the pressure because its budget based on the consumption of 1,00,000 per kg per month at a price of ₹80 per kg. is expected to yield a profit at ₹25,00,000 per month and so a price increase to ₹100 per kg. will bring the Division X close to break even point.

Division X has even found an outside source for a substitute material at a price of ₹95 per kg. Although the substitute material is slightly different from R, it would meet the needs of Division X. Alternatively, Division X is prepared to pay Division Y even the manufacturing cost of ₹88 per kg.

Required

(i) Using each of the transfer price of ₹80, ₹88, ₹95 and ₹100 show with supporting calculations, the financial results as projected by the

  (a) Manager of Division X

  (b) Manager of Division Y

  (c) Company

(ii) Comment on the effect of each transfer price on the performance of the Managers of Division X and Division Y.

(iii) If you were to make a decision in the matter without regard to the view of the individual Divisional Managers, where should Division X obtain its material from and at what price?

Solution:

(i) Statement showing impact on Divisional profit with different transfer prices.

Division X (Transferee)		**Division Y (Transferor)**	
	₹		₹
(a)Transfer Price ₹80		Sales (1,00,000 x 80)	80,00,000
Profit Budgeted	25,00,000	VC (1,00,000 x 76)	76,00,000
		Profit	4,00,000
Company's Profit 29,00,000			
(b)Transfer price ₹ 88			
Profit Budgeted	25,00,000	Sales (1,00,000 x 88)	88,00,000
Addl. cost (1,00,000 x 8)	8,00,000	VC (1,00,000 x 76)	76,00,000
Net profit	17,00,000		12,00,000
Company's profit ₹29,00,000			
(c)Transfer Price ₹95			
Profit Budgeted	25,00,000	Sales (1,00,000 x 95)	95,00,000
Addl. cost (1,00,000 x 15)	15,00,000	VC (1,00,000 x 76)	76,00,000
Net Profit	10,00,000	Profit	19,00,000

Company's Profit ₹29,00,000			
(d)Transfer Price ₹100			
Profit Budgeted	25,00,000	Sales (1,00,000 x 100)	1,00,00,000
Addl. cost (1,00,000 x 20)	20,00,000	VC (1,00,000 x 76)	76,00,000
Net Profit	5,00,000		24,00,000
Company's Profit ₹29,00,000			

(ii) Comment on the different transfer prices

(a) Transfer price of ₹80 given a good incentive to Manager of Div. X whether no incentive to Manager of Div. Y even though he can sell outside and show better profits.

(b) Transfer price of ₹88 reduces the profit of Division X and boosts the performance of Div. Y.

(c) Transfer price of ₹95 further reduced the profits of Division X and improves the profit of Div. Y.

(d) Transfer price of ₹100 put Division X to stand on its own feet vis-à-vis market price and the performance of Div. Y improves.

(iii) Regardless of the view of the individual managers, the position may be as under :

X to buy substitute at ₹95 per kg. from market (additional cost ₹15 per unit).

Y to sell entire quantity of R at the market price of ₹100 to outsiders.

X	₹	Y	₹
Budgeted Profit	25,00,000	Sales (1,00,000 x 100)	1,00,00,000
Addl. Cost (1,00,000 x 15)	15,00,000	VC (1,00,000 x 76)	76,00,000
Net profit	10,00,000	Profit	24,00,000
Company's profit ₹34,00,000			

Illustration 77.

M/s. Foamstar have two divisions FOAM and STAR. FOAM manufactures an intermediate product for which there is no intermediate external market. STAR incorporates this intermediate product in the production of the final product. The expected units of the final product which STAR division estimates it can sell at various selling prices are as follows:

Net Selling Price (₹)	Quantity Sold (Units)
1,000	10,000
900	20,000
800	30,000
700	40,000
600	50,000
500	60,000

The cost of each division are as follows :

	FOAM	STAR
Variable cost per units (₹)	110	70
Fixed costs per annum (₹)	60,00,000	90,00,000

The transfer price is ₹350 for the intermediate product and is determined on a full cost plus basis.

You are requested to:

(a) Prepare profit statements for each division and the Company as a whole for the various selling prices.

(b) State which selling price maximises profit for the STAR division and the Company as a whole and comment on why the latter selling price is not selected by STAR division.

(c) State which transfer pricing policy will maximise the Company's profit under a divisional organisation.

Solution:

(a) The contribution for each division and the company as a whole for the various selling prices are as follows:

FOAM Division

Output Level (Units)	Total Revenue (₹ in lakhs)	Variable Cost (₹ in lakhs)	Total Contribution (₹ in lakhs)
10,000	35	11	24
20,000	70	22	48
30,000	105	33	72
40,000	140	44	96
50,000	175	55	120
60,000	210	66	144

The fixed cost of ₹60 lakhs is to be deducted from the above contributions for arriving at the profits at different output levels.

STAR Division

Output Level (Units lakhs)	**Total Revenue (₹ in lakhs)**	**Variable Cost (₹ in lakhs)**	**Cost of Matl. (Transfer Price) (₹ in lakhs)**	**Total Contribution (₹ in lakhs)**
10,000	100	7	35	58
20,000	180	14	70	96
30,000	240	21	105	114
40,000	280	28	140	112
50,000	300	35	175	90
60,000	300	42	210	48

The fixed costs of ₹90 lakhs is to be deducted from the above contributions for arriving at the profits at different output levels.

The Company

Output level (Units)	**Total Revenue (₹ lakhs)**	**Divisional variable cost (₹ in lakhs)**	**Total contribution (₹ lakhs)**
10,000	100	18	82
20,000	180	36	144
30,000	240	54	186
40,000	280	72	208
50,000	300	90	210
60,000	300	108	192

The divisional and the corporate fixed costs are to be deducted from the above contributions to arrive at the corporate profits at different output levels.

(b) Based on the tables and calculations above, STAR Division should select the selling price of ₹800 per unit. This selling price produces a maximum divisional contribution of ₹114 lakhs. However, it is in the best interest of the company as a whole if a selling price of ₹600 per unit is selected. If STAR Division selects a selling price of ₹600 per unit, its contribution will go down by ₹24 lakhs and hence it will be reluctant to do so.

(c) Where there is no market for the intermediate product and the supplying division has no capacity constraints, the correct transfer price is that at which the marginal cost of the supplying division equals the receiving division's net marginal revenue before deducting the transfer price.

FOAM's marginal cost is ₹110 per unit at all levels of production.

For STAR the marginal revenues are:

Output		**Revenue net of own Var. Cost (₹ in lakhs)**		**Marginal Revenue/unit** ₹
Cum	Marginal	Cum	Marginal	
10,000	10,000	93	93	930
20,000	10,000	166	73	730
30,000	10,000	219	53	530
40,000	10,000	252	33	330
50,000	10,000	265	13	130
60,000	10,000	258	(7)	(70)

It appears that at the output level of 50,000 for either Division, the net marginal revenue of STAR approximates the marginal cost of FOAM. Assuming that both the Divisions have no other products to make. FOAM must earn at least (50,000 × ₹110 + ₹60,00,000) or ₹1,15,00,000 to break even, whilst STAR after recovering its own full cost of (50,000 × ₹70 + 90,00,000) or ₹1,25,00,000 can pass on the surplus of ₹(3,00,00,000 – 1,25,00,000) ₹1,75,00,000 to FOAM. Transfer Price will therefore lie between the low of ₹115 lakhs and the high of ₹175 lakhs, i.e. ₹230 per unit and ₹ 350 per unit. However, in order to motivate the Divisions, the surplus of ₹1,75,00,000 may be shared by the Divisions on some equitable basis. Assuming equal investments are made in both Divisions and uniform return on capitals employed are desired the profits may be shared 50 : 50. In this event, the Transfer Price will be ₹290 per unit, it being an average of ₹230 and ₹350.

Illustration 78.

Vinak Ltd. has two manufacturing divisions, AD and CD. Each division operates as an independent profit centre.

AD which produces two components BRITE and LITE has a capacity of 1,00,000 hours per annum. The annual fixed overheads of this department amounts to ₹20 lakhs. The product wise variable cost data are as under:

	BRITE ₹/unit	LITE ₹/unit
Direct Materials	10	5
Direct Labour and Variable overheads	140	35
Total	150	40

The direct labour and variable overhead is ₹ 35 per hour.

AD has a permanent customer for the purchase of 15,000 units of BRITE per annum at a selling price of ₹300 per unit. The balance capacity is devoted to the production of LITE for which there is an unlimited sales potential at ₹60 per unit.

CD assembles a product known as TITE using a imported component. The annual fixed overheads of this division amount to ₹4 lakhs and the variable cost data per unit are as under:

	TITE ₹/Unit
Imported component	300
Direct Materials	40
Direct Labour and variable overheads (10 hours @ ₹25)	250
Total	590

The selling price of TITE is ₹700 per unit.

With a view of minimising the dependence on imported components, the possibility of using the company's own component BRITE, which is similar to the imported component, was explored. The import substitution is possible with slight modification in the manufacture of TITE which in that case will take two extra labour hours per unit. This means an increase of ₹50 in variable costs per unit of TITE. CD envisages a production of 5,000 units per annum of TITE.

You are required to present the division wise profitability and the profitability of the company as a whole on the basis of the following conditions:

(i) CD Imports its requirements of 5,000 components for the manufacture of TITE.

(ii) CD Stops import and substitutes BRITE by drawing 5,000 units of BRITE from AD at the market price of ₹300 per unit.

(iii) Same situation as in (ii) above except that CD gets a relief of ₹50/- per unit (net transfer price to CD is ₹250 per unit) of BRITE to compensate the increased labour and variable overhead cost of CD.

(iv) CD revises its production programme to manufacture 12,000 units of TITE by drawing 10,000 units of BRITE from AD at ₹250 per unit and imports the balance of 2,000 units of components at ₹300/- per unit. Due to installation of additional production capacity, the annual fixed overhead of CD would increase by ₹7,70,000. In order to induce CD to the expansion programme do you think a negotiated transfer price of ₹240 for BRITE would be agreed by AD? Give reasons and also comment on the best alternative (i to iv) for the company as a whole.

Solution:

	BRITE ₹	LITE ₹	TITE ₹
Selling Price	300	60	700
Variable Costs	150	40	590
Contribution	150	20	110

Time required to produce 1 unit of BRITE = 140/35 = 4 hrs.

Time required to produce 1 unit of LITE = 35/35 = 1 hr.

Profitability :

(i)

	₹
Division AD	
15,000 units of BRITE x ₹150	22,50,000
40,000 units of LITE x ₹20	8,00,000
Total contribution	30,50,000
Fixed expenses	20,00,000
Profit (A)	10,50,000

Division CD	
5,000 units of TITE X ₹110 contribution	5,50,000
Fixed expenses	4,00,000
Profit (B)	1,50,000
Overall Profit (A + B)	12,00,000

(ii)

	₹
Division AD	
15,000 units of BRITE outside customer @ ₹150	22,50,000
5,000 units of BRITE Division CD @ ₹150	7,50,000
20,000 units of LITE (Limited to capacity) @ ₹20	4,00,000
Total contribution	34,00,000
Fixed expenses	20,00,000
Profit (A)	14,00,000
Division CD	
Extra cost of labour ₹50. Hence VC = 640 Hence, contribution = 700 – 640 = ₹60	
5,000 units @ ₹60 contribution	3,00,000
Fixed expenses	4,00,000
Profit (B)	(1,00,000)
Overall Profit (A + B)	13,00,000

(iii)

		₹
Division AD		
15,000 units of BRITE outside customer @ ₹150		22,50,000
5,000 units of BRITE Division CD @ ₹100		5,00,000
20,000 units of LITE (Limited to capacity) @ ₹20		4,00,000
Total contribution		31,50,000
Fixed expenses		20,00,000
Profit (A)		11,50,000
Division CD		
BRITE from AD	₹ 250	
Labour and overhead	₹ 340	
Variable costs	₹ 590	
Contribution (₹700 – ₹590)	₹ 110 per unit	
5,000 unit @ ₹110		5,50,000
Fixed expenses		4,00,000
Profit (B)		1,50,000
Overall profit (A + B)		13,00,000

(iv)

	₹
Division AD	
15,000 units of BRITE outside party @ ₹150	22,50,000
10,000 units of BRITE to CD @ ₹250 i.e. contribution @ ₹100	10,00,000
Total contribution	32,50,000

Fixed expenses	20,00,000
Profit (A)	12,50,000
Division CD	
Contribution on input from AD [10,000 × ₹(700-250-340)]	11,00,000
Contribution on imported material [2,000 × ₹(700-340-250)]	2,20,000
Total contribution	13,20,000
Fixed expenses (4,00,000 + 7,70,000)	11,70,000
Profit (B)	1,50,000
Overall Profit (A + B)	14,00,000

Alternative (ii) and (iii) is the same from company's point of view, profit is merely transferred from one division to other. In general import substitution has helped the company as a whole finding from (i) and (iii). Net transfer price of ₹250 per unit is fair to AD and it also does not harm CD because its profitability has not reduced. In fact to encourage CD to be an active member of import substitution the transfer price could be lower than ₹250 per unit so long it is not detrimental to the interest of AD i.e. as long as total profit remains above ₹10,50,000 in (i).

If CD increases its production and wants to utilise the capacity of AD with good product mix, the company will benefit. More production of BRITE at the cost of LITE will benefit AD and that has happened in alternative (iv). The total company profit is the highest but the condition of CD has not improved because of increase in fixed cost.

Illustration 79.

P.H. Ltd. has two manufacturing departments organised into separate profit centres known as the Basic unit and Processing unit. The Basic unit has a production capacity of 4,000 tonnes per month of Chemvax but at present its sales are limited ₹ 2,000 tonnes to outside market and 1,200 tonnes to the Processing unit.

The transfer price for the year 2013 was agreed at ₹ 400 per tonne. This price has been fixed in line with the external wholesale trade price on 1st January 2013. However due to heavy competition the Basic unit has been forced to reduce the wholesale trade price to ₹ 360 per tonne with effect from 1st June, 2013. This price however was not made applicable to the sales made to the Processing unit of the company. The Processing unit applied for revision of the price as applicable to the outside market buyers as from 1st June 2013 but the same was turned down by the basic unit.

The Processing unit refines Chemvax and packs the output Known as Colour-X in drums of 50kgs each. The selling price of colour-X is ₹ 40 per drum. The Processing unit has a potential of selling a further quantity of 16,000 drums of colour-X provided the overall price is reduced to ₹ 32 per drum. In that event it can buy the additional 800 tonnes of Chemvex from the basic unit whose capacity can be fully utilised. The outside market will not however absorb more than the present quantity of 2,000 tonnes.

The cost data relevant to the operations are:

	Basic Unit	**Processing Unit**
	₹	₹
Raw Materials/tonne	70	Transfer price
Variable Cost/tonne	140	170
Fixed Costs/month	₹ 3,00,000	1,20,000

You are required:

(i) Prepare statement showing the estimated profitability for June 2013 for each uint and the company as a whole on the following bases:

(a) At 80% and 100% capacity utilisation of the Basic unit at the market price and transfer price to the Processing unit of ₹ 400 per tonne.

(b) At 80% capacity utilisation of the basic unit at the market price of ₹ 360 per tonne and the transfer price to the Processing unit of ₹ 400 per tonne.

(c) At 100% capacity utilisation of the Basic unit at the market price and transfer price to the Processing unit of ₹ 360 per tonne.

ii) Comment on the effect of the company's transfer pricing policy on the profitability of the Processing Unit.

Solution:

(i) (a) Statement showing computation of profit at 80% capacity when transfer price is ₹ 400/- ton:

		Basic unit	**Processing unit**	**Total drums**
(i) No. of units		3200	(1200x1000)/50 = 24,000	
(ii) Contribution per unit	₹	{400-(140 + 70)} = 190	{40 – (570/20)} =11.50	
(iii) Total contribution	₹	608000	276000	884000
(iv) Fixed cost	₹	300000	120000	420000
(v) Profit	₹	308000	156000	464000

At 100% capacity:

		Basic unit	**Processing unit**	**Total**
(i) No. of units		4000	(2,000×1,000)/50 = 40000 drums	
(ii) Contribution per unit	₹	190	{32 - (570/20)} = 3.50	
(iii) Total contribution	₹	760000	140000	900000
(iv) Fixed cost	₹	300000	120000	420000
(v) Profit	₹	460000	20000	480000

(b) Computation of profit:

		Basic unit		Processing unit	Total
		Out side sale	Internal transfer		
(i) No of units		2000	1200	24000	
(ii) Contribution per unit	₹	150	190	11.50	
(iii) Total contribution	₹	300000	228000		
	₹		528000	276000	804000
(iv) Fixed cost	₹		300000	120000	420000
(v) Profit	₹		228000	156000	384000

(c) Computation of profit:

		Basic unit	Processing unit	Total
No of units		4000	40000	
Contribution per unit	₹	150	{(32-(530/20)} = 5.50	
Total contribution	₹	600000	220000	820000
Fixed cost	₹	300000	120000	420000
Profit	₹	300000	100000	400000

(ii) Overall profit is more at 100% capacity of basic unit with a transfer price of ₹ 400/- per ton being the market price if individual interests are not considered this may adopted. However, from the view point of the processing unit, it will not be interested to buy more than 1200tonnes from the basic unit, because its profit gets reduced when it takes additional units. Therefore, the present policy of the management is not at all attractive to the processing unit.

Illustration 80.

Division A is a profit centre which produces three products X, Y and Z. Each product has an external market.

	X	Y	Z
External market price per unit	₹48	₹46	₹40
Variable cost of production in division A	₹33	₹24	₹28
Labour hours required per unit in division A	3	4	2

Product Y can be transferred to Division B, but the maximum quantity that might be required for transfer is 300 units of Y.

	X	Y	Z
The maximum external sales are :	800 units	500 units	300 units

Instead of receiving transfers of Product Y from Division A, Division B could buy similar product in the open market at a slightly cheaper price of ₹45 per unit.

What should the transfer price be for each unit for 300 units of Y, if the total labour hours available in Division A are?

(a) 3800 hours

(b) 5600 hours.

Solution:

Computation of contribution per labour hour from external sales:

	X	**Y**	**Z**
Market price(₹)	48	46	40
Variable cost(₹)	33	24	28
Contribution(₹)	15	22	12
Labour hours required	3	4	2
Contribution per labour hour(₹)	5	5.50	6
Priority	III	II	I

Computation of transfer price when

(a) The capacity is 3800 hours:

Hours required for Z = 300 x 2 = 600

Y = 500 x 4 = 2000

X = 800 x 3 = 2400

5000

The existing capacity is not sufficient to produce the units to meet the external sales. In order to transfer 300 units of Y, 1200 hours are required in which division A will give up the production of X to this extent.

	₹
Variable cost of Y	24
(+) contribution lost by giving up production of X to the extent of 1200 hours	
= 1200 × 5 = 6000	
∴ Opportunity cost per unit = (6000/300)	20
Required transfer price	**44**
(b) If the capacity is 5600 hours:	
Variable cost	
Contribution cost of giving up X to the extent of 600hours = 600 × 5 = 3000	24
Opportunity Cost Per unit = (3000/300)	10
Required transfer price	**34**

Illustration 81.

SV Ltd. Manufactures a product which is obtained basically from a series of mixing operations. The finished product is packaged in the company made glass bottles and packed in attractive cartons.

The company is organized into two independent divisions viz. one for the manufacture of the end product and the other for the manufacture of glass bottles. The Product manufacturing division can buy all the bottle requirements from the bottle manufacturing division. The General Manager of the bottle manufacturing division has obtained the following quotations from the outside manufacturers for the empty bottles.

Volume (empty bottles)	Total cost (₹)
8,00,000	14,00,000
12,00,000	20,00,000

A cost analysis of the bottle manufacturing division for the manufacture of empty bottles reveals the following production costs:

Volume (empty bottles)	Total purchase value (₹)
8,00,000	₹10,40,000
12,00,000	14,40,000

The production cost and sales value of the end product marketed by the product manufacturing division are as under.

Volume	Total cost of end product*	Sales Value
		(Packed in bottles)
8,00,000	₹64,80,000	₹ 91,20,000
12,00,000	₹96,80,000	₹1,27,80,000

There has been considerable discussion at the corporate level as to the use of proper price for transfer of empty bottles from the bottle manufacturing division to product manufacturing division. This interest is heightened because a significant portion of the Divisional General Manager's salary is in incentive bonus based on profit centre results. As the corporate management accountant responsible for defining the proper transfer prices for the supply of empty bottles by the bottle manufacturing division to the product manufacturing division, you are required to show for the two levels of volume of 8,00,000 and 12,00,000 bottles, the profitability by using (i) market price and (ii) shared profit relative to the cost involved basis for the determination of transfer prices. The profitability position should be furnished separately for the two divisions and the company as a whole under each method. Discuss also the effect of these methods on the profitability of the two divisions.

* (Excluding cost of empty bottles)

Solution:

Statement showing Computation of transfer price on the basis of profit shared on cost basis:

	Output (800000)	Output (1200000)
	(₹)	(₹)
Sales	9120000	12780000
Costs:		
Product manufacturing division	6480000	9680000
Bottle manufacturing division	1040000	1440000
	7520000	11120000
Profit	1600000	1660000
Share of bottle manufacturing division	221276	214964
Product manufacturing division	1378724	1445036
Transfer price	(10,40,000+2,21,276) 1261276	(14,40,000+2,14,964) 1654964
Transfer price per bottle	1.5777	1.379

Profitability on the basis of market price:

		Output (800000)	Output (1200000)
		(₹)	(₹)
Bottle manufacturing division			
Sale value		1400000	2000000
(-)cost		1040000	1440000
Profit		360000	560000
Product manufacturing division			
Sale value		9120000	12780000
(-)cost of product	6480000		
Cost of bottle	1400000	7880000	11680000
Profit		1240000	1100000
Total profit		1600000	1660000
Transfer price per bottle		(14,00,000/8,00,000) 1.75	(20,00,000/12,00,000) 1.67

Illustration 82.

A Company with two manufacturing divisions is organised on profit centre basis. Division 'A' is the only source for the supply of a component that is used in Division B in the manufacture of a product KLIM. One such part is used for each unit of the product KLIM. As the demand for the product is not steady, Division B can obtain orders for increased quantities only by spending more on sales promotion and by reducing the selling prices. The Manager of Division B has accordingly prepared the following forecast of sales quantities and selling prices.

Sales units per day	Average Selling price per unit of KLIM
	₹
1,000	5.25
2,000	3.98
3,000	3.30
4,000	2.78
5,000	2.40
6,000	2.01

The manufacturing cost of KLIM in Division B is ₹3,750 first 1,000 units and ₹750 per 1,000 units in excess of 1,000 units.

Division A incurs a total cost of ₹1,500 per day for an output of 1,000 components and the total costs will increase by ₹900 per day for every additional 1,000 components manufactured. The Manager of Division A states that the operating results of his Division will be optimised if the transfer price of the component is set at ₹1.20 per unit and he has accordingly set the aforesaid transfer price for his supplies of the component to Division A.

You are required:

(a) Prepare a schedule showing the profitability at each level of output for Division A and Division B.

(b) Find the profitability of the company as a whole at the output level which

  (i) Division A's net profit is maximum.

  (ii) Division B's net profit is maximum.

(c) If the Company is not organised on profit centre basis, what level of output will be chosen to yield the maximum profit.

Solution:

i. Statement showing profit of division A:

Sale per day(units)	Sale value	Cost	Profit/(loss)
	₹	₹	₹
1000	1200	1500	(300)
2000	2400	2400	-
3000	3600	3300	300
4000	4800	4200	600
5000	6000	5100	900
6000	7200	6000	1200

Profit of division B:

No of units	Sales	Transfer price	Other manufacturing cost	Total cost	Profit/(loss)
	₹	₹	₹	₹	₹
1000	5250	1200	3750	4950	300
2000	7960	2400	4500	6900	1060
3000	9900	3600	5250	8850	1050
4000	11120	4800	6000	10800	320
5000	12000	6000	6750	12750	(750)
6000	12060	7200	7500	14700	(2640)

ii. Profitability of the company at the output level where division A's net profit is maximum

	₹
Profit of division A at 6000units	1200
Profit of division B at 6000units	(2640)
Profit /(loss)	(1440)
Division B's net profit is maximum:	
Profit of division A at 2000 units	-
Profit of division B at 2000units	1060
	1060

(c) When the company is not organized on profit centre basis

Profit at different levels of output

Units	Division A	Division B	Total
	₹	₹	₹
1000	(300)	300	-----
2000	-----	1060	1060
3000	300	1050	1350
4000	600	320	920
5000	900	(750)	150
6000	1200	(2640)	(1440)

Best output level is 3000 units

Illustration 83.

Transferor Ltd. has two processes Preparing and Finishing. The normal output per week is 7,500 units (Completed) at a capacity of 75%

Transferee Ltd. had production problems in preparing and requires 2,000 units per week of prepared material for their finishing processes.

The existing cost structure of one prepared unit of Transferor Ltd. at existing capacity

Material ₹2.00 (variable 100%)

Labour ₹2.00 (Variable 50%)

Overhead ₹4.00 (variable 25%)

The sale price of a completed unit of Transferor Ltd is ₹16 with a profit of ₹4 per unit.

Construct the effect on the profits of Transferor Ltd., for six months (25 weeks) of supplying units to Transferee Ltd. with the following alternative transfer prices per unit:

(i) Marginal Cost

(ii) Marginal Cost + 25%

(iii) Marginal Cost + 15% Return on capital(assume capital employed ₹20 lakhs)

(iv) Existing Cost

(v) Existing Cost + a portion profit on the basis of (preparing cost / Total Cost) x Unit Profit

(vi) At an agreed market price of ₹8.50. Assume no increase in fixed cost.

Solution:

Transferred units	25 x 2000 =	50000
Existing profit	7500 x 25 x 4= ₹	750000

Effect on profit if transfer price is

i. Marginal cost

	₹
Material	2.00
Labour	1.00
OHs	1.00
	4.00

At this transfer price there is no effect on profit of Transferor Ltd.

ii. Transfer Price = ₹ (4+1) = ₹ 5

So, profit increased by 50,000 × ₹1 = ₹ 50,000

iii. Profit per unit = 4 + {(2000000 × 15% × 0.5)/50000} = 7

Under this method profit of Transferor Ltd is increases by 150000 i.e., 50000 × (7-4)

iv. Profit increases by 50000 x (8-4) = 200000

v. Transfer price: ₹

{8 + (8/12)4} = 10.67

(-) profit = 4.00

6.67

Profit increases by 50000 x 6.67 = ₹ 333500/-

vi. Transfer price = 8.50

Profit increase by 4.5 x 50000 = ₹ 2,25,000

Illustration 84.

L Ltd. and M Ltd. are subsidiaries of the same group of companies.

L Ltd produces a branded product sold in drums (10,000 in number) at a price of ₹20 per drum.

Its direct products cost per drum are:

- Raw material from M Ltd. at a transfer price of ₹9 for 25 liters.
- Other products and services from outside the group : At a cost of ₹3.

L Ltd's fixed costs are ₹40,000 per month. These costs include process labour whose costs will not alter until L Ltd's output reaches twice its present level. A market research study has indicate that L Ltd's market could increase by 80% in volume if it were to reduce its price by 20%. M Ltd produces a fairly basic product which can be converted into a wide range of end products. It sells one third of its output to L Ltd and the remainder to customers outside the group.

M Ltd production capacity is 1,000 kiloliters per month, but competition is keen and it budgets to sell no more than 750 kiloliters per month for the year 31st December 2013. Its variable costs are ₹200 per kiloliter and its fixed costs are ₹60,000 per month.

The current policy of the group is to market prices, where known, as the transfer price between its subsidiaries. This is the basis of the transfer price between M Ltd and L Ltd.

You are required:

(a) To calculate the monthly profit position for each of L Ltd and M Ltd if sales of L Ltd are :

(i) At their present level and

(ii) At the higher potential level indicated by the market research, subject to a cut in price of 20%.

(b) To explain why the use of market price as the transfer price produces difficulties under the conditions outlined in (a) (ii) above

(c) To recommend, with supporting calculations, what transfer price you would propose.

Solution:

(a) (i) Statement showing computation of profit at division and total at present level

	'M' Ltd.	'L' Ltd	Total
No. of Units	750 Ki. Ltrs	10000 Drums	
	₹	₹	₹
Selling Price	(9/25×1,000) 360	20	
Variable Cost per unit	200	12	
Contribution per unit	160	8	
Total contribution	1,20,000	80,000	2,00,000
Fixed Cost	60,000	40,000	1,00,000
Profit	60,000	40,000	1,00,000

(ii) Statement showing computation of profit when 'L' Ltd. Capacity increased by 80%

	'M' Ltd.	'L' Ltd	Total
No. of Units	950 K. Ltrs.	18000 Drums	
	₹	₹	₹
Contribution per unit	160	4	
Total contribution	15,20,000	72,000	2,24,000
Fixed Cost	60,000	40,000	1,00,000
Profit	92,000	32,000	1,24,000

(b) Usually, the market price is the most satisfactory basis for inter company transfer prices as it avoids an extensive arbitration system. However, in the present case, 'L' Ltd. by increasing its sales to 80% reduces it profit by ₹ 8000 and at the same time profit of 'M' Ltd increases by ₹ 32,000.

Therefore No increases to 'L' Ltd to take extra business though the overall profit increased by ₹ 24,000 i.e., 24%. There is decrease in profit of 'L' Ltd. Thus there will be no goal congruence between 'L' Ltd and the group.

(c) Under the circumstances, the proposed Transfer Price will be fixed in the following lines. At present level, the profit of ₹ 1,00,000 is shared by two divisions in the ratio of 60:40. Therefore it is fair and appropriate to share the additional profit of ₹ 24,000 in the same ratio.

Then share of 'L' Ltd = 24,000 x 40/100 = ₹9,600

Then share of 'M' Ltd = 24,000 x 60/100 = ₹14,400

The transfer price is fixed in such a way that 'L' Ltd will get a profit of ₹ 49,600.

₹ (40,000 + 9,600). The profit to be increased = 49,600 – 32,000 = 17,600

No. of units transferred from 'L' Ltd. To 'M' Ltd. is 2,00,000 Ltrs. i.e., 8000 drums

Transfer price to be reduced per drum = 17600/8000 = ₹2.2

Proposed Transfer price = 9.0 – 2.2 = ₹6.80

Therefore Proposed Transfer Price for additional production / sales to be fixed at ₹ 6.8 per drum.

Illustration 85.

A group has two companies:

K Ltd. which is operating at just above 50% capacity, and

L Ltd. which is operating at full capacity (7,000 production hours).

L Ltd. produces two products, X and Y, using the same labour for each product. For the next year its budgeted capacity involves a commitment of the sale of 3,000 kgs of Y, the remainder of its capacity being used on X.

Direct costs of these two products are:

	X	Y
	₹per kg	₹per kg
Direct materials	18	14
Direct wages	15 (1 production hour)	10 (2/3 production hour)

The company's overhead is ₹1,26,000 per annum relating to X and Y in proportion to their direct wages. At full capacity ₹70,000 of this overhead is variable. L Ltd prices its products with a 60% mark up on its total costs.

For the coming year, K Ltd. wishes to buy from L Ltd. 2,000 kgs of product X which it proposes to adopt and sell as product Z for ₹100 per kg. The direct costs of adaptation are ₹15 per kg. K Ltd's total fixed costs will not change, but variable overhead of ₹2 per kg will be incurred.

You are required to recommend as group management accountant:

(a) At what range of transfer prices, if at all 2,000 kgs of product X should be sold to K Ltd.

(b) What other points should be borne in mind when making any recommendations about transfer prices in the above circumstances?

Solution:

Computation of Transfer price of product 'X'

	₹
Direct materials	18
Direct Wages	15
Variable Over Heads (70,000/7,000 x 1)	10
Fixed Overhead	8
Total Cost	51
Add: Markup for profit @ 60%	30.6
Transfer Price	81.6

Profit of 'K' Ltd on the sale of 'Z' = 100-(15+2+81.6) = ₹1.4

Total profit on 2000 units = 1.4 x 2000 = ₹2,800

From the view point of 'L' Ltd.:

It is charging a profit of 60% i.e., a price of ₹ 81.6, which it charges to outsiders. Market price is normally considered as the best transfer price because it avoids extensive arbitration and also it gives the Buyer and seller an equitable basis for inter company trading.

From the view point of 'K'Ltd.

It is making a small margin of ₹ 1.4 per Kg. on the incremental cost of ₹ 17 which just equal to 8.24% (1.4/17 x 100). This is very much below the 'L' Ltd's margin included in the transfer price. 'K' Ltd may point out that 'L' Ltd will save some variable overhead. For example Transport, Advertisement, Credit control etc. This is likely to be more than ₹ 2 per Kg. out of ₹ 10 (Variable Overhead) categorized as 'L' Ltd's Overhead which is included in selling and Administrative expenses. In that case the transfer price can be reduced by ₹ 3.2 (2+2 x 60%) to ₹ 78.4. Then the new profit of 'K' Ltd = ₹4.6 per Kg. Then percentage of profit = 27% (4.6/17 x 100)

This may justify the view point of 'K' Ltd. Therefore, the recommended Transfer price may range from ₹78.4 to ₹81.6.

Illustration 86.

A machine which originally cost ₹12,000 has an estimated life of 10 years and is depreciated at the rate of ₹1,200 per year. It has been unused for some time, however, as expected production orders did not materialise.

A special order has now received which would require the use of the machine for two months.

The current net realisable value of the machine is ₹8,000. If it is used for the job, its value is expected to fall to ₹7,500. The net book value of the machine is ₹8,400. Routine maintenance of the machine currently costs ₹40 per month. With use, the cost of maintenance and surplus would increase to ₹60 per month.

What would be the relevant cost of using the machine for the order so that it can be charged as the minimum price for the order?

Solution:

	₹
Net Book value	8,400
Net realisable value	8,000
User cost already incurred	400

The amount by which the net book value exceeds the net realisable value is a user cost of the machine which has already been incurred. It is not relevant cost of the order in question.

The machine cost of the order would be recorded as:

2 months depreciation	₹ 200
Maintenance & repairs	₹ 120
	₹ 320

This is also not relevant

In deciding whether or not to accept the order or what is the minimum price that should be charged for the order, the relevant cost are:

(a) Marginal user cost: the loss in the net realisable value of the machine through using it on the order (₹8,000 – ₹7,500)	₹ 500
(b) Additional maintenance and repair i.e., in excess of existing routine maintenance costs [(₹60 – ₹40)×2]	₹ 40
Minimum price	₹ 540

The loss in net realisable value by using the machine ₹500, would be further augmented by considering the interest cost of not realising ₹8,000 now for the machine.

Further realisable value would be discontinued to a present value amount and the loss in value through use would be the difference between ₹8,000 and this discounted amount.

Illustration 87.

X Ltd. has been approached by a customer who would like a special job to be done for him and is willing to pay ₹22,000 for it. The job would require the following materials.

Materials	Total Units Required	Units already in stock	Book value of units in Stock ₹/unit	Realisable value ₹/units	Replacement cost ₹/unit
A	1,000	0	—	—	6
B	1,000	600	2	2.5	5
C	1,000	700	3	2.5	4
D	200	200	4	6	9

(i) Material B is used regularly by X Ltd. and if stocks are required for this job, they would need to be replaced to meet other production demand.

(ii) Material C and D are in stock as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of material E, which currently cost ₹5 per unit (of which the company has no units in stock at the moment).

What are the relevant costs of material, in deciding whether or not to accept the contract? Assume all other expenses on this contract to be specially incurred besides the relevant cost of material is ₹550.

Solution:

(a) Material A is not yet owned. It would have to be purchased in full at the replacement cost of ₹6 per unit.

(b) Material B is used regularly by the company. There are existing stocks (600 units) but if these are used on the contract, a further 600 units would have to be purchased to replace them. Relevant costs are therefore 1,000 units at the replacement cost of ₹5 per unit.

(c) Material C – 1,000 units are needed and 700 are already in stock. If used for the contract, a further 300 units to be purchased at ₹4 each. If the existing stock are used for the contract, they could not be sold at ₹2.50 each. The realisable value of these 700 units is an opportunity cost foregone.

(d) Material D – These are already in stock and will not be replaced. There is an opportunity cost of using D in the contract, because there are alternative opportunities either to sell the existing stocks for ₹6 per unit (₹1,200 in total) or avoid other purchases (of material E) which would cost 300 × ₹5 = ₹1,500. Since substitution for E is more beneficial, ₹1,500 is the opportunity cost.

(e) Summary of relevant cost:

	₹
Material A (1,000 @ ₹6)	6,000
Material B (1,000 @ ₹5)	5,000
Material C [(300 @ ₹4) + (700 @ ₹2.50)]	2,950
Material D (300 @ ₹5)	1,500
Other expenses	550
	16,000

(i) Contract should be accepted since price offered is ₹ 22,000.

Illustration 88.

As a result of change in customer preference the company of which you are the management accountant finds that certain materials in stock which were bought for ₹7,000 a few years ago have not moved for long time. The current replacement price of these materials is ₹8,000. If these materials were disposed off by sale, they would fetch a new realisable value of ₹4,000 only.

The company has the opportunity of carrying out a one-time job (Job No. 101) which can utilise these materials and yield a revenue of ₹16,000. The additional costs other than the cost of these materials, chargeable to this job will amount to ₹14,200. This charge includes the apportionment of general administration overheads amounting to ₹3,800 but the incurrence of all other expenses is dependent upon the execution of Job 101.

Alternatively the materials in question could be used as a substitute for other materials in another regular Job (208). The materials so replaced will otherwise cost ₹6,000. These costs have been included in the viability of Job 208 which is expected to yield an additional net benefit of ₹11,000.

The company has thus three alternatives namely:

(i) use of the material in Job 208

(ii) use the materials in Job 101 and carryout Job 208 by buying in the material required.

(iii) sell the materials and carryout Job 208 by buying in the materials required.

You are required to:

(i) State with reasons the costs which are irrelevant to the decision of alternative choices

(ii) Evaluate the three alternatives given above by using the concepts of

  (a) incremental costs and benefit analysis

  (b) opportunity cost and benefit analysis

(iii) State which of the alternatives should be accepted by Company.

Solution:

(i) (a) The original expenditure of ₹7,000 incurred in the acquisition of the inventory is a past cost because it has already been incurred and is therefore irrelevant to the analysis.

  (b) A sum of ₹11,000 being the net additional benefit arising from the execution of Job 208 has already been committed because the company has already undertaken to carry out this regular job and is therefore irrelevant.

  (c) Apportionment of general administration overheads being fixed costs are irrelevant to the analysis.

(ii) (a) **Incremental cost benefit analysis:**

Keeping the job 208 substituting the material as base, being a regular and committed job of the company, the incremental cost benefit analysis is as under:

	Execute Job 208 ₹	**Use the material in the Job 101** ₹	**Selling the existing materials** ₹
Costs:			
Cost of job 101 (14,200 – 3,800)	—	10,400	—
Purchase of material of job 208		6,000	6,000
Total (a)	—	16,400	6,000
Benefits:			
Sale of existing materials	—	—	4,000
Revenue from job 101	—	16,000	—
Total (b)	—	16,000	4,000
Net (Cost)/benefit [(a) – (b)]	—	(400)	(2,000)

(b) **Opportunity Cost Concept:**

	Execute Job 208 ₹	Use the material in the Job 101 ₹	Selling the existing materials ₹
Opportunity cost relating to the decision	—	10,400	—
Benefits arising from the use of materials	6,000	16,000	4,000
Net (cost)/benefit	6,000	5,600	4,000

(iii) Since the net cost is more in accepting job 101 and the benefit is more in executing job 208, it is advisable to use the material in job 208.

Illustration 89.

Chakra Ltd. manufactures Mixer Grinders. The manufacture involves an assembly of various parts which are processed in the machine shop and purchased components. The on/off switch is presently being purchased from a vendor at ₹4.50 each, annual requirement being 20,000 pieces.

The production manager has put a proposal 2 months back to make the switch in the machine shop. He had suggested that the company will save profit and taxes on bought-out switch. The costing department was asked to make an estimate of making the item which showed that the cost of making was ₹4.73. The purchase department continued buying the item on the basis of the cost estimate given to them. Recently, the vendor has sent a letter requesting the purchase department to grant increase in price by 10% minimum per switch as the input costs had gone up. The costing department was once again requested to estimate cost of making the switch.

The costing department re-estimated the costs using current prices and observed that the cost of making has gone up to ₹5.33. Purchase department again decided to continue buying as it was cheaper to buy than make. The cost estimates prepared by costing department were as under:

	Annual Costs	
	Previous ₹	Current ₹
Direct Materials	40,000	48,000
Direct Labour ₹2 per hour	20,000	22,000
Overheads at ₹3 per hour	30,000	31,500
Total cost	90,000	1,01,500
Add: Expected increase @ 5%	4,500	5,075
Expected manufacturing cost	94,500	1,06,575
Cost per piece	4.73	5.33

Twenty five percent of the overheads are fixed.

Do you agree with the decision of buying considering the relevant costs? If the cost of making or buying is more or less same, what factors other than cost will influence the making decision?

Solution:

To make or buy decision is generally based on relevant costs. In the present case, the expected future costs are not relevant since the vendor is also likely to increase his price in future. The fixed overheads are also not relevant as these will be there even though the factory makes the switch or not.

Based on above, the cost of making will get reduced by the amount of fixed overheads and future expected cost as under:

	Two months Back ₹	Current ₹
Fixed overheads	7,500	7,875
Future expected cost	4,500	5,075
Irrelevant Costs	12,000	12,950
Per switch	0.60	0.65

It is clear from above that earlier cost estimate of ₹4.73 should have been ₹4.13 and present estimate of ₹5.33 should have been ₹4.68. In both the cases, making is cheaper than buying.

When the costs of making or buying are more or less same, making will be preferred on the following grounds:

(1) Quality can be assured.

(2) Supply is sure and in time.

(3) Capacity utilisation can be increased.

(4) Technical data drawings etc. can be kept secret.

(5) Design can be changed and controlled.

(6) There will be further scope for cost reduction.

Illustration 90.

A Company manufacturing several products for regular sales, has conducted a market survey at a cost of ₹1,00,000 to introduce a new product NP. The market Survey suggests that there is a demand for the sale of 1,00,000 units of NP at ₹18 each for one year.

The following information has been furnished by the Company:

(i) Raw Materials: Each article of NP requires one unit of each of the three types of the raw materials namely A, B, and C. Material 'A' is in regular use of the Company and the stocks are replaced as and when exhausted. Material 'B' is not in regular use of the Company at present holds a stock of 60,000 units. Material 'C' is used only in NP and hence the Company has to purchase the same as per the requirement of production of the new product.

The data relating to the three items of raw materials are as under:

Raw Material	Current Stock (Units)	Cost per unit of raw material		
		Original Cost ₹	Current Replacement Cost ₹	Current Resale ₹
A	1,00,000	2.00	2.50	1.75
B	60,000	3.50	3.00	1.00
C	—	—	6.00	5.00

(ii) Direct Labour : NP requires for each article :

Skilled labour 0.25 hour at ₹3 per hour and unskilled labour 2 hours at ₹2 per hour.

Due to shortage of skilled labour, the Company has, in the event of deciding to take up the production of NP, to divert the skilled labour from some other product which earns a contribution of ₹2 per hour of skilled labour. The Company has a surplus of 3,00,000 hours of unskilled labour for which payment is being made on time basis as per contract and it is not possible to terminate the surplus worker.

(iii) Additional staff required for the manufacture of NP :

One Foreman at ₹36,000 p.a.

One Supervisor at ₹24,000 p.a.

(iv) Machines: Two machines namely Machine Type 'P' and Machine Type 'Q' are required to produce NP. Machine Type 'P' is in regular use on other products also and Machine Type 'Q' is now idle. If NP is not produced Machine Type 'Q' can be sold immediately. The relevant data relating to each type of machine are as under.

	At the start of the year ₹	At the close of the year ₹
Type 'P' Replacement Cost	1,60,000	1,30,000
Resale value	1,20,000	94,000
Type 'Q' Replacement Cost	26,000	18,000
Resale value	22,000	17,000

The Company charges depreciation on straight line basis.

(v) Overheads :

Fixed Overheads of the Company ₹18,000 per annum.

Variable Overheads ₹1.50 per unit of the new product NP.

Using the concept of relevancy of costs, prepare a cost sheet to show the cost per unit of the new product NP. Substantiate the figures with necessary explanation

Solution:

(i) Cost sheet showing cost per unit of product NP

	for 1,00,000 units ₹	Cost per units ₹
Direct Materials :		
A: 1,00,000 × 2.50	2,50,000	
B: 60,000 × 1.00	60,000	
40,000 × 3.00	1,20,000	
C: 1,00,000 × 6.00	6,00,000	
	10,30,000	10.30
Direct Labour :		
Skilled 25,000 hrs × 3/-	75,000	
Opportunity loss 25,000 × 2/-	50,000	
Unskilled	—	
	1,25,000	1.25
Valuable overheads 1,00,000 × 1.50	1,50,000	1.50
Fixed overheads :		
Factory overheads	—	
Additional overheads :		
Foreman	36,000	
Supervisor	24,000	
Total	60,000	0.60
Depreciation :		
Type P	30,000	
Type Q	5,000	
	35,000	0.35
Total costs	14,00,000	14.00
Sale	18,00,000	18.00
Profit	4,00,000	4.00

Calculations:

Direct Material:

(A) It is regular use and hence replacement of ₹2.50 will be charged

(B) Total requirement 1,00,000 units

60,000 units—opportunity cost ₹1.00 each

40,000 unit—purchase price ₹3.00 each

(C) Purchase price of ₹6.00

Direct Labour:

Skilled Labour 1,00,000 units at ₹0.25 per hour

Unskilled labour — Available in surplus and being paid for. Hence not relevant.

Loss of contribution on existing product.

Opportunity loss 25,000 × 2 = ₹50,000

Additional staff:

Foreman	₹36,000 p.a.	Relevant costs
Supervisor	₹24,000 p.a.	

Variable overheads ₹1.50 per unit— Relevant

Fixed overheads — Not relevant

Depreciation :

Type P Since used on other product replacement cost is relevant. Hence
Depreciation = ₹1,60,000 – 1,30,000 = ₹30,000

Type Q Since It can be sold if not used, resale value is relevant
Depreciation = ₹22,000 – 17,000 = ₹5,000

Market survey cost is sunk cost. Hence not relevant.

Illustration 91.

B. Ltd. is having a big plant where tailor made jobs are carried out. Recently a customer has approached them for a job as per specifications supplied. B. Ltd. does not want to lose the customer and is ready to quote a lower price. The planning engineer was asked to prepare an estimate of materials requirements as per the specifications. The cost estimates worked out are as under:

	₹
(1) Steel sheets 5000 kg at ₹15 per kg.	75,000
(2) Steel rods 1000 kg at ₹10 per kg	10,000
(3) Bearing, hardware items etc.	15,000
(4) Employees Costs:	
Monthly rate-grade A 400 hours at ₹10	4,000
Monthly rated-grade B 600 hours at ₹8	4,800
(5) Overheads:	
Fabrication shop 500 hours at ₹20	10,000
Welding shop 300 hours at ₹40	12,000
Planning Engineers 200 hours at ₹15	3,000
Design Engineers 100 hours at ₹15	1,500
Total estimated costs	1,35,300

Following additional information is available:

(1) The stocks of steel sheets are more than sufficient and were purchased a year ago. Present market price of this item is ₹12 per kg.

(2) The steel rods were purchased five years back at ₹10 per kg. Present purchase price is ₹18 per kg. This material is already declared as non-moving and can be sold in market as such at ₹15 per kg or can be substituted for alloy steel rods which are presently costing at ₹17 per kg.

(3) The labour force is always moved from job to job depending on urgency. It is likely that the above job, if accepted, will have to be done by grade-A workers alone.

(4) The fabrication shop is treated as profit centre. A transfer price of ₹20 per hour is used for charging to other shops in the workshop. The fabrication shop also does jobs for outsiders whom ₹25 per hour are charged. The transfer price fixed by welding shop is ₹40 per hour. The transfer prices are calculated as under:

		Fabrication	Welding
Variable cost per machine hour	₹	7	16
Departmental Fixed Costs	₹	6	20
Profit	₹	7	4
Transfer price	₹	20	40

(5) The hourly rates of planning/design engineers are ₹10 per hour. However, for outside consultancy work, it is a practice to charge ₹15 per hour.

The management wants to have the bare minimum cost for the job so that the opportunity of getting the order is not lost.

Required:

(1) Revise the cost estimate using the additional information. Give reasons for each of the revised figure used in your calculations.

(2) Briefly state the applicability of opportunity cost approach and its implications in practical situations.

(3) Do you think that opportunity cost is relevant in a situation of alternate choice or make or buy decisions?

Solution:

(1) Revised cost estimates

	₹
(1) Steel sheets 5000 kg. at ₹12 per kg	60,000
(2) Steel Rods 1000 kg at ₹17 per kg	17,000
(3) Bearings, Hardware items etc.	15,000
(4) Labour cost	Nil
(5) Overheads :	
Fabrication shop 500 hrs at ₹25	12,500
Welding shop 300 hrs at ₹16	4,800
Planning Engineers cost	Nil
Design Engineers cost	Nil
Minimum	1,09,300

Reasons for changed figures:

(a) Steel sheets are taken at current rates as the old price is not relevant.

(b) The opportunity cost of substitution is relevant cost in case of steel rods.

(c) The wages of monthly rates workers are fixed costs. Fixed cost is not relevant.

(d) Since fabrication shop does the job for outsiders, the price of ₹25/- charged to them is considered for the aforesaid calculations on the assumption that fabrication job is otherwise fully occupied.

(e) For welding shop only incremental variable cost is relevant as it is not serving outsiders.

(f) The planning and design engineers costs are not relevant being fixed costs.

(2) The opportunity cost approach is preferred over conventional cost approach in certain situations since the conventional cost approach will always show higher cost and thus a higher price may ultimately cause loss of order. In practice, the opportunity cost approach is not favoured by the management as it is contradictory to the established conventional approach. Difficulties also arise in currently ascertaining the opportunity costs. This approach has only a limited applicability in soliciting marginal orders or exploring new markets or introducing new products. In long run, price has to cover all cost elements and reasonable return on investment.

(3) Opportunity cost approach is relevant in choice of alternatives or in make or buy decisions since the opportunity sought will in long run bring additional contribution towards fixed cost which otherwise would be lost.

Illustration 92.

A company has two machines producing the same product. Each machine has a capacity of 80,000 units per annum but because of the machines being of different make the costs are different at different levels of production as given below. The production is carried out in lots of 20,000 units each.

Annual level of production up to max. level	Annual total costs	
	Machine X ₹ '000	**Machine Y ₹ '000**
Shut down cost	104	130
20,000 units	210	216
40,000 units	264	244
60,000 units	296	262
80,000 units	348	408

These costs include apportioned overheads of ₹ 12,000 per annum for each machine. The selling price of the product is ₹6 per unit.

The company has received an offer to buy either of the two machines from an overseas organisation. If the company decides to dispose off one of its machines by sale to the overseas organisation, the company will be able to obtain an increase in the selling price by ₹2 per unit due to reduced production. Moreover, in that event, all shut down services except the apportioned overheads of ₹12,000 of the disposed of machine have an opportunity of being used elsewhere in the factory for productive purpose.

Required:

(i) Set out a table from 20,000 to 1,60,000 units in lots of 20,000 units each to show which machine or combination of machines should be used at each level of output to yield minimum costs to the company.

(ii) Present a statement showing the profit at different levels of output from 20,000 to 1,60,000 in lots of 20,000 units each and recommend the level of total sales in units which will yield largest profit.

(iii) Recommended, by giving a comparative statement of profitability, as to which machine should be sold to the overseas organisation.

(iv) Find the loss which the company has to suffer by reason of its decision to sell one of its machines to the overseas organisation.

Solution:

₹ '000

	Machine X		Machine Y	
	Total Costs ₹	Incremental Costs ₹	Total Costs ₹	Incremental Costs ₹
Shut down Costs	104	—	130	—
20,000 units	210	106	216	86
40,000 units	264	160	244	114
60,000 units	296	192	262	132
80,000 units	348	244	408	278

Shut down costs are not relevant Costs.

(i) Minimum Cost Table

₹ '000

Production	**Machine X**		**Machine Y**		**Total Costs**
Units	**Units**	**Costs** ₹	**Units**	**Costs** ₹	₹
20,000			20,000	86	86
40,000			40,000	114	114
60,000			60,000	132	132
80,000	20,000	106	60,000	132	238
1,00,000	40,000	160	60,000	132	292
1,20,000	60,000	192	60,000	132	324
1,40,000	80,000	244	60,000	132	376
1,60,000	80,000	244	80,000	278	522

(ii) Profit Statement ₹ '000

Output	**Sales @ SP of ₹6/- per unit** ₹	**Costs** ₹	**Contribution** ₹
20,000	120	86	34
40,000	240	114	126
60,000	360	132	228
80,000	480	238	242
1,00,000	600	292	308
1,20,000	720	324	396
1,40,000	840	376	464
1,60,000	960	522	438

Highest Profit can be achieved at the production level of 1,40,000 units : Machine X 80,000 units and Machine Y 60,000 units.

(iii) Comparative profitability

₹ '000

	Machine X	**Machine Y**
Sales of 80,000 units @ ₹6/- per unit	480	480
Total Costs	348	408
Profit	132	72

Since machine Y yields lower profit, it should be sold to the overseas organisation.

The net profit of retaining machine X is as under:

	₹ '000
Profit	132
Non-recovery of apportioned overheads of Machine Y	12
Net profit	120

(iv) Maximum profit by sale of 1,40,000 units from Machine X

₹ '000

	₹	₹	₹
Contribution can be earned by sale of 1,40,000 units			464
Sales 80000 units @ ₹8/-		640	
Costs of Machine X	348		
Apportioned overheads of Machine Y	12	360	
Profit on Machine X			280
Loss			184

Illustration 93.

The Nandan Repair Shop repairs and services Machine Tools. Annual summary of its costs (by activity) is:

		₹
(1) Materials and Labour for servicing Machine Tools	Item 1	10,00,000
(2) Re-work Costs	Item 2	55,000
(3) Expediting Costs caused by work delays	Item 3	50,000
(4) Materials Handling	Item 4	45,000
(5) Materials Procurement and Inspection Costs	Item 5	30,000
(6) Preventive Maintenance of Equipment	Item 6	25,000
(7) Break-down Maintenance of Equipment	Item 7	65,000

Required:

(1) Classify each cost as Value-Added, Non-Value-Added, or in the Grey Area between.

(2) For any cost classified in Grey Area, assume 45% of it is Value- Added and 55% is Non-Value-Added. How much of total of all seven costs is Value-Added and how much is Non-Value-Added?

(3) The Company is considering the following changes at the Shop -

(a) Introducing Quality Improvement Programs whose net effect will be to reduce re-work and expediting costs by 70% and Materials and Labour Costs for servicing Machine Tools by 10%,

(b) Working with Suppliers to reduce Materials Procurement and Inspection Costs and Materials Handling Costs by 20%, and

(c) Increase in Preventive Maintenance Costs by 30% to reduce Break-down Maintenance Costs by 40%.

What is the effect of each of the above programs on Value-Added, Non-Value-Added and Total Costs? Comment.

Solution:

(1) **Statement showing VA, NVA and Grey Area Costs (before and after)**

	Present Situation				Effect of Cost Reduction Program				
Item	**VA**	**NVA**	**GA**	**Total**	**VA**	**NVA**	**GA**	**Total**	**Savings**
1	10,00,000			10,00,000	9,00,000			9,00,000	1,00,000
2		55,000		55,000		16,500		16,500	38,500
3		50,000		50,000		15,000		15,000	35,000
4			45,000	45,000			36,000	36,000	9,000
5			30,000	30,000			24,000	24,000	6,000
6			25,000	25,000			32,500	32,500	- 7,500
7		65,000		65,000		39,000		39,000	26,000
Total	**10,00,000**	**1,70,000**	**1,00,000**	**12,70,000**	**9,00,000**	**70,500**	**92,500**	**10,63,000**	**2,07,000**
Adjt.	45,000	55,000	Transfrd		41,625	50,875	Transfrd		
Total	**10,45,000**	**2,25,000**		**12,70,000**	**9,41,625**	**1,21,375**		**10,63,000**	
%	82.28	17.72		100.00	88.58	11.42		100.00	

Note: Grey Area Costs have been re-allocated to VA and NVA as 45% and 55% respectively.

Illustration 94.

You are the Manager of Uday Paper Mills and have recently come across a particular type of paper, which is being sold at a substantially lower rate (by another Company P & Co. Ltd) than the price charged by your own mill. The Value Chain for one Tonne of such paper for P & Co. Ltd is: P & Co. Ltd. -> Merchant -> Printer -> Customer.

P & Co. Ltd sells this particular paper to Merchant at the rate of ₹1,400 per Tonne. P & Co. Ltd pays for the Freight which amounts to ₹50 per Tonne. Average Returns and Allowances amount to 6% of Sales and approximately equals ₹87 per Tonne.

The Value Chain of your Company, through which the paper reaches the ultimate customer is similar to that of P & Co. Ltd. However, your Mill does not sell directly to the Merchant, the latter receiving the paper from huge Distribution Centre maintained by your Company at Mumbai. Shipment Costs from the Mill to the Distribution Centre is ₹10 per Tonne while the Operating Costs in the Distribution Center are estimated at ₹30 per Tonne. The Return on Investment required by the Distribution Centre for the investments made, amount to an estimate ₹63 per Tonne.

Calculate the "Mill Manufacturing Target Cost" for this particular paper for Uday Ltd. Assume that the return on the investment expected by Uday Ltd is ₹100 per Tonne of paper.

Solution:

(All amounts are in ₹ per Tonne)

Sale Price of P & Co. Ltd to Merchant		1,400
Less: Reduction towards - Freight paid by P & Co. Ltd	50	
Returns and Allowances (given)	87	137
Target Sale Price for Uday Paper Mills		1,263
Less: Target Profit Margin for Uday Paper Mills = Overall Return on Investment Expected (given)		100

Target Cost for Uday Paper Mills (Overall, i.e. Mill + Distribution)		1,163
Less: Value Addition at Distribution Centre Level		
(a) Shipping Costs + Operating Cost (10 + 30)	40	
(b) Return on Investment for Distribution Centre	63	103
Target Cost at Mill Level, i.e. Mill Manufacturing Target Cost for Uday Paper Mills		1,060

Illustration 95.

Prava Ltd. has the capacity of production of 80,000 units and presently sells 20,000 units at ₹50 each. The demand is sensitive to Selling Price and it has been observed that for every reduction of ₹10 in Selling Price, the demand is doubled.

Required:

(i) What should be the Target Cost at full capacity, if Profit Margin on Sale is 10%?

(ii) What should be the Cost Reduction Scheme if at present 40% of Cost is variable, with same % of profit?

(iii) If Rate of Return desired is 15%, what will be the maximum investment at full capacity?

Solution:

(i) **Target Cost at Full Capacity**

Selling Price per unit	₹50	₹40	₹30
Demand	20,000 units	40,000 units	80,000 units = Full Capacity

Hence, Target Cost at Full Capacity = Sale Price less Profit Margin = ₹30 less 10% thereon = ₹27 p.u.

(ii) **Determination of Target Cost Reduction**

		₹
(a) Since Present Price is ₹50 p.u. and Profit is 10% thereon, Present Cost p.u. = ₹45, of which 40% is variable. So, Fixed Cost is 60% of ₹45 =₹27p.u. So, Total Fixed cost	27 x 80,000	21,60,000
(b) Variable Cost at Full Capacity [(40% of ₹45 p.u.) x 80,000 units]		14,40,000
(c) Estimated Cost at Full Capacity [{Fixed Cost (constant at all levels) + Variable Cost} i.e. (a+ b)]		36,00,000
(d) Target Cost at Full Capacity [₹27 p.u. for 80,000 units]		21,60,000
(e) Cost Reduction Target / Scheme [Estimated Cost less Target Cost i.e. (c-d)]		14,40,000

(iii) **Computation of Investment required**

(a) Profit at full capacity [(10% of ₹30) x 80,000 units]	₹2,40,000
(b) Since ROCE desired is 15%, Maximum Required Investment $\left[\frac{₹\ 2,40,000}{15\%}\right]$	₹16,00,000

Illustration 96.

All is Well Co. manufactures and sells 20,000 units of a product. The Full Cost per unit is ₹300. The Company has fixed its price so as to earn a 25% Return on Investment of ₹20,00,000.

Required:

(i) Calculate the Selling Price per unit from the above. Also, calculate the Mark-up % on the Full Cost per unit.

(ii) If the Selling Price as calculated above represents a Mark-up % of 25% on Variable Cost per unit, calculate the Variable Cost per unit.

(iii) Calculate the Company's Income if it had increased the Selling Price to ₹330. At this Price, the Company would have sold 16,000 units. Should the Company have increased the Selling Price to ₹330?

(iv) In response to competitive pressures, the Company must reduce the price to ₹310 next year, in order to achieve sales of 20,000 units. The Company also plans to reduce its investment to ₹18,00,000. If a 25% Return on Investment should be maintained, what is the Target Cost per unit for the next year?

Solution:

(i) Target sale price per unit [Full cost +Target profit] $\left[₹\ 300 + \frac{₹\ 20,00,000 \times 20\%}{20,000 \text{ units}} \right]$	₹320
So, Mark-up on Full Cost $\left[\frac{₹\ 20}{300} \times 100 \right]$	6.67%
(ii) Above Sale Price ₹320 [VC + 25% thereon, i.e 125% on VC]. So Var. Cost $\left[\frac{₹\ 320}{125\%} \right]$	₹256
(iii) Present Contribution at 20,000 units [(₹320 - ₹256) x 20,000 units]	₹12,80,000
Revised Contribution at 16,000 units [(₹330 - ₹256) x 16,000 units]	₹11,84,000
Hence, Increase in Sale Price is not beneficial, due to reduction in Contribution by	₹96000
(iv) Target profit p.u. for next year = $\frac{₹\ 18,00,000 \times 25\%}{20,000 \text{ units}}$ = ₹22.50 So, Target cost for next year = New sale price less Target profit = ₹310 – ₹22.50	₹287.50

Illustration 97.

S Ltd. has sales of 2,00,000 units at a price of ₹100.00 per unit and profit of ₹70.00 Lakhs in the current year. Due to stiff competition, next year the Company has to reduce its price of product @ 3% to achieve same target volume of sales. The cost structure and profit for the current year is given as below:

Particulars	(₹ Lakhs)
Direct Material	50.00
Direct Wages	40.00
Variable Factory Overheads	15.00
Fixed Overheads including Sales & Admin Expenses	25.00
Total Cost	130.00

To achieve the Target Cost to maintain the same profit, the Company is evaluating the proposal to reduce Labour Cost and Fixed Factory Overheads. A Vendor supplying the Machine suitable for the Company's operations has offered an advanced technology Semi-Automatic Machine of ₹10 Lakhs as replacement of Old Machine worth ₹3 Lakhs. The Vendor is agreeable to take back the Old Machine at ₹1 Lakh only. The Company's policy is to charge depreciation at 15% on WDV. The Maintenance Charge of the Existing Machine is ₹1 Lakh per annum whereas there will be warranty of services free of cost for the New Machine first two years. There are 7 Supervisors whose Salary is ₹1.50 Lakhs per annum. The New Machine having Conveyor Belt is expected to help in cost cutting measures in the following ways -

(1) Improve Productivity of workers by 10%

(2) Cut-down Material Wastage by 5%

(3) Elimination of services of Supervisors because of automatic facilities of the machine

(4) Saving in Packaging Cost by ₹1 Lakhs.

Assuming Cost of Capital to be 15%, calculate how many Supervisors should be removed from the production activities to achieve the Target Cost.

Solution:

For the same quantity, Sales Value will reduce by 3% of (2,00,000 units x ₹100.00) =₹6.00 lakhs. For maintaining the same amount of profit, cost also has to be reduced by ₹6.00 Lakhs, which can be achieved as under:

Particulars	₹ Lakhs
Savings: Reduction in Wages (**Note:** Due to higher Labour Productivity, Wages will be $\frac{40}{110} \times 100$ = ₹ 36.36 lakhs)	3.64
Elimination of wastage of Materials = 5% of ₹50 Lakhs	2.50
Savings in Packaging Cost (given)	1.00
Saving in Maintenance Cost (given)	1.00
Sub-Total Savings (A)	**8.14**
Costs: Loss in Disposal of Old Machine (₹3 Lakhs - ₹1 Lakhs)	2.00
Difference in Depreciation (₹10 Lakhs - ₹3 Lakhs) x 15%	1.05
Cost of Capital Investment (₹10 Lakhs x 15%)	1.50
Sub-Total Costs (B)	**4.55**
Effective Cost Reduction before considering removal of Supervisors (A-B)	3.59
Additional Reduction required for meeting Target Cost, 'by removing Supervisors (₹6.00 Lakhs-₹3.59 Lakhs)	2.41

Hence, number of Supervisors to be removed = $\frac{\text{₹ 2.41 Lakhs}}{\text{₹ 1.50 Lakhs per supervisor}}$

= 2 Supervisors (Approx)

Illustration 98.

S Ltd. manufactures many products. To compute Manufacturing Cost, it uses a Costing System with one Direct-Cost category (Direct Materials) and three indirect-Cost categories:

(a) Batch-related Set-up, Production Order, and Materials-Handling Costs, all of which vary with the number of batches.

(b) Manufacturing Operation costs that vary with machine-hours.

(c) Costs of Engineering Changes that vary with the number of engineering changes made.

In response to competitive pressures at the end of 2012, Product Designers at the Company employed Value Engineering techniques to reduce Manufacturing Costs. Actual Information for 2012 and 2013 are as follow:

Particulars	Actual Results for 2012	Actual Results for 2013
Total Setup, Production-Order, and Material-Handling Costs	₹75,00,000	₹72,00,000
Total Number of Batches	1,000	1,200
Total Manufacturing Operations Costs	₹1,22,00,000	₹1,32,00,000
Total Number of Machine Hours worked	2,00,000	2,20,000
Total Costs of Engineering Changes	₹27,00,000	₹25,00,000
Total Number of Engineering Changes made	300	250

The Company wants to evaluate whether Value Engineering has succeeded in reducing the Target Manufacturing Cost per unit of one of its main products, P, by 12%. Actual Results for 2012 and 2013 for P are:

Particulars	Actual Results for 2012	Actual Results for 2013
Units of P produced	4,500	5,000
Direct Materials Costs per unit of P	₹1,000	₹1,000
Total No. of batches required to produce P	50	60
Total machine-hours required to produce P	20,000	22,000
Number of Engineering Changes made	14	5

Required:

(i) Calculate the Manufacturing Cost per unit of P for 2012 and 2013.

(ii) Did the Company achieve the Target Manufacturing Cost per unit for P? Show your calculations.

Solution:

Activity	ABC Rate	2012	ABC Rate	2013
Set-up, etc,	$\frac{₹\ 75,00,000}{1,000}$ = ₹ 7,500 per batch	50 x 7,500 = 3,75,000	$\frac{₹\ 72,00,000}{1,200}$ = ₹ 6,000 per batch	60 x 6,000 = 3,60,000
Manufacturing Operations	$\frac{₹\ 1,22,00,000}{2,00,000}$ = ₹ 61 per m/c hr.	20,000 x 61 =12,20,000	$\frac{₹\ 1,32,00,000}{2,20,000}$ = ₹ 60 per m/c hr.	22,000 x 60 =13,20,000
Engineering Changes	$\frac{₹\ 27,00,000}{300}$ = ₹ 9,000 per change	14 x 9,000 = 1,26,000	$\frac{₹\ 25,00,000}{250}$ = ₹ 10,000 per change	5 x 10,000 = 50,000
Total OH Cost		17,21,000		17,30,000
Output Quantity		4,500 units		5,000 units

OH Cost per unit	382.44		346.00
Add: Direct Materials Cost per unit	1,000.00		1,000.00
Total Cost per unit	1,382.44		1,346.00
Target Cost for 2013		1,382.44 less 12% thereon	1,217.00
Comments on Target Cost Reduction		Not achieved	

Illustration 99.

Challenge Ltd. manufactures two parts 'A' and 'B' for an industry.

(1) A: Annual Production and Sales of 2,00,000 units at a Selling Price of ₹60 per unit.

(2) B: Annual Production and Sales of 50,000 units at a Selling Price of ₹140 per unit.

Direct and Indirect Costs incurred on these two parts are as follows:

(₹ in thousands)

Particulars	**A**	**B**	**Total**
Direct Material Cost (Variable)	4,000	2,000	6,000
Labour Cost (Variable)	1,500	500	2,000
Direct Machining Costs (See Note)	800	200	1,000
Indirect Costs:			
Machine Set Up Cost			500
Testing Cost			3,000
Engineering Cost			2,500
Total			15,000

Note: Direct Machining Costs represent the cost of machine capacity dedicated to the production of each product. These costs are fixed and are not expected to vary over the long-run horizon.

Additional information is as follows:

Particulars	**A**	**B**
Production	2,00,000 units	50,000 units
Batch Size	1,000 units	500 units
Set up Time per batch	40 hours	20 hours
Testing Time per unit	4 hours 30 minutes	6 hours
Engineering Cost incurred on each product	₹10,00,000	₹15,00,000

A Foreign Competitor has introduced product very similar to A. To maintain the Company's share and profit, Challenge Ltd. has to reduce the price to ₹50. The Company calls for a meeting and comes up with a proposal to change design of product 'A'. The expected effect of new design is as follows:

(1) Direct Material Cost is expected to decrease by ₹5 per unit.

(2) Labour Cost is expected to decrease by ₹1.50 per unit.

(3) Machine Time is expected to decrease by 20 minutes, previously it took 3 hours to produce 1 unit of 'A'. The machine will be dedicated to the production of new design.

(4) Set up Time will be 35 hours for each set up.

(5) Time required for testing each unit will be reduced by 30 minutes.

(6) Engineering Cost will be increased by ₹90,000

(7) Batch Size will be unchanged.

Required:

(i) Company Management identifies that Cost Driver for Machine Set up Costs is 'Set up Hours used in batch setting' and for Testing Costs is 'Testing Time'. Engineering Cost assigned to products by special study. Calculate the full cost per unit for A and B using Activity-Based Costing.

(ii) What is the Mark-up on Full Cost per unit of A?

(iii) What is the Target Cost per unit for new design to maintain the same mark up percentage on Full Cost per unit as it had earlier? Assume Cost per unit of Cost Drivers for the new design remains unchanged.

(iv) Will the new design achieve the Cost Reduction Target?

(v) List four possible management actions that the Challenge Ltd. should take regarding new design.

Solution:

(i) Computation of Quantities of Cost Drivers

Particulars	**A**	**B**	**Total**
(a) Quantity	2,00,000 units	50,000 units	
(b) Batch Size	1,000 units	500 units	
(c) Number of Batches (a ÷ b)	200 batches	100 batches	
(d) Set Up Time per batch	40 hours	20 hours	
(e) Total Set Up Time for Production (c x d)	8,000 hours	2,000 hours	10,000 hours
(f) Testing Time per unit	4.50 hours	6 hours	
(g) Total Testing Time for Production (a x f)	9,00,000 hours	3,00,000 hours	12,00,000 hours

Computation of ABC Recovery Rates

Activity	**Activity Cost Pool**	**Cost Driver**	**Cost Driver Quantity**	**ABC Rate**
(a) M/c Set Up	₹5,00,000	Set Up Hours	10,000 Set Up Hours	₹50.00 per hour
(b) Testing	₹30,00,000	Testing Hours	12,00,000 Testing Hours	₹2.50 per hour

Note: Engineering Costs are assigned by special study. Hence ABC Rate is not calculated.

Computation of Cost per unit using ABC System

Particulars	**A**	**B**
(a) Direct Costs:		
Direct Materials	₹40,00,000 ÷ 2,00,000 = ₹20.00	₹20,00,000 ÷ 50,000 = ₹40.00
Direct Labour	₹15,00,000 ÷ 2,00,000 = ₹7.50	₹5,00,000 ÷ 50,000 = ₹10.00
Direct Machining	₹8,00,000 ÷ 2,00,000 = ₹4.00	₹2,00,000 ÷ 50,000 = ₹4.00
Sub-Total Direct Costs	₹31.50	₹54.00
(b) Indirect Costs:		
Machine Set Up	(₹50 x 40 hrs) ÷ 1,000 units = ₹2.00	(₹50 x 20 hrs) ÷ 500 units = ₹2.00
Testing	(₹2.5 ph x 4.5 hours) = ₹11.25	(₹2.5 ph x 6 hours) = ₹15.00

Engineering	10,00,000 ÷ 2,00,000 = ₹5.00	15,00,000 ÷ 50,000 = ₹30.00
Sub-Total Indirect Costs	₹18.25	₹47.00
(c) Total Costs	₹49.75	₹101.00

(ii) Markup (or) Profit per unit of A = Selling Price - Full Cost = ₹60 - ₹49.75 = ₹10.25 p.u. Percentage of Markup to Full Cost = ₹10.25 ÷ ₹49.75 = 20.60% on Cost.

(iii)

New Selling Price (given)	₹50.00
Less: Target Profit at 20.60% on Cost, i.e. 20.60/120.60 on Selling Price [50 x 20.60/120.60]	₹8.54
Target Cost for New Design of A	₹41.46

(iv) Target Costing and Cost Reduction Aspects

Particulars	₹
(a) Direct Costs:	
Direct Materials	20.00 - 5.00 = 15.00
Direct Labour	7.50 - 1.50 = 6.00
Direct Machining (dedicated machine, hence time saved is not relevant, as the costs continue to be fixed)	4.00
Sub-Total Direct Costs	25.00
(b) Indirect Costs:	
Machine Set Up (₹50 x 35 hours) ÷ 1,000 units	1.75
Testing (₹2.5 ph x 4 hours)	10.00
Engineering (₹ 10,90,000 ÷ 2,00,000 units)	5.45
Sub-Total Indirect Costs	17.20
Total Estimated Costs of New Design A	42.20

Target Cost is ₹41.46 only. Hence, the new design will not achieve the Cost Reduction Target.

Note: It is assumed that output of A will remain at 2,00,000 units, inspite of the reduction in machine time. To maintain 20.60% profit margin, probable Selling Price of New Design A will be ₹42.20 + 20.60% = ₹50.89 (Approx).

(v) Possible management actions for new design:

(a) Value Engineering and Value Analysis to reduce the Direct Material Costs.

(b) Time and Motion Study in order to re-define the Direct Labour time and related costs.

(c) Exploring possibility of cost reduction in costs of Direct Machining.

(d) Identifying Non-Value Added Activities and eliminating them in order to reduce Overheads.

(e) Analysis of effect of sale of New Design A on sale of B.

(f) Analysis of sensitivity of sale quantity of New Design A to price changes from ₹50 to ₹50.89.

Illustration 100.

X Ltd. is considering a project with following cash flows :

Year	Purchase of Plant ₹	Running Costs ₹	Savings ₹
0	(7,000)		
1		2,000	6,000
2		2,500	7,000

The cost of capital is 8% .Measure the sensitivity of the project to changes in the levels of Plant Value, Running Costs and Savings (considering each factors at a time) such that Net present value becomes zero. Which factor is most sensitive to affect the acceptability of the project. The Present value factors at 8% are as follows:

Year	Factor
0	1.00
1	0.93
2	0.86

Solution:

The present value of the cash flows are as follows:

Year cost	Discount Factor at 8%	PV of plant cost ₹	PV of running cost ₹	PV of savings ₹	PV of Net cash flows ₹
0	1.00	(7,000)			(7,000)
1	0.93		(1,860)	5,580	3,720
2	0.86		(2,150)	6,020	3,870
		(7,000)	(4,010)	11,600	590 = NPV

The project has a positive NPV and therefore accepted. The changes in cash flows which would need to occur the project only just breaks even (NPV= 0) are as follows:

Sensitivity Analysis :

(a) Plant costs would need to **increase** by a **PV** of ₹590

i.e. by $\frac{590}{7,000} \times 100 = 8.43\%$

(b) Running costs would need to **increase** by a **PV** of ₹590

i.e. by $\frac{590}{4,010} \times 100 = 14.71\%$

(c) Saving would need to **fall short** by a **PV** of ₹590

i.e. by $\frac{590}{11,600} \times 100 = 5.09\%$

Savings therefore is most sensitive to affect the acceptability of the project.

Illustration 101.

The Programme schedule operated by Cheviot TV contains a drama series called the Cobbler of Umbndge (Cobblers). This consists of five half-hour installments per week broadcast in the peak 7.00 to 7.30 pm slot, with each evening's episode repeated the following morning in an off peak slot. The series is produced by another television company which has offered it to sunburst for a fee of ₹8,00,000 per year for the full ten years of franchise.

Cobbler is set in a village community. It was first devised in the 2012 and the basic characterisation and storyline have since remained unchanged.

An independent firm of film makers has recently started producing a series called Acapulco which is set in a British expatriate community in Spain. This has been offered to sunburst for an annual fee of ₹2,50,000 for the first five years of the franchise and ₹7,50,000 per year thereafter.

Each half hour programme carries five minutes of advertising. Fees paid for advertising are linked to audience penetration based on an independent audit. One audience point represents 1% of the total viewing public. Rates are planned to be as follows:

Peak-time viewing	₹9.00 per minute per point
Off-peak viewing	₹3.60 per minute per point

Current audience penetration of the alternative series are as follows:

	Cobblers point	Acapulco point
Peak-time showing	63	28
Off-peak showing	87	25

Jones asks for your advice as follows:

"I am undecided whether to include cobblers or Acapulco in our programme plan. Cobblers is a dated product and penetration is sure to drop by an average of four points per year (peak-time and off-time) during the franchise. Although, Acapulco's penetration has been poor on those stations that have taken it, I believe that in time it will gain audience."

You are required:

(a) to advice Jones on the rate of audience growth (points per year) needed throughout the ten-year franchise period to justify taking Acapulco instead of cobblers:

(b) to explain the term "product life cycle" and its relevance to Jones's choice between Acapulco and cobblers.

In answering the above, you may assume:

- Current rate of corporate tax is 33%
- Writing down allowances and depreciations are on 25% reducing balance basis
- Tax is paid in the same year, in which profit are earned
- sunburst cost of money is 12%, pre tax and 8% post tax
- Sunburst has various profitable activities
- All relevant costs are specified above.

Solution:

(a)

From: Management Accountant	To: Mr. D Jones
Date:	
Subject: Rate of audience growth to justify "Acapulco"	
Please find enclosed my calculation based on the information furnished by you. Sunburst must expect a 2 points cumulative average improvement in audience penetration to facilitate change from "Cobbler" to "Acapulco". Then "Acapulco" will become financially viable venture. For details, please refer to the annexure. If you need any information, please let me know	
Sd/- Management Accountant	

Annexure

Annual advertising time:		
5 Minutes×5 instalments×52 weeks=1,300 minutes		
"Cobblers" revenue per minute		
Peak	63×₹9.00	₹567.00
Off-Peak	87×₹3.60	₹313.20
		₹880.20
Annual revenue = 1,300 minutes × ₹880.20 = ₹11,44,260		
Annual decline in revenue:		
Peak	4×₹9.00	₹36.00
Off-peak	4×₹3.60	₹14.40
		₹50.40
Annual decline = 1,300 minutes × ₹50.40 = ₹65.520		

NPV of revenue over 10 years Cobblers

(₹000)

Plan	Revenue	Cost	Contribution	Tax at 33%	Net cash flow	Discounting factor at 8%	NPV
1	1,144	(800)	344	(114)	230	0.93	214
2	1,079	(800)	279	(92)	187	0.86	161
3	1,013	(800)	213	(70)	143	0.79	113
4	948	(800)	148	(49)	99	0.74	73
5	882	(800)	82	(27)	55	0.68	37
6	817	(800)	17	(6)	11	0.63	7
7	751	(800)	(49)	16	(33)	0.58	(19)
8	686	(800)	(114)	38	(76)	0.54	(41)
9	620	(800)	(180)	59	(121)	0.50	(60)
10	555	(800)	(245)	81	(164)	0.46	(75)
	8,495	(8,000)	495	(164)	331		410

Acapulco revenue per minute:

Peak	28×₹9.00	₹252
Off-peak	25×₹3.60	90
		342

Annual revenue= ₹342×1,300 minutes=₹4,44,600

NPV of revenue over 10 years **Acapulco**

(₹000)

Years	Revenue	Cost	Contribution	Tax at 33%	Net cash flow	Discounted at 8%	NPV
1	445	(250)	195	(64)	131	0.93	121
2	445	(250)	195	(64)	131	0.86	112
3	445	(250)	195	(64)	131	0.79	103
4	445	(250)	195	(64)	131	0.74	96
5	445	(250)	195	(64)	131	0.68	89
6	445	(750)	(305)	100	(205)	0.63	(129)
7	445	(750)	(305)	100	(205)	0.58	(119)
8	445	(750)	(305)	100	(205)	0.54	(111)
9	445	(750)	(305)	100	(205)	0.50	(103)
10	445	(750)	(305)	100	(205)	0.46	(94)
							(35)

Each one point change in penetration will increase revenue per minute by:

Peak	1×₹9.00	₹9.00
Off-peak	1×₹3.60	₹3.60
		₹12.60

Annual revenue = ₹12.60×1,300 minutes = ₹16,380

After tax at 33% = ₹10,975

The effect over 10 years consuming a one unit cumulative increase is:

Year	Extra revenue after tax (₹000)	Discount factor at 8%	NPV (₹000)
2	11	0.86	9
3	22	0.79	17
4	33	0.74	24
5	44	0.68	30
6	55	0.63	35
7	66	0.58	38
8	77	0.54	42
9	88	0.50	44
10	99	0.46	46
			285

To justify taking Acapulco instead of Cobblers the NPV must be increased by ₹4,10,000+₹35,000=₹4,45,000.

As one point change in penetration will increase the revenue by ₹2,85,000, then penetration must be increased by ₹4,45,000÷₹2,85,000=1.6 point or 2 points on the rounded scale.

(b) **Product life cycle:** Many products have a small market in the beginning. Then volume tends to build up as a result of publicity and customer recommendation. After period of steady growth sales reaches a plateau and then starts to decline. This happens due to cheaper or more advanced products.

Product Life Cycle is useful concept in sales forecasting and planning. In initial stages there is large cost due to experimentation work, machine set-up and employees training. As sales improve cost per unit reduces and profit increases. In decline stage, cost may again as more publicity in required to sustain sales against competitive products.

The product life cycle concept is very relevant to Jones's decision. Cobbler is out-dated product with declining audience. More and more cost is to be incurred to maintain viewers' interest. On the other hand Acapulco is a new product and has a longer life ahead.

The cost is lower in first five years, as Sunburst will have to build up a loyal body of viewers. If the series is a success, it will receive publicity and recommendation. On these expectation the annual fee increase from ₹2,50,000 to ₹7,50,000 per year.

If the expected fall in Cobbler audience is correct, then Acapulco has to make only a small improvement of about 2 points to be the better financial venture.

Illustration 102.

Z Plc. supports the concept of life cycle costing for new investment decisions covering its engineering activities. The final side of this philosophy is now well established and its principles extended to all other areas of decision making.

The company is to replace a number of its machines and production manager is to torn between the Exe machine, a more expensive machine with a life of 12 years, and the Wye machine with an estimated life of 6 years. If the Wye machine chosen it is likely that it would be replaced at the end of 6 years by another Wye machine. The pattern of maintenance and running cost differs between the two types of machine and relevant data are shown below:

	Exe	**Wye**
Purchase price (₹)	19,000	13,000
Trade-in-value (₹)	3,000	3,000
Annual repair cost (₹)	2,000	2,600
Overhaul cost	(at year 8)4,000	(at year 4)2,000
Estimated financial costs averaged over machine life	10%p.a.	10%p.a.

You are required to recommend, with supporting figures, which machine to purchase, stating any assumption made.

Solution:

Machine Exe-Life 12 years

	Year	Cost	Discount factor	Discounted cost
Purchase price	0	₹19,000	1.00	₹19,000
Overhead cost	8	4,000	0.47	1,880
Trade-in-value	12	(3,000)	0.32	(960)
Annual repair cost	1-12	2,000	6.81	13,620
				33,540

Annualised equivalent ₹33,540 ÷ 6.81 = ₹4,925

Machine Wye-Life 6 years

	Year	Cost	Discount factor	Discounted cost
Purchase price	0	₹13,000	1.00	₹13,000
Overhead cost	4	2,000	0.68	1,360
Trade-in-value	6	(3,000)	0.56	(1,680)
Annual repair cost	1-6	2,600	4.36	11,336
				24,016

Annualised equivalent ₹24,016 ÷ 4.36 = ₹5,508

Recommendation:

Machine Exe should be purchased.

Assumption:

(i) Same performance, capacity and speed

(ii) No inflation

(iii) 12 year estimates are as accurate as 6 year estimate

(iv) Cash flows are at the end of every year.

Study Note - 8

BUDGETARY CONTROL AND STANDARD COSTING IN PROFIT PLANNING

This Study Note includes

8.1 BUDGETARY CONTROL

Various systems of costing provide information about the expenses incurred. Their objective is ascertainment of cost. As information provided is related to past, it is only a postmortem–what has happened. Modern Management wants something more to make the concern successful. Modern Management wants:

(A) All operations should be forecasted and planned ahead, as far as possible.

(B) Compare actual results with the planned action for exercising control.

For the above two functions of Planning and Control, two new techniques are applied, namely Standard Costing and Budgetary Control.

Planning is a management function. In this competitive environment, the business enterprise becomes successful only with planning. Plans are framed to achieve better results. However, planning for the sake of it is of no use. Plans should work to achieve the results planned. This is possible through co-ordination, as all the tasks cannot be performed, in isolation. Where more than one individual is involved; only co-ordination can bring the required results. For it, control is needed.

Budget

Budget is a financial and /or quantitative statement, prepared and approved prior to a defined Period of time of the policy to be pursued during that period for the purpose of attaining a given objective. It may include income, expenditure and employment of capital.

Features:

1. Financial and/or Quantitative Statement.
2. Futuristic - prepared and approved prior to a defined period of time.
3. Goal Oriented - for the purpose of attaining a given objective.
4. Components - Income, Expenditure and Employment of Capital.

Objectives of budgeting

The objectives of Budgeting are-

1. To encourage self-study in all aspects of a Company's operations.
2. To get all members of management to "put their heads" to the basic question of how the business should be run, to make them of a co-ordinated team operating in unison towards clearly defined objectives.

3. To promote the planning process and provide a sense of direction to every member of the organization.
4. To force a definition and crystallization of Company policies and aims.
5. To increase the effectiveness with which people and capital are employed.
6. To disclose areas of potential improvement in the Company's operations.
7. To stimulate study of relationship of the Company to its external economic environment for improving the effectiveness of its direction.
8. To direct and co-ordinate business activities and units to achieve stated targets of performance.
9. To facilitate the control process, by comparing actual results with plan, and provide feedback to the employees about their performance.

Budgetary Control

Budgetary Control is defined as "the establishment of budgets, relating the responsibilities of executives to the requirements of a policy, and the continuous comparison of actual with budgeted results either to secure by individual action the objective of that policy or to provide a base for its revision.

Salient features:

(a) Objectives: Determining the objectives to be achieved, over the budget period, and the policy(ies) that might be adopted for the achievement of these ends.

(b) Activities: Determining the variety of activities that should be undertaken for achievement of the objectives.

(c) Plans: Drawing up a plan or a scheme of operation in respect of each class of activity, in physical a well as monetary terms for the full budget period and its parts.

(d) Performance Evaluation: Laying out a system of comparison of actual performance by each person section or department with the relevant budget and determination of causes for the discrepancies, if any.

(e) Control Action: Ensuring that when the plans are not achieved, corrective action are taken; and when corrective actions are not possible, ensuring that the plans are revised and objective achieved

Objectives of Budgetary Control System

The objectives of a Budgetary Control System are -

1. **Definition of Goals:** Portraying with precision, the overall aims of the business and determining targets of performance for each section or department of the business.
2. **Defining Responsibilities:** Laying down the responsibilities of each individual so that everyone knows what is expected of him and how he will be judged.
3. **Basis for Performance Evaluation:** Providing basis for the comparison of actual performance with the predetermined targets and investigation of deviation, if any, of actual performance and expenses from the budgeted figures. It helps to take timely corrective measures.
4. **Optimum use of Resources**: Ensuring the best use of all available resources to maximize profit or production, subject to the limiting factors.
5. **Co-ordination**: Coordinating the various activities of the business and centralizing control, but also making a facility for the Management to decentralize responsibility and delegate authority.
6. **Planned action**: Engendering a spirit of careful forethought, assessment of what is possible and an attempt at it. It leads to dynamism without recklessness. It also helps to draw up long range plans with a fair measure of accuracy.
7. **Basis for policy**: Providing a basis for revision of current and future policies.

Advantages of the Budgetary Control System

1. The use of budgetary control system enables the management of a business concern to conduct its business activities in the efficient manner.
2. It is a powerful instrument used by business houses for the control of their expenditure. It infact provides a yardstick for measuring and evaluating the performance of individuals and their departments.
3. It reveals the deviations to management, from the budgeted figures after making a comparison with actual figures.
4. Effective utilization of various resources like-men, material, machinery and money is made possible, as the production is planned after taking them into account.
5. It helps in the review of current trends and framing of future policies.
6. It creates suitable conditions for the implementation of standard costing system in a business organization.
7. It inculcates the feeling of cost consciousness among workers.

Disadvantages/Limitations of the Budgetary Control System

1. **Estimates:** Budgets may or may not be true, as they are based on estimates. The assumptions about future events may or may not actually happen.
2. **Rigidity:** Budgets are considered as rigid document. Too much emphasis on budgets may affect day-today operations and ignores the dynamic state of organizational functioning.
3. **False Sense of Security:** Mere budgeting cannot lead to profitability. Budgets cannot be executed automatically. It may create a false sense of security that everything has been taken care of in the budgets.
4. **Lack of co-ordination:** Staff co-operation is usually not available during Budgetary Control exercise.
5. **Time and Cost**: The introduction and implementation of the system may be expensive.

Different Types of Budgets

Budgets may be classified on the following bases -

1. Time-Period	2. Conditions	3. Capacity	4. Coverage
(a) Long-term Budget &	(a) Basic Budget &	(a) Fixed Budget &	(a) Functional Budget &
(b) Short-term Budget	(b) Current Budget	(b) Flexible Budget	(b) Master Budget

1. BASED ON TIME PERIOD:

Long Term Budget	Short Term Budget
(a) Budgets which are prepared for periods longer than a year are called Long-Term Budgets. (b) Such Budgets are helpful in business forecasting and forward planning. (c) **Examples:** Capital Expenditure Budget and R&D Budget.	(a) Budgets which are prepared for periods less than a year are known as Short-Term Budgets. (b) Such Budgets are prepared in cases where a specific action has to be immediately taken to bring any variation under control. (c) **Example:** Cash Budget.

2. BASED ON CONDITION:

Basic Budget	Current Budget
A Budget, which remains unaltered over a long period of time, is called Basic Budget.	A Budget, which is established for use over a short period of time and is related to the current conditions, is called Current Budget.

3. BASED ON CAPACITY:

Particulars	Fixed Budget	Flexible Budget
(a) Definition	It is a Budget designed to remain unchanged irrespective of the level of activity actually attained.	It is a Budget, which by recognizing the difference between fixed, semi-variable and variable costs is designed to change in relation to level of activity attained.
(b) Rigidity	It does not change with actual volume of activity achieved. Thus it is known as a Rigid or Inflexible budget.	It can be re-casted on the basis of activity level to be achieved. Thus it is not rigid.
(c) Level of Activity	It operates on one level of activity and under one set of conditions. It assumes that there will be no change in the prevailing conditions, which is unrealistic.	It consists of various budgets for different levels of activity
(d) Effect of variance analysis	Variance Analysis does not give useful information as all Costs fixed, variable and semi-variable) are related to only one level of activity.	Variance Analysis provides useful information as each cost is analysed according to its behaviour.
(e) Use for Decision making	If the budgeted and actual activity levels differ significantly, then aspects like cost ascertainment and price fixation do not give a correct picture.	If facilitates the ascertainment of cost, fixation of selling price and submission of quotations.
(a) Performance Evaluation	Comparison of actual performance with budgeted targets will be meaningless, especially when there is a difference between two activity levels.	It provides a meaningful basis of comparison of the actual performance with the budgeted targets.

4. BASED ON COVERAGE:

Functional Budget	Master Budget
Budgets, which relate to the individual functions in an organization, are known as Functional Budgets, e.g. purchase Budget, Sales Budget, Production Budget, plant-Utilization Budget and Cash Budget.	It is a consolidated summary of the various functional budgets. It serves as the basis upon which budgeted Profit & Loss Account and forecasted Balance Sheet are built up.

Essential Steps for Installation of Budgetary Control System

In order to have effective Budgetary Control System, it is appropriate to take the following steps:

1. Budget Manual: This is a written document specifying the objectives and procedures of budgetary control. **It spells out the duties and responsibilities of executives.** The budget manual defines the sanctioning powers of the various authorities.

2. **Budget Centres:** A budget centre is that part of organisation for which the budget is prepared. **Budget centre can be a department, section of a department or any other part of department.** Budget centres are necessary for the purpose of ascertaining cost, performance and its control.

3. **Budget Committee:** In a large concern, all the functional heads are the members of the budget committee. They discuss their respective budgets and finalise the budget, after collective decisions. **The committee is responsible for its execution and achievement of the goals set.**

4. **Budget Officer:** The chief executive appoints some person as the budget officer. He is conversant with the functioning of the various departments. All budgets are presented to the budget officer who places before the budget committee, after making the necessary changes, for its approval. The actual performance of each department is communicated to the budget officer. He determines the variances, analyses the reasons and reports to the top management to take the necessary steps to remove the deviations. The variances are reported to the concerned departments too for necessary action, as may be necessary. **As the convenor of the budget committee, the main function of Budget officer is co-ordination to ensure achievement of the budgeted targets.**

5. **Functional Budgets: Separate functional budgets have to be prepared.** Examples are Production Budget, Sales Budget, HR Budget, Cash Budget, Capital expenditure Budget and R & D Budget.

6. **Budget Period: A budget period is the length of the period for which budget is prepared.** Normally, budgets like purchases and sales budgets are prepared for one year. However, a capital expenditure budget is prepared for a longer period i.e. 3 to 5 years.

7. **Determination of Key Factor:** Budgets are prepared for all the functional areas such as production, sales, purchases, finance, human resources and research and development. These activities are inter-connected and inter-dependent and so the budgets are. For example, raw material supply may be limited. So, production and sales budgets are prepared, based on the purchase budget. To some of the firms, finance may be a constraint. Then, all other budgets are prepared based on the availability of finance. **A factor, which influences all other budgets, is known as key factor or principal factor.**

A better co-ordination brings better performance, even while facing constraints. The influence of key factor may neither be permanent nor the same factor may be constant. Limited supply of raw materials may be the key factor, till an alternative source of supply for that material is found. When the raw material supply problem is cleared, another factor may create the problem and become key factor. After raw materials problem is eased, sales may become a problem and become a key factor, due to change in trends. The management would be constantly endeavouring to remove the problems associated with key factor for better performance.

Comparison of Standard Costing with Budgetary Control

Standard Costing with Budgetary Control aims at maximising efficiency and controlling costs. They are useful tools to management. However, they differ in the following aspects.

Base	Budgetary Control	Standard Costing
Coverage	It covers all the functions of a business such as purchases, production, sales, finance, capital expenditure and research and development etc. in other words, it has a macro-approach.	Standard costs are, basically, developed for the manufacturing function i.e., production. In other words, it has a micro-approach.
Objective	Objective is to delegate responsibility and ensure performance, without sacrificing control.	Objective is to enable the management to fix standards, control variances and value closing stock.

Application	It can be implemented in all industries.	It is not possible to implement in all types of industries. It cannot be applied in jobbing activity, in all operations.
Scope	It is more extensive as it covers all the departments or operations of the business, as a whole.	It is more intensive in application as it calls for detailed analysis of variances. Concentration is on various elements of cost like raw materials, labour and overheads.
Implementation	It can be implemented, even in parts. To certain areas or departments, it can be implemented, while leaving rest of the areas. For example, it can be implemented in the sales department, alone.	It cannot be operated in parts. It has to cover all items of expenses, without leaving any item.
Projection	It is based on the past actual records and suitably adjusted to future trends and expectations. It is a projection of financial accounts.	It is based on the technical assessments. It is a projection of cost accounts.
Variance	Budgetary control deals with total variances. The variances are calculated for the different departments or the organization, as a whole.	Variances are calculated for different elements of costs i.e., material, labour and overheads. Further, they are analysed, in detail, for their causes.
Orientation	It is more management oriented.	It is more engineering oriented.
Relationship	Budgetary control can be applied, even without the help of standard costing.	To establish standard costing, some form of budgeting is needed to forecast the level of outpuit and prescribed set of working conditions in which standard costs would be used.
Difference in advantages	It aims in policy determination and facilitates introduction of Delegation of Authority.	Standard costs are used in various management decisions, price fixing and valuation of closing stock etc.

Both standard costing and budgetary control are complementary to each other. Both should be used to achieve maximum efficiency.

Principal Budget Factor

The principal budget factor is the factor that limits the activities of functional budgets of the organization. The early identification of this factor is important in the budgetary planning process because it indicates which budget should be prepared first.

The general sales volume is the principal budget factor. So the sales budget must be prepared first, based on the available sales forecasts. All other budgets should then be linked to this.

Alternatively, the machine capacity may be limited for the forthcoming period and therefore machine capacity is the principal budget factor. In this case, the production budget must be followed first and all the other budgets follow it.

The **principal budget factor** is the factor which acts as an over-riding limitation on the activities of the organisation. It might be sales, productive capacity, finance, shortages of materials, labour or energy. The principal budget factor can change over time. Identifying limiting factors is a key element in the co-ordination aspect of budgetary control. Failure to identify the principal budget factor could lead to delays later on when the managers realize that the targets they have been working with are not feasible.

Following is he representative list of key factors :

(a)	Sales	(i) Market potential
		(ii) Insufficient demand
		(iii) Consumer demand
(b)	Material	(i) Non-availability of a particular material
		(ii) restrictions imposed by local governments due to licensing or quota system
(c)	Labour	(i) Non-availability of a particular grade of labour
		(ii) change in political conditions
(d)	Plant	(i) Limited capacity
		(ii) Non-availability of imported plant and equipment due to Government restrictions
(e)	Management	(i) Shortage of efficient executives
		(ii) Restricted policy due to lack of capital
(f)	Working capital	(i) Shortage due to lack of capital
		(ii) Inefficient use of working capital

How to identify the principal budget factor

1. In case of single product organization
2. In case of multi-product organization

In case of Single product organization

Steps to follow:

(i) Identify the capacity of the production departments. Generally the normal capacity is considered for budget/estimation

(ii) Max. production in a department = Normal Capacity / Time per unit

(iii) Select the minimum production volume among the above results.

(iv) The department producing that result is known as the bottleneck among the production department.

(v) Identify the sale or the demand of the product

In case of multi product organization

Steps to follow:

(i) Sale/demand is the principal budget factor

(ii) Capacity is in short supply or the limiting factor i.e. capacity requirement according to demand is more than the supply

  (a) Only one limiting factor

  (b) More than one limiting factor

8.2 ZERO-BASED BUDGETING (ZBB)

Traditionally, on the basis of the targets which have been set in the last year, budgeting is done. In the last year's budget, certain additions & deductions are done for arriving at the figures for the current budget. Thus, in making traditional budget, we have to depend on the last year's targets as well as on the principles of incrementalism or decrementalism, for the purpose of deciding upon the additions or deletions which are required to be incorporated in the budget figures of the previous year so that the figures of the current budget can be arrived.

In case of Zero-base budgeting (ZBB), the assumption is made that there was no budget for the previous year & in the light of expected benefits & costs which are involved; independent evaluation are made of the proposals of the current budget. Thus, ZBB refers to the formulation of a budget without any reference made to the previous plans & achievement but particular reference is made to the justification of the proposed resources' allocation. This is not done only once. Whenever a budget needs to be prepared, every time, the process of budgeting should start from zero & in terms of cost-benefit analysis, the proposed allocation of resources should be justified.

In the cases of planning & decision making, ZBB becomes ideal. Undertaking of previous type of work of which there is no previous experience is included in development planning. In these cases, on the basis of past targets which have been modified by certain additions & deletions, budgets can be prepared. On the basis of cost-benefit analysis, evaluation of every budget proposal is to be done. Identification of all proposed activities is to be done, as evaluation of decision packages is made by systematic analysis & ranking is done in order of priority. Upon the priority list, depends the decision making.

Main Features of ZBB:

The main features of ZBB are the following:

(a) As the basis of budgeting, Zero (or scratch) is taken & not the previous budgets' targets.

(b) The fund demanded has to be justified by the management of each decision unit.

(c) Grouping of all proposed activities has to be done into various decision packages.

(d) According to priority, the adequate evaluation & arrangement of all decision packages are done.

(e) After proper evaluation, consideration has to be given to the alternative decision packages.

(f) On the merits of evaluation of all decision packages including the alternative decision packages, resources are finally allocated.

Zero based budgeting is used to help justify expenses throughout each budget cycles. This prevents programs that are ineffective from continually getting funded without justification for their expenses. It also helps prevent waste, fraud and abuse within the system. This is because the budget starts at zero and each charge is accounted for. This can be particularly useful for charitable organizations and governmental departments where money can easily flow to certain activities with little or no oversight.

Difference between ZBB & Traditional Budgeting:

The distinctions between the traditional budgeting & zero-base budgeting are the following:

(a) In traditional budgeting, emphasis is given on previous level of expenditure, whereas, in ZBB, every time a budget is prepared, new economic appraisal is made.

(b) Traditional budgeting is a function which is accounting oriented, whereas, ZBB is a function which is project or decision oriented.

(c) For the preparation of a traditional project, rejustification of the existing programme is not needed, whereas, for the preparation of a zero-base budgeting, the justification of existing & new projects is needed to be done in the light of benefits & costs.

(d) In the case of traditional budget, the justification regarding why, for a particular decision unit, a particular amount of expenditure is decided upon, is justified by the top management, whereas, in case of ZBB, the amount of expenditure is justified by the manager of the decision unit & not the top management.

(e) In the case of traditional budgeting, the amount to added with or deleted from the figures of the previous budget figures is only taken into account, whereas, in case of ZBB, existing level of expenditure is appraised & the justification of future proposal for expenditure is done from different angles.

(f) Preparation of a traditional budget is a simple job which is done year after year monotonously, whereas, preparation of a zero-base budgeting requires logical approach & many complex steps are involved for the establishment of logic behind a proposal.

Merits of ZBB:

The following are the merits of ZBB:

(a) Careful examination of all projects-whether current or future is done with reference to cost and benefits and the project which is most efficient is accepted. Thus, ZBB is always a technique which is based on logic. The current projects, only if they are logically sound and efficient, are continued.

(b) For rational planning, on the cost-benefit acceptability, the most efficient ones amongst the available alternatives are chosen. The managers of decision units are required by ZBB to find out cost effective ways for the implementation of the plans. Thus, with the help of ZBB, best planning is made and cost can also be controlled with the help of ZBB.

(c) In respect of both existing and future projects, cost-benefit analysis is done. Ranking of the projects is done on the basis of the result of the analysis and allocation of funds is done in order of priority. Thus, ZBB helps in getting labour efficiently allocated.

(d) In ZBB, for the purpose of using the available resources of the organization, the most useful alternatives are found out. Alternative ways are taken into consideration in performing an activity also. Similarly, consideration is also given to the alternative quantum of efforts which are to be put in. These help promoting new ideas so that an activity can be performed in the best possible way.

(e) With regard to justifiability of continuing new undertaking on the basis of cost-benefit analysis, existing activities and new projects are appraised with equal importance.

(f) In ZBB, reports are to be submitted by managers of all decision units on their claims of funds and justification of the claims. Thus, in the making of zero-base budget, it becomes compulsory for all managers of decision units to participate. Thus in allocation and utilization of funds, forthcoming of new ideas gets promoted by this.

(g) Since in ZBB, existing activities gets appraised carefully, activities which fails to give desired results may be discontinued and thus by this way unproductive expenditure may be saved.

(h) Since all managers adopt ZBB technique, they are obliged for making self evaluation of projects under their command. If there are any loopholes in the working progress, those are automatically detected and remedial measures are adopted. Efficiency in performance can be achieved by awareness of managers' in respect of detection of errors and their rectification.

(i) Automatic motivation is created by ZBB which helps forming a management team of individuals having skills and talents.

(j) Top management gets linked with medium and lower level management with the help of ZBB. Thus, speedy communication helping expediting appropriate decision-making is ensured.

(k) ZBB helps in introducing and implementing 'Management by objective' (or MOB). The objectives of the traditional budgeting can be fulfilled using ZBB; as other objectives can as well be fulfilled with its help.

Demerits of ZBB:

The following are the demerits of ZBB:

(a) Time, energy and money is required in collecting and analyzing data of alternative future projects as well as existing activities.

(b) If full co-operation amongst management staff is not forthcoming, then ZBB technique implementation becomes difficult.

(c) As ideal standard of evaluation is not available, evaluation often becomes very difficult. Technical knowledge may be required in a desired manager's evaluation which may not be available.

(d) Managers are required to undergo continuous training. Implementation of ZBB cannot be expected in a right way if basis idea and objective of ZBB are not crystal clear to managers.

(e) In case of ZBB, according to priority, ranking of projects need to be done. Irrational ranking of project may arise due to ego of top management (i.e. Irrespective of its merits, a project favored by the top management may be ranked high). Moreover, regarding the method of ranking which needs to be adopted, confusion may arise among the management staff.

(f) Involvement of good number of individuals may be required by ZBB. Thus, complications may be created in communication system which results in difficulty in managing of the huge volume of data and voluminous paper work may be involved etc.

Steps involved in the introduction of Zero-Based Budgeting.

- **Decision Units:** The organisation is divided into decision units. The manager of the decision unit justifies the budget proposal. An organisation can have the following decision units- products, customers groups, markets, capital projects etc. The division of the organisation into the decision units should be in accordance to the organisational objectives.
- **Identification of decision package:** Each decision unit should be broken down into smaller decision packages. A decision package can be defined as a document that distinctively defines function, operation and activity. It should contain the following information:
  - (i) Identification of data
  - (ii) Economic benefits
  - (iii) Alternative course of action
  - (iv) Intangible benefits

Ranking of decision package: Ranking implies prioritising the available decision packages. This facilitates efficient allocation of resources by directing scarce resources to the most promising lines.

8.3 LEAN ACCOUNTING

What we now call lean manufacturing was developed by Toyota and other Japanese companies. Toyota executives claim that the famed Toyota Production System was inspired by what they learned during visits to the Ford Motor Company in the 1920s and developed by Toyota leaders such as Taiichi Ohno and consultant Shigeo Shingo after World War II. As pioneer American and European companies embraced lean manufacturing methods in the late 1980s, they discovered that lean thinking must be applied to every aspect of the company including the financial and management accounting processes.

Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. The reason for this is

that traditional accounting and management methods were designed to support traditional manufacturing; they are based upon mass production thinking. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

Classic examples of these kinds of problems are:

- Lean improvements showing cost increases as a result of the way standard costing applies labor and overhead costs. There is many an excellent lean strategy that has been cancelled or held back because the standard costing system shows a negative impact.
- Traditional performance measurements motivating the people to take anti-lean actions like building inventory, running large batches, "cherry picking" production jobs to maximize earned hours, combining jobs into more "efficient" runs, buying large (so called) economic order quantities of raw materials & components, and so forth. These problems are caused by measurements like labor efficiency, machine utilization, purchase price variance, and perhaps worst of all-overhead absorption variance (and other variances).

The lean team working hard to eliminate waste from the value stream only to find that profitability goes down owing to the adjustments made by significant inventory reduction. Looking at the other side of this same problem, the finance people are told about all the savings being made in operations but they see (at best) no financial improvement; and often a negative impact.

What is Lean Accounting? Is an oft-asked question. Everybody working seriously to implement lean thinking in their company eventually bumps up against their accounting systems. It soon becomes clear that traditional accounting systems are actively anti-lean.

- They are large, complex, wasteful processes requiring a great deal of non-value work.
- They provide measurements and reports like labor efficiency and overhead absorption that motivate large batch production and high inventory levels.
- They have no good way to identify the financial impact of the lean improvements taking place throughout the company. On the contrary, the financial reports will often show that bad things are happening when very good lean change is being made.
- Very few people in the company understand the reports that emanate from the accounting systems, and yet they are used to make important and far-reaching decisions.
- They use standard product (or service) costs which can be misleading when making decisions related to quoting, profitability, make/buy, sourcing, product rationalization, and so forth. Almost all companies implementing lean accounting are making poor decisions, turning down highly profitable work, out-sourcing products or components that should be made in house, manufacturing overseas products that can be competitively manufactured here at home etc.

A short example will illustrate why traditional accounting approaches can lead us to the wrong decisions. Let's assume a company runs a traditional standard costing system with a Standard Cost of ₹27 per piece made up of materials ₹12, labour ₹5 and overhead (absorbed on a labour hours basis) of ₹15. A request for quote comes in from a major potential customer for 10,000 pieces. The customer's target price is ₹29 per piece. Should we take the order ? In its standard costing system the company adds 15% to its standard cost when making quotes, thus it would quote this customer ₹31.05 per piece and not take the order.

Is this the right decision? The answer is we don't know. The Standard Cost approach doesn't tell us whether we have the spare capacity to produce the order, it doesn't tell us whether we have the potential to improve our Value Stream to produce the order and so on. In fact the Standard Cost tells us nothing.

What we actually need to do is take an incremental (marginal) costing approach to the decision. The materials to produce the extra product will cost ₹50,000 (at ₹5 each). If we have enough spare capacity in the Value Stream then there will be no extra labour cost, but let's assume we need to work ₹100,000 of overtime to complete the order. There won't be any extra overheads, but let's say there would be ₹25,000 of extra energy costs and consumables. Thus the incremental income from the order would be ₹290,000; and the incremental costs would be ₹175,000 (₹50,000 + ₹100,000 + ₹25,000) = an extra ₹115,000 contribution to profit.

Thus, based on Standard costing we would refuse a profitable order. Of course there are other factors to take into account - what impact would this price of ₹29 have on our other customers? Is this a one-off order or a potential long term relationship? etc etc. I am not saying that this approach gives us the whole picture, but it gives us more of the picture than a standard costing approach.

The purpose of lean accounting is to tell us about the flow through the Value Stream; to tell us about the capacity for extra work in the Value Stream; and to tell us about the incremental costs of alternative decisions and actions. Traditional accounting tells us nothing about these things.

Principles, Practices and Tools of Lean Accounting

Principles	Practices	Tools of lean accounting
(a) Lean & simple business accounting	1. Continuously eliminate waste from the transactions processes, reports, and other accounting methods	(a) Value stream mapping; current & future state (b) Kaizen (lean continuous improvement) (c) PDCA problem solving
B. Accounting processes that support lean transformation	1. Management control & continuous improvement	(a) Performance Measurement Linkage Chart; linking metrics for cell/process, value streams, plant & corporate reporting to the business strategy, target costs, and lean improvement (b) Value stream performance boards containing break-through and continuous improvement projects (c) Box scores showing value stream performance
	2. Cost management	(a) Value stream costing (b) Value stream income statements
	3. Customer & supplier value and cost management	(a) Target costing
C. Clear & timely communication of information	1. Financial reporting	(a) "Plain English" financial statements (b) Simple, largely cash-based accounting
	2. Visual reporting of financial & non-financial performance measurements	(a) Primary reporting using visual performance boards; division, plant, value stream, cell/ process in production, product design, sales/ marketing, administration, etc.
	3. Decision-making	(a) Incremental cost & profitability analysis using value stream costing and box scores

D. Planning from a lean perspective	1. Planning & budgeting	(a) Hoshin policy deployment (b) Sales, operations, & financial planning (SOFP)
	2. Impact of lean improvement	(a) Value stream cost and capacity analysis (b) Current state & future state value stream maps (c) Box scores showing operational, financial, and capacity changes from lean improvement. Plan for financial benefit from the lean changes
	3. Capital planning	(a) Incremental impact of capital expenditure on value stream box-score. Often used with 3P approaches
	4. Invest in people	(a) Performance measurements tracking continuous improvement participation, employee satisfaction, & cross-training (b) Profit sharing
E. Strengthen internal accounting control	1. Internal control based on lean operational controls	(a) Transaction elimination matrix (b) Process maps showing controls and SOX risks
	2. Inventory valuation	(a) Simple methods to value inventory without the requirement for perpetual inventory records and product costs can be used when the inventory is low and under visual control.

While Lean Accounting is still a work-in-process, there is now an agreed body of knowledge that is becoming the standard approach to accounting, control, and measurement. These principles, practices, and tools of Lean Accounting have been implemented in a wide range of companies at various stages on the journey to lean transformation. These methods can be readily adjusted to meet your company's specific needs and they rigorously maintain adherence to GAAP and external reporting requirements and regulations. Lean Accounting is itself lean, low-waste, and visual, and frees up finance and accounting people's time so they can become actively involved in lean change instead of being merely "bean counters."

Companies using Lean Accounting have better information for decision-making, have simple and timely reports that are clearly understood by everyone in the company, they understand the true financial impact of lean changes, they focus the business around the value created for the customers, and Lean Accounting actively drives the lean transformation. This helps the company to grow, to add more value for the customers, and to increase cash flow and value for the stock-holders and owners.

CONTRASTING LEAN ACCOUNTING AND TRADITIONAL STANDARD COSTING		
LEAN ACCOUNTING	**STANDARD COSTING**	**WHY IS THIS IMPORTANT FOR LEAN?**
Quick, simple, and timely	Complex and wasteful processes	FLOW: Frequent and simple value stream income statements create much better control.
Clear and easy to understand	Difficult for people to understand	EMPOWERMENT: Information people can understand empowers those people for Lean improvement and growth.
Provides information for effective decisions.	Leads to bad decisions	VALUE: Readily understandable costs lead to better decisions and improved cash-flow and profits.
Supports value stream measurements and box scores	Supports measurements that undermine Lean endeavors	PURSUE PERFECTION: Measurements motivate people, Value Stream costs motivate lean improvement. Standard variance reports are anti-Lean.
Supports a value stream (total process) approach	Supports a departmental view of production	VALUE STREAMS: Focus on value streams lead to improved value, flow, and costs. Department focus opposes Lean.
Enables value stream financial control and improvement.	Narrows the focus of financial control and improvement.	PURSUE PERFECTION: Value Stream cost information creates better financial control and drives improvement.
Enables inventory valuation,	Enables inventory valuation,	FLOW: Standard costs were designed to value inventory. Lean accounting values inventory easier and better.
Enables value based pricing	Enables Cost+ Pricing	VALUE: Value streams focus on customer value leading to value pricing. Traditional companies use cost.

Where Does Lean Accounting Apply?

As with most lean methods Lean Accounting was developed to support manufacturing companies, and most of the implementation of Lean Accounting has been within manufacturing organizations. Now that lean methods are moving into other industries like financial services, healthcare, government, and education there are some initial examples of the application of Lean Accounting in these industries. There are as yet no published cases of the use of lean accounting outside of manufacturing.

8.4 RESPONSIBILITY ACCOUNTING

Responsibility accounting is the collection, summarization, and reporting of financial information about various decision centers throughout an organization; can also be called profitability accounting or activity accounting. It tracks costs, revenues, or profits to the individual managers who are responsible for making the decisions about costs, revenues, or profits and taking action about them. Responsibility accounting is appropriate where top management has delegated authority to make decisions. The idea behind responsibility accounting is that each manager's performance should be judged by how well he or she manages those items under his or her control.

Characteristics of Responsibility Accounting

- an accounting system that collects, summarizes, and reports accounting data relating to the responsibilities of individual managers.
- an accounting system which tracks and reports costs, expenses, revenues, and operational statistics by area of responsibility or organizational unit.
- the system which provides information to evaluate each manager on revenue and expense items over which that manager has primary control (authority to influence).
- some reports contain only those items that are controllable by the responsibility manager.
- some reports contain both controllable and uncontrollable items;
- in this case, controllable and uncontrollable items should be clearly separated.
- the identification of controllable items is a fundamental task in responsibility accounting and reporting.

Some Basic Requirements of Responsibility Accounting

- to implement a responsibility accounting system, the business must be organized so that responsibility is assignable to individual managers.
- the various managers and their lines of responsibility should be fully defined.
- the organization chart is usually used as a basis for responsibility reporting.
- if clear lines of responsibility cannot be determined, it is very doubtful that responsibility accounting can be implemented effectively.
- while decision-making power may be delegated for many items, some decisions (related to particular revenues, expenses, costs or actions) may remain exclusively under the control of top management.
- several items will be directly traceable to a particular manager's area of responsibility but not actually be controllable by that manager. (Items such as property taxes.)

Note: The controllability criterion is crucial to the content of performance reports for each manager.

The Concept of Control

A. Absolute Control

- theoretically, a manager should have absolute control over an item to be held responsible for it.
- absolute controllability is rare.
- frequently, external or internal factors beyond a manager's control may affect revenues or expenses under that manager's responsibility.

- the theoretical requirement regarding absolute control must often be compromised, since some degree of noncontrollability usually exists.
- the manager is therefore usually held responsible for items over which that manager has relative control.

B. Relative Control

- relative control means that the manager has control over most of the factors that influence a given budget item.
- the use of relative control as a basis for evaluation may lead to some motivational problems, since managers may be evaluated on results that may not reflect the manager's efforts or decisions.
- most budget plans assign control on a relative basis in order to develop and use segmental budgets.

Responsibility Reports

A. Basic Features

- a feature of a responsibility accounting system is the varying amount of detail included in the reports issued to different levels of management.
- although the amount of detail varies, reports issued under a responsibility accounting system are interrelated.
- totals from the report on one level of management are carried forward in the report to the management level immediately above.
- data is appropriately summarized, filtered, and/or condensed as information flows upward to higher levels of management.
- encourages or allows "management by exception."

Two basic methods are applied to present revenue and expense data:

(1) only those items over which a manager has direct control are included in the responsibility report for that management level. Any revenue or expense that the manager cannot directly control are not included.

(2) include all revenue and expense items that can be traced directly or allocated indirectly to a particular manager, whether or not they are controllable. In this approach, care must taken to separate controllable from noncontrollable items in order to differentiate those items for which a manager can and should be held responsible.

B. Desired Features.

1. Timely
2. Issued Regularly
3. Format should be relatively simple and easy to read.
4. confusing terminology should be avoided.
5. results should be expressed in physical terms where appropriate, since such figures may be more familiar and understandable to managers.
6. to assist management in quickly spotting budget variances, both budgeted and actual amounts should be reported. A budget variance is the difference between the budgeted and actual amounts of an item because variances highlight areas which require investigation, they are helpful in applying the management by exception principle. Reports often include both current and year-to-date analyses.

Responsibility and Cost Centers

The concept of responsibility accounting has emerged to accommodate the need for management information at a more specific level of detail than can be provided by financial accounting procedures. Responsibility accounting attempts to report results (actual performance) in such a way that: (1) significant variances from planned performance can be identified, (2) reasons for variances can be determined, (3) responsibility can be fixed, and (4) timely action can be taken to correct problems.

Under this approach, pertinent costs and revenues are assigned to various organizational units--departments, bureaus, and programs--designated as responsibility centers. In the private sector, responsibility centers may take several forms:

(1) A cost center

- a responsibility center incurring only expense (cost) items and producing no direct revenue from the sale of goods or services.
- managers are held responsible only for specified expense items.
- the appropriate goal of an expense center is the long-run minimization of expenses.
- short-run minimization of expenses may not be appropriate.

(2) A profit center

- a responsibility center having both revenues and expenses.
- the manager must be able to control both of these categories.
- controllable profits of a segment are shown when expenses under a manager's control are deducted from revenues under that manager's control.
- an expense center can be converted into a profit center by the utilization of transfer prices.

  i.e., via the use of transfer prices, "artificial revenues" can be generated for an expense center as it charges other organizational units of the company for its services or product.

(3) An investment center

- a responsibility center having revenues, expenses, and an appropriate investment base.
- the manager in charge of an investment center is responsible for and has sizable control over revenues, expenses, and the investment base.
- the two most common ways for evaluating the performance of such a center are :

(a) ROI (return on investment.)

(b) Residual Income.

Outside of relatively large corporations, the cost center is the most common building block for responsibility accounting. In fact, the terms cost center and responsibility center are often used interchangeably.

Responsibility accounting placing emphasis on specific costs in relation to well-defined areas of responsibility. Managers often inherit the effects of their predecessors' decisions. Long-term effects of such costs as depreciation, long-term lease arrangements, and the like, seldom qualify as controllable costs on the performance report of a specific manager.

Most models that measure performance in the private sector are tied to profits--for example, profit percentage (profit divided by sales), return on investment (profit divided by initial investment), or residual income (profit minus a deduction for capital costs). Profits are seldom a viable measure at the cost center level, however. Rather, performance is most often measured by comparing actual costs against a budget. A variance is defined as the difference between the amount budgeted for a particular activity and the actual cost of carrying out that activity during a given period. Variances may be positive (under budget) or negative (over budget).

Performance data can be developed for management purposes independent of the budget and control accounts. This kind of performance reporting has been used in the justification of resource requests and in the assessment of cost and work progress where activities are fairly routine and repetitive. Under this approach, units of work are identified, and changes in quantity (and, on occasion, quality) of such units are measured as a basis for analyzing financial requirements. The impact of various levels of service can be tested, and an assessment can be made of changes in the size of the client groups to be served. This approach is built on the assumption that certain fixed costs remain fairly constant regardless of the level of service provided and that certain variable costs change with the level of service or the size of the clientele group served. Marginal costs for each additional increment of service provided can be determined through such an approach. With the application of appropriate budgetary guide-lines, these costs can then be converted into total cost estimates.

Variances, budgeted results, and other techniques of responsibility accounting are relatively neutral devices. When viewed positively, they can provide managers with significant means of improving future decisions. They can also assist in the delegation of decision responsibility to lower levels within an organization. These techniques, however, are frequently misused as negative management tools--as means of finding fault or placing blame. This negative use stems, in large part, from a misunderstanding of the rationale of responsibility accounting.

Passing the buck is an all-too-pervasive tendency in many large organizations. This tendency is supposedly minimized, however, when responsibility is firmly fixed. Nevertheless, a delicate balance must be maintained between the careful delineation of responsibility, on the one hand, and an overly rigid separation of responsibility, on the other. Many activities may fall between the cracks when responsibility is too strictly prescribed. This problem is particularly evident when two or more activities are interdependent. Under such circumstances, responsibility cannot be delegated too far down in the organization, but must be maintained at a level that will ensure cooperation among the units that must interact if the activities are to be carried out successfully.

Large organizations have operating activities which are voluminous. Controlling such activities in details & in every sphere is not possible for the top management. The top management has the total authority & responsibility. For the purpose of controlling efficiently, the total authority & responsibility is decentralized by forming small segments which are called responsibility centers & to these centers, specific costs & revenues are allocated. The evaluation of performance of each responsibility center is done at the periodical intervals on the basis of pre-determined targets.

Responsibility accounting may be known as decentralization of responsibility center so that desired control can be ensured & thereby the goal of the organization can be attained. Responsibility accounting involves the following:

(a) Entire organization is divided into small responsibility centers;

(b) In terms of revenues & costs, the responsibility of each responsibility center is fixed;

(c) In terms of its predetermined target, the performance of each responsibility center is measured.

Pre-requisites of effective responsibility accounting:

The pre-requisites of the effective responsibility accounting are the following:

(a) Under the supervision of a manager should be each responsibility center & for the purpose of operating, it must be separable & identifiable.

(b) The independent measurement of performance of each center must be capable of being done.

(c) Each responsibility center should have clearly set targets.

(d) Each responsibility center's budget should set targets which should be neither too high nor too low i.e., the budget should be one which can be realised.

(e) The top management should fully support the system.

(f) All managers of responsibility centers should participate in the formulation of plans & policies relating to responsibility centers for the purpose of providing motivation.

(g) For sincere performance of each responsibility center the organizational environments must be conducive.

Objectives of Responsibility Accounting:

The objectives of responsibility accounting are the following:

(a) Overall organizational goals are broken down into small goals, each of the small goals is meant for better achievement of a responsibility center.

(b) With the attached responsibility each responsibility center is tied up & there is adequate authority so that responsibility can be discharged.

(c) At the end of a period, evaluation is done of the performance of each responsibility center & comparison of the performance is done with the predetermined targets.

(d) Thorough study is made of the achievements which are above or below the targets & remedial measures are adopted.

(e) Assessment is made of the contribution made by each responsibility center & examination is done of how far it's possible for the contribution to fulfilling its share in the ultimate organizational growth.

(f) Emphasize is given on the control of cost through planning.

(g) Use is made of the principle of 'management by exception' for the purpose of recording only those data where the actual performance of responsibility center falls short of the set target & where the variance is beyond the reasonable limit.

Advantages of Responsibility Accounting:

For the purpose of exercising control, responsibility accounting is an important tool in the hands of management. For the purpose of effecting efficient control on operations and achieving the organizational goal, responsibility accounting system should be introduced by the organizations which have large dimensions and complex operations which are decentralized.

Since for the purpose of achieving the overall goal in a piecemeal way; to various responsibility centers, overall responsibility and authority are decentralized, continuous communication should be there between the overall responsibility center and various sub-responsibility centers. Thus a communication system is automatically established by responsibility accounting.

The following advantages can be expected from responsibility accounting system:

(a) Allocation is made of all the activities of the organization, all the items of income and expenditure including capital expenditure to the well defined responsibility centers. Profit of each responsibility center is also identified. It should be understood by the manager of the centre what has to be performed by him with what resources and in what time period. He gets the things done by making his own way without any interference. Thus much importance is given to human resources.

(b) The managers of responsibility centers worked independently which helps in achieving the ultimate goal.

(c) There is a relationship between efforts and achievement, thereby, loopholes, if any, in the operations gets easily detected.

(d) The overall goals of the organization and individual goals of responsibility centers are communicated to all so that by keeping a view on that, guidance can be given to the managers in their respective centers of the operations.

(e) Among the managers and their subordinates, cost-consciousness gets generated which results in automatically reducing cost.

(f) It becomes easy to detect the weak areas in the organization. So for the purpose making the weak areas strong, corrective measures are taken.

(g) By recording the negative variances between the actual performance and target, introduction of management by exception can be done.

(h) For the purpose of exercising best managerial control over the affairs of the organization and achieving the desired goal, responsibility accounting system and budgetary control system can work together.

(i) As realistic goals are fixed for a responsibility centre, its achievement by the employees becomes easy. Their contribution can be assessed by themselves for the purpose of achieving the goal of the organization as a whole. A sense of belonging to the organization is created among the employees by the systematic responsibility accounting as the reward of the employees for accomplishment is not unsatisfactory.

(j) As managers of responsibility centers are allowed to sit with the top management for exchanging of views and opinions, appropriate decision making is almost assumed.

As against expected advantages there are also some apprehended disadvantages.

Disadvantages of Responsibility Accounting:

The following are the apprehended disadvantages of responsibility accounting:

(a) Solely upon the sincere efforts put in by the managers of the responsibility centers, the success of the responsibility accounting depends. Whether the system will succeed or not shall be decided by the personal factors of the managers.

(b) The place of good management cannot be ever taken by the responsibility accounting because the latter is only a tool in the hands of the former.

(c) Although theoretically, the manager of each organization is given free hand, in actual practice, neglect of employees' reaction, interference etc. is often noticed. Thus, in the way of proper discharging of responsibility, this stands.

(d) In modern organizations, among the departments, inter-relations & inter-departments are mostly observed. So it becomes almost impossible to demarcate responsibility centers by clear-cut outlines.

(e) Manager of the responsibility center prepares & communicates performance reports. The desired result will not be achieved by the responsibility accounting system, if there is any shortcoming in the report.

(f) Remuneration, future prospects, rewards, good working condition, welfare work & many others account for the individual interest of employees. Co-operation from the employees may be required where there is a clash between individual interest & the organizational interest.

8.5 VARIANCE ANALYSIS

Variance analysis, in budgeting (or management accounting in general), is a tool of budgetary control by evaluation of performance by means of variances between budgeted amount, planned amount or standard amount and the actual amount incurred/sold. Variance analysis can be carried out for both costs and revenues.

The concept of variance is intrinsically connected with planned and actual results and effects of the difference between those two on the performance of the entity or company.

Variances can be divided according to their effect or nature of the underlying amounts.

When **effect of variance** is concerned, there are two types of variances:

- When actual results are better than expected results given variance is described as favorable variance. In common use favorable variance is denoted by the letter F - usually in parentheses (F). A **favourable variance** might mean that: Costs were lower than expected in the budget, or Revenue/profits were higher than expected.
- When actual results are worse than expected results given variance is described as adverse variance, or unfavourable variance. In common use adverse variance is denoted by the letter U or the letter A - usually in parentheses (A). an **adverse variance** might arise because Costs were higher than expected or Revenue/profits were lower than expected.

All adverse variances are not bad and all favourable variances are not indicators of efficiency in operation - An adverse variance might result from something that is good that has happened in the business. For example, a budget statement might show higher production costs than budget (adverse variance). However, these may have occurred because sales are significantly higher than budget (favourable budget).

In a standard costing system, some favorable variances are not indicators of efficiency in operations. For example, the materials price variance, the labour rate variance, the manufacturing overhead spending and budget variances, and the production volume variance are generally not related to the efficiency of the operations.

On the other hand, the materials usage variance, the labour efficiency variance, and the variable manufacturing efficiency variance are indicators of operating efficiency. However, it is possible that some of these variances could result from standards that were not realistic. For example, if it realistically takes 2.4 hours to produce a unit of output, but the standard is set for 2.5 hours, there should be a favorable variance of 0.1 hour. This 0.1 hour variance results from the unrealistic standard, rather than operational efficiency.

Remember, it is the cause and significance of a variance that matters – not whether it is favourable or adverse.

"**Management by exception**" is the name given to the process of focusing on activities that require attention and ignoring those that appear to be running smoothly.

Budget control and analysis of variances facilitates management by exception since it highlights areas of business performance which are not in line with expectations.

Items of income or spending that show no or small variances require no action. Instead concentrate on items showing a large adverse variance.

Interpretation and Interrelationship of Variances

Before management decides whether or not to investigate a particular variance, there are a number of factors which should be considered.

- **Materiality:** Small variations in a single period are bound to occur and are unlikely to be significant. Obtaining and 'explanation 'is likely to be time-consuming and irritating from the manager concerned. For such variations further investigation is not worthwhile.
- **Controllability:** Controllability must also influence the decision whether to investigate further. If there is general worldwide price increase in the price of an important raw material there is nothing that can be done internally to control the effect of this. If a central decision is made to award all employees a 10% increase in salary, staff costs will increase by this amount and variance is not controllable by manager. Uncontrollable variances call for a change in the plan' not an investigation into past.
- **Variance Trends:** If, say, an efficiency variance is ₹ 1,000 adverse in month 1, the obvious conclusion is that the process is out of control and that corrective action must be taken. This may be correct but what if the same variance is ₹1,000 adverse every month? The trend indicates that the process

is in control and the standard has been wrongly set. Suppose, though, that the same variance is consistently ₹1,000 adverse for each of the first six months of the year but the production has steadily fallen from 100 units in month 1 to 65 units by month 6. The variance trend in absolute terms is constant, but relative to the number of units produced, efficiency has steadily worse.

Management Signals from Variances Trend Information

Variance analysis is a mend of assessing performance, but it is only a method of signaling to management areas of possible weakness where control action might be necessary. It does not provide a ready-made diagnosis of faults, nor does it provide management with a ready made indication of what action needs to be taken. It merely highlights items for possible investigation.

Here are some of the signals that may be extracted from variance trend information,

- Materials price variances may be favorable for a few months, then shift to adverse variances from the next few months and so on. This could indicate that process are seasonal and perhaps stock could be built up in cheap seasons.
- Regular, perhaps fairly slight, increase in adverse price variances usually indicates the working of general inflation. If desired allowance could be made for general inflation when flexing the budget.
- Rapidly large increases in adverse price variances may suggest a scudded scarcity of a resource.
- Gradually improving labour efficiency variances may signal the existences of a learning curve, or the success of a productivity bonus scheme. In either case opportunities should be sought to encourage the trend.
- Worsening trends in machine running expenses may show up that equipment is deteriorating and will soon need repair or even replacement.

Interrelationships between Variances

Quite possible, individual variances should not be looked at in isolation. One variance might be inter-related with another, and much of it might have occurred only because the other, inter-related variance occurred too. When two variances are interdependent (interrelated) one will usually be adverse and the other one favorable.

Here is an example,

Material price and usage-if cheaper materials are purchased in order to obtain a favorable price variance, materials wastage might be higher and an adverse usage variance will occur. If the cheaper material is more difficult to handle, there might be an adverse labour efficiency variance too. If more expensive material is purchased, however the price variance will be adverse but the usage variance might favorable.

Investigation of Variances

An investigation should only be undertaken if the benefits expected from the investigation exceeds the costs of searching for and correcting the source of the variance.

The act of investigation variances costs money. Time is spent in deciding the cause of the variance. Interpretation may suggest possible cause of variances but investigation must arrive at definite conclusions about the cause of the variance so that action to correct the variance can be effective. Corrective action may be expensive; machinery may need to be modified; a new processing method may be necessary to overcome a change in unavoidable raw material changes, labour relations may be affected by attempts to correct the behaviour of a member of staff who is working below an acceptable level of performance. Benefits from incurring the costs of investigation should ideally be considered.

There are behavioural as well as technical consequences to the decision to investigate variances. If no variances are investigated, it may cease to be motivated by the system which produce variances. Investigating favourable and adverse variances may create positive behavioural reinforcements, with implications for motivation, aspiration levels and inter-departmental relationships.

Relevant Cost Approach to Variance Analysis

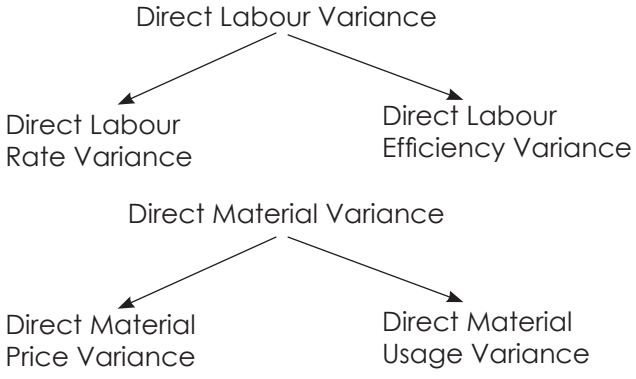
Conventional approach to variance analysis is to compute variances based on acquisition cost and standard prices for the acquisition of the resources. This is misleading, when scarce resources exist. Failure to use scarce resource efficiently leads not only to increased acquisition cost but also to a lost contribution. Therefore, meaningful approach is to incorporate the lost contribution in variance analysis. For example, if scarce material is used excessively, it will cause material costs to be high and in addition there will be lost contribution, which should be attached to material usage variance. When this approach is used, price or expenditure variances are not affected. Quantity variance is affected by how efficiently scarce resource is being used.

Planning and Operating Variances

Explaining the causes of variances is a key step in variance analysis. In some cases the cause is purely operational (e.g. the price of raw materials went up due to market shortages) but in some cases the cause is due to poor budgeting and planning (e.g. we used an out of date price list when setting the standard cost of materials). Often causes are a mixture of planning and operating factors. Some firms seek to make these distinctions more explicit by separating out planning and operating variances.

The basic approach is to have two budgets - the original budget and a revised one that takes into account planning issues. We can then determine two sets of variances:

In a traditional approach to standard absorption costing variances relating to both direct labour and direct material sub-divide to the factors shown in the following diagram:



This traditional approach is one whereby actual performance is compared with the standard cost of activity achieved and is based on predetermined standards. If the predetermined standard, set prior to the budget period, is still realistic under current conditions then the variance report will still be of added value to the user. However if there has been changes in both internal and external factors then the standards may no longer be realistic and the variances reported will be of little use and no longer relevant for control purposes.

To address this problem, for example, Terry Lucey, Management Accountant suggests that the total variances should be sub-divided to planning and operating variances.

He states "Planning variances seek to explain the extent to which the original standard needs to be adjusted in order to reflect changes in operating conditions between the current situation and that envisaged when the standard was originally calculated. In effect it means that the original standard is brought up to date so that it is a realistic attainable target in current conditions.

Operating variances indicate the extent to which attainable targets (i.e. the adjusted standards) have been achieved. Operating variances would be calculated after the planning variances have been established and are thus a realistic way of assessing performance."

The use of this approach challenges the assumption that in the traditional model the variances are due in whole to operating deficiencies and that planning which underpins the predetermined standards was accurate.

Planning and operational variances for sales

The sales volume variance can be sub-divided into a planning and operational variance:

Original budgeted sales × standard margin	Market size variance (planning)
Revised budgeted sales × standard margin (to achieve target share of actual market)	
Actual sales quantity × standard margin	Market share variance (operational)

Planning and operating variances for costs

When applying planning and operating principles to cost variances (material and labour), care must be taken over flexing the budgets. One accepted approach is to flex both the original and revised budgets to actual production levels:

Actual results	**Operating Variance**
Revised (flexed) budget	**Planning variance**
Original (flexed) budget	

Example 1: Revising the budget

Rhodes Co manufactures Stops which it is estimated require 2 kg of material XYZ at ₹10/kg In week 21 only 250 Stops were produced although budgeted production was 300. 450 kg of XYZ were purchased and used in the week at a total cost of ₹5,100. Later it was found that the standard had failed to allow for a 10% price increase throughout the material supplier's industry. Rhodes Ltd carries no stocks.

Solution:

Planning and operational analysis

The first step in the analysis is to calculate:

(1) Actual Results

(2) Revised flexed budget (ex-post).

(3) Original flexed budget (ex-ante).

(W1)	**Actual results**		
	450 kg for	**₹5,100**	**Operational variance**
(W2)	**Revised flexed budget (ex-post)**		
	250 units at 2 kg per unit for ₹11/kg	**= ₹5,500**	
(W3)	**Original flexed budget (ex-ante)**		**Planning variance**
	250 units at 2 kg per unit for ₹10/kg	**= ₹5,000**	

Example 2 : Revising the budget

A transport business makes a particular journey regularly, and has established that the standard fuel cost for each journey is 20 litres of fuel at ₹2 per litre. New legislation has forced a change in the vehicle used for the journey and an unexpected rise in fuel costs. It is decided retrospectively that the standard cost per journey should have been 18 litres at ₹2.50 per litre.

Required:

Calculate the original and revised flexed budgets if the journey is made 120 times in the period.

Solution:

Original flexed budget:	
120 × 20 × ₹2	**₹4,800**
Revised flexed budget:	
120 × 18 × ₹2.50	**₹5,400**

Controllable and Non-Controllable Variance

The variance may be classified as Controllable and Uncontrollable., depending upon the controllability of the factors causing variances.

Variance is said to be controllable if it is identified as the primary responsibility of a particular person or department. It refers to the deviation caused by such factors which could be influenced by the managerial/ executive action. For example, the excessive use of materials or labour hours than the standards can be attributable to a particular person.

When the variations are due to the factors beyond the control of the concerned person or department, it is said to be uncontrollable. The rise in prices of materials, increase in wage rates, Govt. restrictions etc., are the examples of uncontrollable variance. These factors are not within the control of the management and the responsibility of the variance cannot be assigned to any particular person or division. Revision of the standard becomes necessary to avoid non-recurrence of such variance in future.

The division of variance into controllable and uncontrollable is important from the view point of management as it can place more emphasis on controllable variance and thus facilitates to the principle of management by exception. Standard costing to be more realistic, sometimes the standards set are to be revised on account of changes in uncontrollable factors like wages, materials etc. To take into account these factors into variance, a 'revised variance' is created and the basic standard is allowed to continue. This revision variance is the difference between the standard cost originally set and the revised standard cost.

The size of controllable variance reflects the degree of efficiency of the person/department. It is the controllable variance with which the management is concerned because it needs remedial measures. Variances can be expressed in absolute (in monetary) or in relative terms (in percentage).

Finding variance is not the ultimate objective of the standard costing. But their analysis and finding the causes of variance is the ultimate aim to control cost. Control of cost depends on the corrective action taken by the management. The analysis of variance helps the management to locate deficiency and assign responsibility to particular person or cost centre. The next step of the management is to find out the reason for the variance to pin points where necessary, corrective action should be taken over.

Learning Curve Variances

The Learning Curve

Most workers become more proficient at their tasks the more they do them. Learning takes place especially through the early stages of a job. For example, contractors constructing a highrise apartment

building find the twentieth storey goes on faster than the eighth storey. This effect means break-even analysis would have multiple breakeven points when learning occurs, because the assumption of constant worker and machine productivity would be violated. In addition, the estimation of labour time standards becomes more complex than the average. The learning curve represents the fact that the time spent per unit declines by a constant percentage as the number of units produced doubles. This phenomenon has been observed where new longterm production activities are undertaken or where a long production cycle is conducted, such as building construction projects, airplane manufacture, and shipbuilding. Selling prices and workforce needs, as well as standards for time, can be assessed from such an analysis. Care is needed, however, because management practices, design, production technology, and quality requirements can interfere with the actual time spent by employees. Behavioural considerations can also affect learning. Factors such as peer pressure, union-imposed constraints, and the state of management-worker relationships can affect productivity and limit learning. The learning curve model states that each time the number of units produced doubles, the cumulative average time per unit is reduced by a constant percentage.

Learning curves can serve as a method of setting and revising standard labour hours in a repetitive task environment. The use of the approach would be most appropriate where many workers are learning a task over a reasonably extended period of time. Shortrun learning effects can be dealt with within a single accounting period using an average performance rate. Individual employees can have labour efficiency variances occurring during their learning periods without serious inaccuracies being introduced to the standard cost variances. However, large groups functioning at the same stage, particularly early in a production sequence when the effects of learning are pronounced, need evaluation relative to their projected learning curve. Incorporating the learning curve times into the standard times should help avoid misleading standard cost variances. It should be borne in mind that learning curve phenomena are applicable for labour intensive manufacturing. Learning curve effects were originally studied in connection with aircraft manufacture in World War II. The learning curve has typically been employed in industries such as construction, shipbuilding, and electronics. In the new manufacturing environment, learning curves have less relevance. Automated manufacturing is unlikely to have much variation or to display a regular learning curve. In less-automated processes, however, where learning curves do occur, it is important to take the resulting decline in labour hours and costs into account in setting standards, determining prices, planning production, or setting up work schedules.

With the help of the learning curve theory the standard time of any batch or unit can be computed then compare the actual data with the standard and compute the variances.

Impact on Labour Variances.

The learning curve model will affect labour variances since:

- The initial standard time taken to produce the item will become rapidly out of date.
- Variances calculated using out of date standards will quickly become meaningless for planning and control.

In many respects the easiest way of incorporating learning effects is to build them into the standards used.

Example 3.

A company has introduced a new product and it is anticipated that a 90% learning curve applies. The standard cost card for the product, based on estimates for the time required to produce the first unit, includes standard labour time of 200 hours at a cost of ₹8 per hour.

The first 8 units took 1,150 hours to produce at a cost of ₹9,430.

Required:

Calculate the labour rate and efficiency variances based on a labour standard which takes into account the learning curve effect.

Solution:

Standard average time per unit for the first 4 units:

$y = ax^b$

where b is the learning coefficient

b = log r/ log 2 = log 0.9/ log 2 = - 0.15200

$y = 200 \times 8^{-0.15200} = 145.80$ hours

Standard time for the first 8 units:

145.80 hours × 8 units = 1,166.40 hours

Labour variances :

	₹	₹
AH × AR =	9,430	
Rate variance		230 (A)
AH × SR = 1,150 hours × ₹ 8 =	9,200	
Efficiency variance		131.2 (F)
SH × SR = 1,166.40 hours × ₹ 8 =	9,3312	

Example 4

Calculate planning and operating variances following the recognition of the learning curve effect.

	Flexed budget	Actual output	Revised flexed budget
Output	560	560	560
Direct labour hours	4,480	3,500	1,712 (W1)
Direct labour cost	₹67,200	₹57,750	₹25,680

Workings:

(W1) – Direct labour hours

Using the learning curve formula:

$Y = aX^b$

Y = average time for that (X) number of units or the average cost per unit

a = time for the first unit or the cost for the first unit

X = the number of units you want to calculate an average time or cost for

b = the index of learning (log r/log 2)

a = 8 hours, b = –0.1520

Work out the average time for the first 560 units:

Y = 8 x (560 to the power of –0.1520) = 3.057 hours

Total time for 560 units = 3.057 x 560 = 1,712 hours

Solution:

Planning variance = flexed budget – revised flexed budget

Planning variance = ₹67,200 - ₹25,680 = ₹41,520 (F)

Labour efficiency variance = (actual hours – revised flexed hours) x std cost per hr

Labour efficiency variance = (3,500 -1,712) x ₹15 = ₹26,820 (A)

Labour rate variance = actual hours at std rate – actual cost

Labour rate variance = (3,500 x ₹15) - ₹57,750 = ₹5,250 (A)

Example 5

A firm has developed a product for which the following standard cost estimates have been made for the first batch to be manufactured in Month 1.

	Standard costs for the batch	
	₹	₹
500 labour hours @ ₹ 8 per hour	4,000	
55 units of direct materials @ ₹ 100 per unit	5,500	
Variable overhead 500 hours @ ₹ 15 per hour	7,500	17,000

From experience the firm knows that labour will benefit from a learning effect and labour times will be reduced. This is expected to approximate to an 80% learning curve.

In addition, the growing expertise of labour is expected to improve the efficiency with which materials are used. The usage of materials is expected to approximate to a 95% learning curve.

The actual production for the first six months was as follows :

Month 1	20 batches
Month 2	30 batches
Month 3	25 batches
Month 4	24 batches
Month 5	33 batches
Month 6	28 batches Total 160 batches

During Month 6 the following results were recorded for the last batch made :

Actual results of last batch

Labour hours	95
Direct wages	₹ 978
Direct materials (41 units)	₹ 3,977
Variable overhead	₹ 1,685

You are required:

(a) to calculate the learning coefficient for materials ;

(b) to derive the Standard Cost of the last batch in Month 6;

(c) to calculate what variance have arisen in connection with the last batch i.e.160th ;

(d) to explain what information the variances provide for management.

Solution:

(a) Learning Co-efficient of material

= log 95/log 2 = (-1 + 0.9777)/0.3010 = - 0.0741

(b) Standard for 160th = Total for 160 –total for 159

Material:

Total consumption for 160 batch

Total consumption $_{160}$ = $55\times(160)^{1-0.0741}$

= log 55 + 0.9259 × log 160

= 1.7404 + 0.9259 × 2.2041

= 3.7812

∴ Total consumption for 160 = ₹ 6,042

For 159 units

TC159 = $55 \times (159)^{0.9259}$

= log 55 + 0.9259 log 159

= 1.7404 + 0.9259 × 2.2014

= 3.7787

∴ Total consumption for 159 = ₹ 6,008

∴ Consumption for 160th batch = 6,042 - 6,008 = 34 units

Labour

b = 0.3219 (1-0.3219)

Total hour for 160 batch = log 500 + 0.6781 log 160

= 2.6990 + 0.6781 × 2.2041

= 4.1936

Antilog of 4.1936 = 15,620

For 159 batch , total hours

log 500 +0.6781×2.2014

= 4.1918

= 15,550

∴ Labour hour for 160th batch = 15,620 – 15,550 = 70 hrs.

Cost Card

Standard (output 1 unit) Actual (output 1 unit) Std. Rate ×Actual input

	Standard (output 1 unit) in Amt in ₹			Actual (output 1 unit)		Std. Rate x Actual input
Mat.	34	100	3,400	41	3,977	4,100
Lab.	70	8	560	95	978	760
Variable overhead	70	15	1,050	"	1,685	1,425

Material cost variance = standard cost for actual output – actual cost

= ₹(3400 – 3977) = ₹577 A

Material usage variance = standard cost for actual output – Std rate × actual input

= ₹ 3400 – 4100 = ₹ 700 A

Material price variance = Std rate × actual input - actual cost

= ₹ 4100 – 3977 = ₹ 123 (F)

Lab cost variance = standard cost for actual output – actual cost

= ₹ 560 – 978 = ₹ 418 A

Lab Efficiency variance = standard cost for actual output – Std rate × actual input

= ₹560 – 760 = ₹ 200 A

lab rate variance = Std rate × actual input - actual cost

= ₹ 760 – 978 = ₹ 218 A

Variable overhead

Cost variance = standard cost for actual output – actual cost

= ₹ 1050 – 1685 = ₹ 635 A

Efficiency variance = standard cost for actual output – Std rate × actual input

= ₹ 1050 – 1425 = ₹ 375 A

Expenditure variance = Std rate × actual input - actual cost

= ₹ 1425 – 1685 = ₹ 260 A

Accounting Methods

There are three methods which may be used by accountants when Standard Costing system is in operation. The adoption of accounting methods will depend upon the types of standards used, viz.,

I. When current standard costs are used, either of the following methods may be employed: (i) Partial plan, or (ii) Single plan

II. When basic standard costs are used, the method that may be used is known as Dual Plan.

Again, the above three methods of accounting differ in how the Work-in-Progress Account is handled. We explain the accounting methods in brief in the following paragraphs:

Partial Plan Method

Under this method, work-in-progress is debited with actual costs and credited with standard costs. The characteristics of this method are:

(a) Stores Account is maintained at actual costs.

(b) Finished Goods Account is maintained at standard costs.

(c) Material variances are calculated at the end of the accounting period and not on purchases of materials as is done in the Single Plan method.

At the end of the period, the work-in-progress is credited with the standard value of goods, finished as well as unfinished. The variance analysis is facilitated if the work-in-progress account is maintained an columnar form, showing each element of cost separately or three separate accounts for three elements of cost - one for material, one for labour and one for overheads - are maintained. The variances when calculated will be entered in the Work-in-Progress Account as follows:

Favourable variance

Work-in-Progress A/c

To Variance A/c

Unfavourable variance

Variance A/c

To Work-in-Progress A/c

The various variances when posted in the Work-in-Progress Account will enable to balance the Work in-Progress Account. The variances may be ultimately transferred to Costing Profit and Loss Account in order to arrive at the actual profit figure.

Single Plan

Under the Single Plan Method, Work-in-Progress Account is debited and credited with standard costs. Since this "Central" account is maintained at standard costs, the Stores Ledger Account and Finished Goods Account are also maintained at standard costs. Again, unlike the previous method, Materials Price Variance is calculated on receipt of materials. This helps in focussing attention on efficiencies without wasting time. Under this method, all expenses incurred are charged at actual to the accounts concerned but are recovered in the Work-in-Progress Account at standard. Thus, with the exception of Material Price Variance, the variances will be identical under both methods of accounting.

The main advantages of this method are:

1. The Work-in-Progress Account is debited and credited at standard cost. Therefore, prompt disclosure of the variance is possible.
2. It is simple to understand and easy to operate.
3. It helps to analyze the variances in as much detail as the management may desire.

As a result of all these reasons, the Single Plan, sometimes with some modifications to meet individual requirements, is most commonly used.

Accounting Principles

The accounting principles involved are now discussed below:

1. Materials
   (a) Purchase:
      (i) If actual price is lower than standard price:
      Debit Stores Ledger A/c (with standard cost)
      Credit Cost Ledger A/c (with actual cost)
      Credit Material price variance (with the difference for favourable variance)
      (ii) If actual price exceeds standard price:
      Debit Stores Ledger A/c (with standard cost)
      Debit Material Price Variance (with unfavourable price variance)
      Credit Cost Ledger A/c (with actual price)
   (b) Issue to Production:
      (i) When actual quantity exceeds standard quantity:
      Debit Work-in-Progress A/c (with standard cost)
      Debit Material Usage Variance A/c (with unfavourable variance)
      Credit Stores Ledger A/c (with standard cost of actual quantity)

(ii) When materials issued are less than standard set:

Debit Work-in-Progress A/c (with standard cost)

Credit Stores Ledger A/c (with standard cost of actual quantity)

Credit Material usage variance (with favourable variance)

2. Wages

(i) When incurred:	(ii) When allocated:
Debit Wages Control A/c	Debit Work-in-Progress A/c (with standard cost)
Credit Cost Ledger A/c (with actual amount)	Credit Wages Control A/c

Note: For favourable or unfavourable variances (Rate, Efficiency, etc.), the respective variance account will be credited or debited and the corresponding debit or credit should be given to the Wages Account.

Similarly, when overheads are incurred, the Cost Ledger Control A/c is credited with the amount and Overheads A/c is debited. When recovered, Work-in-Progress A/c is debited (with standard amount) and Overhead A/c is credited. The variances will then be posted in Variance A/cs and Overheads A/c.

The next step is to credit the Work-in-Progress A/c with the standard cost of goods finished. From this stage, the principles involved in accounting are similar to Partial Plan Method

Partial plan	Single Plan
Variances are computed at the end of the period. (Year end)	Variances are computed at the point of transaction-purchase of materials, payment of wages etc. i.e. Periodically.
Responsibility for adverse variances can be fixed only after the period . Hence, it helps only post-control.	Responsibility for adverse variances is fixed as and when the transaction occur. Current Control is facilitated.
Material Price Variance is computed for the actual quality consumed.	Material price variance is computed for the Actual quantity purchased , i.e. Material Purchase Price Variance (MPPV)
Raw- material inventories are valued at actual cost.	Raw material inventories are valued at Standard cost.
All variances are adjusted in the WIP Control Account.	All variance are adjusted in the Respective cost account, i.e. Raw Material Control, Wages Control.
Partial plan is suitable where simple analysis of variance is sufficient at the end of the period.	single plan is preferred if frequent detailed analysis of various is desired.
All variances are investigated only at the end of the period. Detailed reporting at the point of transaction is not considered necessary.	The installation of this system requires more planning so that effective documentation at each stage is introduced for proper recording and analysis of variance.

Note: In both the above plans, WIP and Finished Goods Stocks are valued at Standard Cost.

Marginal Costing System

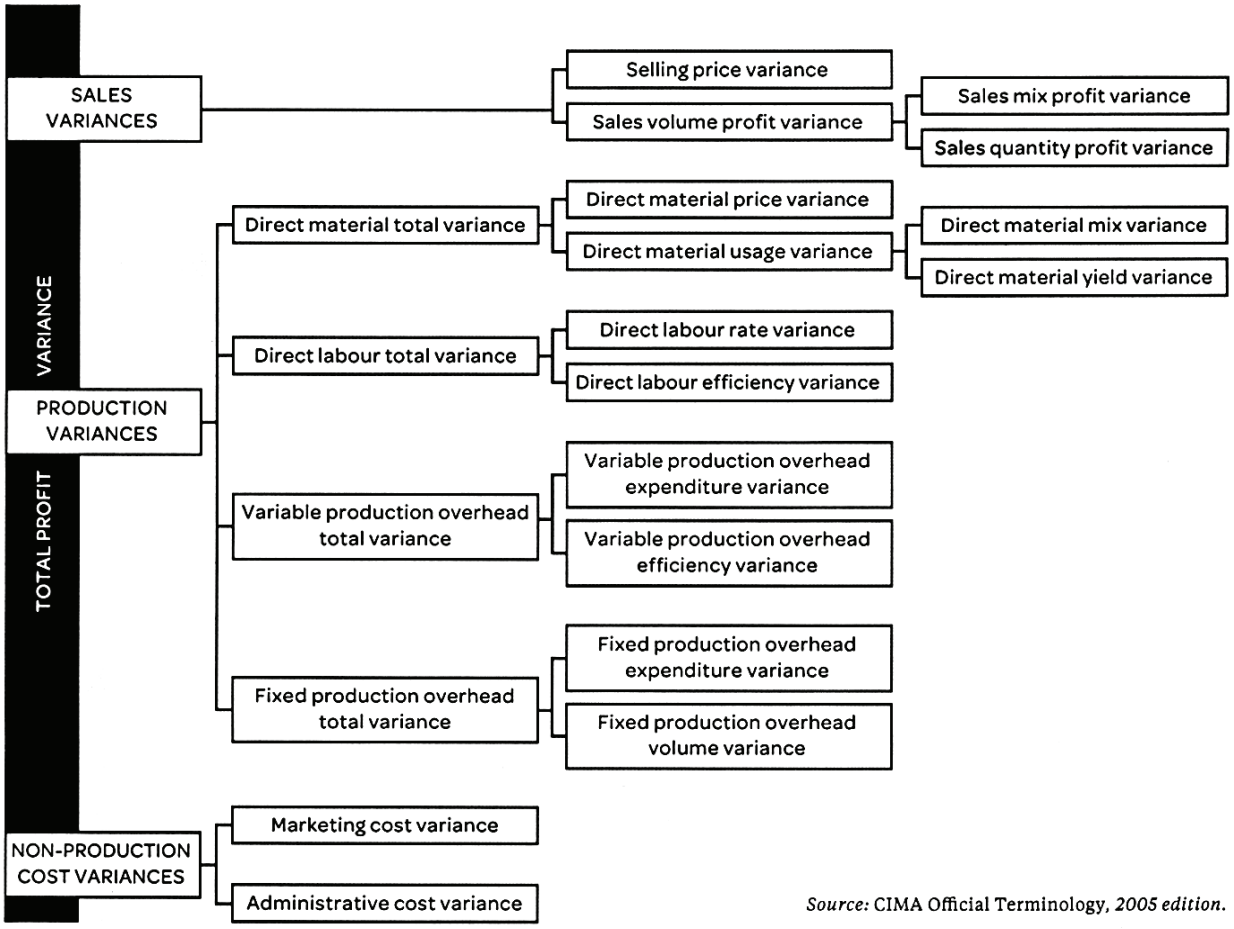
With a marginal costing profit and loss, no overheads are absorbed, the amount spent is simply written off to the income statement.

So with marginal costing the only fixed overhead variance is the difference between what was budgeted to be spent and what was actually spent, i.e. the fixed overhead expenditure variance.

Absorption Costing System

Under absorption costing we use an overhead absorption rate to absorb overheads. Variances will occur if this absorption rate is incorrect (just as we will get over/under-absorption).

So with absorption costing we calculate the fixed overhead expenditure variance and the fixed overhead volume variance (this can be split into a capacity and efficiency variance).



Source: CIMA Official Terminology, *2005 edition.*

Operating Statement Under Absorption Costing

The purpose of calculating variances is to identify the different effects of each item of cost/income on profit compared to the expected profit. These variances are summarised in a reconciliation statement or operating statement.

Operating statement under Absorption Costing (AC)

	₹
Budgeted Profit	x
Sales volume profit variance	x/(x)
	x
Standard profit on actual sales = (fixed budget profit)	
Selling price variance	x/(x)
	x

Cost variances :

	F	A
	₹	₹
Material price	x	(x)
Material usage	x	(x)
Labour rate	x	(x)
Labour efficiency	x	(x)
Variable overthead expenditure	x	(x)
Variable overthead efficiency	x	(x)
Fixed production overthead expenditure variance	x	(x)
Fixed production overthead capacity variance	x	(x)
Fixed production overthead efficiency variance	x	(x)
Total		x/(x)
		x

Operating Statement Under Marginal Costing

The operating statement under marginal costing is the same as that under absorption costing except;

- a sales volume contribution variance is included instead of a sales volume profit variance
- the only fixed overhead variance is the expenditure variances
- the reconciliation is from budgeted to actual contribution then fixed overheads are deducted to arrive at a profit.

Operating statement under Marginal Costing (MC)

	₹
Budgeted Profit	
(budgeted production x budgeted contn/unit)	x
Sales volume profit variance	x/(x)
Standard profit on actual sales	
= (fixed budget contribution)	x
Selling price variance	x/(x)
	x

Cost variances :

	F	A	
	₹	₹	
Material price	x	(x)	
Material usage	x	(x)	
Labour rate	x	(x)	
Labour efficiency	x	(x)	
Variable overthead expenditure	x	(x)	
Variable overthead efficiency	x	(x)	
Total	x	(x)	x/(x)
Actual contribution			x
Budgeted fixed production overthead			x
Fixed overthead expenditure variance			x/(x)
Actual profit			x

Ratio Analysis

Cost control efforts can be aided considerably by using ratio analysis technique. The rationale behind ratio analysis is that management must take greater interest in relative term as opposed to absolute figures in order to control costs. The management can compute a number of ratios pertaining to liquidity, profitability and capital structure, etc., but this discussion is concerned with only operating cost ratio. Variances expressed in terms of absolute figures do not convey the true picture very effectively. Absolute figures of variances are also not very useful when comparison of two different periods is to be made. Variance are also not very useful when comparison of two different periods and highlighting the abnormal situations which are of interest to management. Following variances ratios are commonly used:

(1) **Efficiency ratio:** Efficiency ratio summarises the relationship between output expressed in standard hours and actual hours spent for that output. Following formula is used for determining the Efficiency Ratio :

$$\text{Efficiency ratio} = \frac{\text{Output expressed in terms of standard hours}}{\text{Actual hours spent for producing that output}} \times 100$$

In other words, efficiency ratio reveals the input-output relationship. Input is available in terms of hours worked. Output is converted into standard hours to determine the relationship of input and output. It is a very important ratio and it reveals the extent of efficiency or inefficiency of production during the related period. (The reader should bear in mind that standard hour is the media of expressing output in terms of hours.) It can be referred to as a hypothetical hour which measures the amount of work which should be performed in one hour according to standard.

(2) **Activity ratio / Production volume ratio:** This ratio refers to the relationship between output expressed in terms of standard hours and the budgeted standard hours. In other words, following three steps are involved in determining this ratio :

(a) actual output should be expressed in terms of standard hours.

(b) budgeted output should be expressed in standard hours.

(c) percentage relationship of (a) and (b) should be expressed.

In other words, this ratio highlights the actual level of activity in comparison to budgeted activity level. This ratio reveals how effectively or ineffectively actual efforts were made in comparison to budgeted estimates. Activity ratio is expressed as under :

$$\text{Activity ratio} = \text{Production volume ratio} = \frac{\text{Actual output in standard hours}}{\text{Budgeted output in sandard hours}} \times 100$$

(3) Calendar ratio: It refers to the relationship between actual number of working days in a period and the number of working days in the related budget period:

$$\text{Calendar ratio} = \frac{\text{Actual number of working days in a period}}{\text{Number of working days in related budgeted priod}} \times 100$$

(4) Actual capacity usage ratio: This ratio refers to the relationship between actual number of working hours and the maximum possible number of working hours in a period as per budget:

$$\text{Actual Capacity Usage Ratio} = \frac{\text{Actual hours worked}}{\text{Maximum possible working hours}} \times 100$$

(5) Actual usage of budgeted capacity ratio: This ratio refers to the relationship between actual number of working hours and the budgeted number of working hours for that period. While actual capacity usage ratio refers to the utilisation of available capacity, actual usage of budgeted capacity ratio stresses the utilisation of budgeted capacity only:

$$\text{Actual usage of budgeted capacity ratio} = \frac{\text{Actual working hours}}{\text{Budgeted hours}} \times 100$$

(6) Standard capacity usage ratio: This ratio refers to the relationship between budgeted hours and maximum possible working hours in a budget period.

$$\text{Standard Capacity Usage Ratio} = \frac{\text{Budgeted hours}}{\text{Maximum possible no of working hours}} \times 100$$

Application of Standard Costing and Budgetary Control in Profit Planning

Both standard costing and budgetary control aim at the objective of maximum efficiency and managerial control. Standard cost and budgetary control compares actual performance with the predetermined standards, analyses and reports of variances.

Without standard cost figure, preparation of budget or a real budgetary control system cannot be achieved. Similarity between Standard Cost and Budget are as follows:

1. Both aim at the determination of cost in advance.
2. For both of them predetermined standards are fixed.
3. In both of them actual costs are compared with standard costs.
4. Both require periodic cost reports.
5. Both aim at the maximum efficiencies and managerial costs. But they differ in scope and technique.

A budget is a profit plan reflecting anticipated financial inflows and outflows. It is comprehensive in nature and covers several business activities such as production, purchase, selling and distribution, research and development. Budgets include both income and expenditure. Budgets project the volume of business and levels of costs which should be maintained. They reflect cost cellings which should not be exceeded if the budgeted profit is to be attained.

Illustration 1.

The selling prices are fixed under control order and raw materials have to be procured from the open market. The material prices are stable but the principal material is not available freely. Prepare a budget for 2013 from the following data for 2012 with the aim of optimizing the operating profit.

	Product A			Product B		
	Territory	Territory	Territory	Territory	Territory	Territory
	1	2	3	1	2	3
Units sold	10,000	15,000	8,000	15,000	12,000	5,000
Sales value (₹)	1,00,000	1,65,000	96,000	1,80,000	1,44,000	65,000
Contribution (₹)	30,000	49,500	24,000	45,000	43,200	13,000
Profit	10,000	12,500	6,000	12,500	11,520	3,250

Other data:

(1) Consumption of principle material - 1 kg. in product A and 1.25 kg in product B (per unit product)

(2) Availability of principal material- Same as in 2012.

(3) Scope for changing the sales mix - Revised volume not to fall below 50% for either product or exceed 125% of the current volume.

Ignore the impact of revised sales mix on the fixed costs.

Solution:

It will be appropriate to measure the profitability of the two products in three territories before preparing a sales forecast for 2013. This can be done on the basis of their P/V Ratio (Profit volume ratio), Calculated as follows:

$$\text{P/V Ratio} = \frac{\text{Total Contribution}}{\text{Total Sales}} \times 100$$

Comparative Profitability Statement of 2012

	Total	Territory 1	Territory 2	Territory 3
Product A	₹	₹	₹	₹
Sales (a)	3,61,000	1,00,000	1,65,000	96,000
Contribution (b)	1,03,500	30,000	49,500	24,000
P/V Ratio[(b÷ a)×100]	28.67%	30%	30%	25%
Product B				
Sales(c)	3,89,000	1,80,000	1,44,000	65,000
Contribution (d)	1,01,200	45,000	43,200	13,000
P/V Ratio[(d÷ c)×100]	26%	25%	30%	20%

The above statement shows that product A is more profitable than product B and profitability of territories 1 and 3 in respect of product A is maximum and profitability of territory 2 in respect of product A & B are same.

The availability of principal material and its use for production of different products may now be computed:

Budget output of product A not to exceed 125%

Budget output of product B not to fall below 50%

Product A	Budget output	33,000×125%×1=41,250×1	41,250 kg
Product B	Budget output	25,400*×1.25	31,750 kg
Total quantity of available to be used			73,000 kg

*Total material is available is 73,000 kg. out of which 41,250 kg. have to be used for Product A. Thus, the balance available is 31,750 kg. Each unit of product B requires 1.25 per kg. Therefore, total units to be produced of B are:

31,750/1.25kg = 25,400 units

Sales as per Revised Sales Mix.

	Total	Territory 1	Territory 2	Territory 3
Product A(units)	41,250	12,500	18,750	10,000
Product B (Units)	25,400	7,900	15,000	2,500

Budget for 2013

Territory	1	2	3	Total
Product A:				
Sales (units)	12,500	18,750	10,000	41,250
Sales (value)(₹)	1,25,000	2,06,250	1,20,000	4,51,250
Contribution(₹)	37,500	61,875	30,000	1,29,375
Fixed costs(₹)	20,000	37,000	18,000	75,000
Profit/Loss (i) (₹)	17,500	24,875	12,000	54,375
Product B				
Sales (units)	7,900	15,000	2,500	25,400
Sales (value) (₹)	94,800	1,80,000	32,500	3,07,300
Contribution(₹)	23,700	54,000	6,500	84,200
Fixed costs(₹)	32,500	31,680	9,750	73,930
Profit/Loss (ii) (₹)	(8,800)	22,320	(3,250)	10,270
Total Profit (Budgeted)(iii) [(i)+(ii)] (₹)	8,700	47,195	8,750	64,645
Actual profit for 2012:				
Product A(₹)	10,000	12,500	6,000	28,500
Product B(₹)	12,500	11,520	3,250	27,270
Total profit actual (iv) (₹)	22,500	24,020	9,250	55,770
Improvement in budgeted profit [(iii)-(iv)](₹)	(13,800)	23,175	(500)	8,875

Comments:

(1) There has been increase in profitability only in respect of Territory 2. Contribution for both product A and B has gone up in case of this territory.

(2) Profitability in respect of both territories 1 and 2 has decreased. This is because increase in contribution of product A has been considerably set off by fall in contribution of product B.

(3) It has been presumed while making sales forecast that condition (3) as given in the question is also applicable in respect of sales mix of each territory.

Illustration 2.

VINAK Ltd. a company engaged in the manufacture of electrical appliances has set the following budget for 20x2:

	Immersion Heaters	Table Lamp	Bread Toasters	Room Heaters
Production (units)	40,000	10,000	50,000	30,000
Selling price per unit (₹)	30.00	50.00	60.00	80.00
Cost per unit:				
Direct Materials (₹)	6.00	13.50	10.50	24.00
Direct labour (₹)	7.50	10.00	18.00	24.00
Variable overheads (₹)	4.50	10.00	12.00	13.00
Fixed overheads (₹)	7.50	10.00	18.00	24.00
Profit/(Loss) (₹)	4.50	6.50	1.50	(5.00)

When the budget was placed before the Budget committee, the Marketing Manager put up a proposal to increase the sales by 20,000 additional units for which capacity existed. The additional 20,000 units could be one product or any combination of products. The proposal was accepted by the Committee.

The Committee also decided that the production capacity for the next year, namely 20x3 would be set in such way that there would be a further increase in the output by 50,000 units over and above the increase of 20,000 units envisaged for 20x2. The additional production of 50,000 units would be of table lamp only for which a new plant would be acquired. The additional fixed expenses of the new plant were estimated ₹70,000 per annum. During 20x2, the material and labour costs were expected to increase by 10% but the other cost and selling prices would remain same.

Required:

(i) Set a budget for 20x2 in such a way that the additional capacity of 20,000 units is utilized to maximize the profits.

(ii) Set a budget for 20x3.

(iii) Assuming that the increased output may not fully materialise, calculate the number of units of table lamps required to be sold in 20x3 at the given price in order to ensure that profitability at least at 20x2 level is maintained.

Solution:

(i) Revised Budget for 20x2

Per unit		Immersion Heaters	Table Lamps	Bread Toasters	Room Heaters
(a) Selling price	(₹)	30.00	50.00	60.00	80.00
(b) Direct Materials	(₹)	6.00	13.50	10.50	24.00
(c) Direct labour	(₹)	7.50	10.00	18.00	24.00
(d) Variable overheads	(₹)	4.50	10.00	12.00	13.00
(e) Total Variable Costs (b+c+d)	(₹)	18.00	33.50	40.50	61.00
(f) Contribution (a-e)	(₹)	12.00	16.50	19.50	19.00
(g) Units planned		40,000	10,000	50,000	30,000
(h) Addl. Units		-	-	20,000*	-

(i) Total units (g+h)		40,000	10,000	70,000	30,000
(j) Total contribution (f×i)	(₹)	4,80,000	1,65,000	13,65,000	5,70,000
(k) Fixed overheads per unit	(₹)	7.50	10.00	18.00	24.00
(l) Total fixed overheads (k×g)	(₹)	3,00,000	1,00,000	9,00,000	7,20,000
Total contribution for all products of the company					25,80,000
Less: Total fixed overheads					20,20,000
Profit for the year					5,60,000

*The production of product which gives highest contribution per unit is augmented. Here, Bread Toaster gives highest contribution of ₹19.50 p.u.

(ii) Budget for 20x3

Per unit		**Immersion Heaters**	**Table Lamps**	**Bread Toasters**	**Room Heaters**
(a) Selling price	(₹)	30.00	50.00	60.00	80.00
(b) Direct Materials (10% increase)	(₹)	6.60	14.85	11.55	26.40
(c) Direct Labour (10% increase)	(₹)	8.25	11.00	19.80	26.40
(d) Variable Overheads	(₹)	4.50	10.00	12.00	13.00
(e) Total Variable Cost (b+c+d)		19.35	35.85	43.35	65.80
(f) Contribution/per unit (a-c)	(₹)	10.65	14.15	16.65	14.20
(g) Units Planned		40,000	60,000	70,000	30,000
(h) Total Contribution (f×g)	(₹)	4,26,000	8,49,000	11,65,500	4,26,000
(i) Fixed Overheads		3,00,000	1,70,000	9,00,000	7,20,000
Total Contribution for all products					28,66,500
Less: Fixed Overheads [Total of row i]					20,90,000
Profit					7,76,500

(iii)

	₹
Total Contribution before increase of output by 50,000 units of table lamps = ₹4,26,000 + ₹1,41,500+₹11,65,500+₹4,26,000	21,59,000
Less: Fixed cost before increase of output	20,20,000
Profit for 20x3 before increase of output	1,39,000
Profit for 20x2	5,60,000
Additional profit required in 20x3 over 20x2	4,21,000
Additional Fixed expenses of the new plant in 20x2	70,000
Total profit required to earn the same level of profit of 20x2	4,91,000
Contribution per unit of table lamps	14.15
The minimum units of table lamps required to be sold, therefore is [₹4,91,000/₹14.15] (in units)	34,700

Illustration 3.

The management accountant of X Ltd. has prepared the following estimates of working results for the year ending 31st Dec, 2012 for the purpose of preparing the budget for the year ending 31st Dec, 2013.

	Year ending 31-12-2012
Direct material	₹ 16 per unit
Direct wages	₹ 40 per unit
Variable Expenses	₹ 12 per unit
Selling price	₹125 per unit
Fixed expenses	₹6,75,000 per annum
Sales	₹25,00,000 per annum

During the year 2013, it is expected that the material prices and variable overheads will go up by 10% and 5% respectively. As a result of reorganisation of production methods the overall direct labour efficiency will increase by 12% but the rate will go up by 5%. The fixed overheads are also expected to increase by ₹1,25,000.

The technical director states that the same level of output as obtained in 2012 should be maintained in 2013 also and efforts should be made to maintain the same level of profit by suitably increasing the selling price.

The marketing director states that the market will not absorb any increase in the selling price. On the other hand he proposes that publicity involving advertisement expenses in these proportions will increase the quantity of sales as under:

Advertisement Expenses (₹)	80,000	1,94,000	3,20,000	4,60,000
Additional units of sales	2,000	4,000	6,000	8,000

Required:

(i) Present an income statement for the year 2012

(ii) Find the revised price and the percentage of increase in the price for 2013 if the technical directors views are accepted.

(iii) Evaluate the four alternative proposals put forth by the marketing director, determine the best output level to be budgeted and prepare the overall income statement for 2013 at the level of output.

Solution:

(i) Statement showing computation of profit for the year 2012:

		₹
(I) SP		125
(II) Variable Cost		68
(III) Contribution		57
(IV) Total Contribution	25,00,000 × 57/125	11,40,000
(V) Fixed Expenses		6,75,000
(VI) Profit		4,65,000

(ii) Technical director's proposal:

Variable Cost		₹
Raw Material	16 x 110 /100	17.6
Wages	40 x 105 / 100 x 100 /112	37.5
Variable OH	12 x105 / 100	12.6
Total VC per unit	(20,000 x 67.70)	13,54,200
FC	6,75,000	
(+) Addnl.	1,25,000	8,00,000
Total Cost		21,54,000
Profit		4,65,000
Sales		26,19,000

SP = 26,19,000 / 20,000 = ₹ 130.95

% increase in SP = 5.95 / 125 × 100 = 4.761%

(iii) Marketing Director's view:

Additional Sales	Units	2,000	4,000	6,000	8,000
Contribution per unit	₹	57.3	57.3	57.3	57.3
Total Contribution	₹	1,14,600	2,29,200	3,43,800	4,58,400
Add: FC	₹	80,000	1,94,000	3,20,000	4,60,000
P / (L)	₹	34,600	35,200	23,800	(1,600)

Statement showing computation of profit at optimum level forecasted by the marketing director:

(I) No. of units			24,000
(II) Contribution per unit	₹		57.3
(III) Total Contribution	₹		13,75,200
(IV) Fixed Cost	₹	(8,00,000 + 1,94,000)	9,94,000
(V) Profit	₹		3,81,200

Illustration 4.

S.U Ltd. produces three products namely A, B and C. The budgeted production, costs and selling prices for the next year are as under:

	A	B	C
Direct materials (₹/unit)	24	16	12
Direct wages:			
Dept. Rate/Hour:			
1. ₹ 4 Hrs/ unit	3	5	2.5
2. ₹ 2 Hrs/unit	3	8	6
Budgeted Production (units)	10,000	12,000	20,000
Max. possible sales (units)	12,000	16,000	24,000
Selling price (₹/unit)	75	105	60

Variable overheads:

Dept.1 Recovered at 100% of direct wages.

Dept.2 Recovered at 50% of direct wages.

Fixed overheads ₹5,00,000 per annum.

A direct labour hour in Dept1 is in short supply and the budgeted volume of output envisages full utilisation of the available direct labour hour in Dept 2. The co. has committed to engage the workers to the extent of the direct labour hours required for the budgeted volume of production. Should a change in the product mix be desired, the co. can engage additional direct labour hours required in dept 2 at normal rates; but any portion of the direct labour hours of dept 2 rendered surplus by reasons of a change in the present product mix have to be paid by the co. as idle wages in view of the commitment already made.

Required:

(i) Present a statement showing the budgeted profitability.

(ii) Set optimal product mix and work out the optimum profit after taking into consideration the idle time wages, if any, payable in dept 2.

(iii) If the co. desires to subcontract the surplus direct labour hours, if any, in dept 2, what minimum charges should be quoted per direct labour hour.

Solution:

(i) Statement showing computation of budgeted profit and contribution per labour hour in dept. 1:

	A	B	C	Total
	₹	₹	₹	₹
Selling Price	75	105	60	
Variable Cost				
Direct Material	24	16	12	
Direct Wages: Dept 1	12	20	10	
Dept 2	6	16	12	
Variable O/H	15	28	16	
Total Variable Cost	57	80	50	
Contribution	18	25	10	
Contribution per labour hour in Dept. 1	6	5	4	
Ranking	I	II	III	
Budged units	10,000	12,000	20,000	
Total contribution	1,80,000	3,00,000	2,00,000	6,80,000
Fixed cost				5,00,000
Profit				1,80,000

(ii) Statement showing optimum mix and profit at that mix:

No. of Units		**A**	**B**	**C**	**Total**
No. of Units		12,000	16,000	9,600	
Contribution p.u.	₹	18	25	10	
Total	₹	2,16,000	4,00,000	96,000	7,12,000
Fixed Cost	₹				5,00,000
Profit	₹				2,12,000
(-) Cost of idle wages in dept 2	₹			24,400 × 2	48,800
Profit after idle wages	₹				1,63,200

Working Notes:

No. of hours in dept 1 = (10,000 x 3) + (12,000 x 5) + (20,000 x 2.5) = 1,40,000

No. of hours in dept 2 = (10,000 x 3) + (12,000 x 8) + (20,000 x 6) = 2,46,000

		Dept I hrs	Dept II hrs
Available Hours		1,40,000	2,46,000
(-) utilized for A		36,000	36,000
		1,04,000	2,10,000
(-) for B		80,000	1,28,000
		24,000	82,000
No. of Units of C =	24,000 / 2.5 = 9,600 units	24,000	9,600 × 6 = 57,600
Idle time		-	24,400

(iii) Hire charges = Labour Cost + Var. O.H
= 2 + 2 x 50% = ₹ 3

Illustration 5.

V Ltd. produces two products P and Q. The draft budget for the next month is as under:

Budgeted production and sale (units)	40,000	80,000
Selling price ₹/unit	25	50
Total costs ₹/unit	20	40
Machine hours/unit	2	1
Max. sale potential (units)	60,000	1,00,000

The fixed expenses are estimated at ₹ 9,60,000 per month. The co. absorbs fixed Overheads on the basis of machine hours which are fully utilised by the budgeted production and cannot be further increased.

When the budget was discussed, the managing director states that the product mix should be altered to yield optimum profit. The marketing director suggests that he could introduce a new product C each unit of which take 1.5 machine hour. However a processing vat involving a capital outlay of ₹ 2,00,000 is to be installed for processing product C. The additional fixed overheads relating to the processing vat was estimated at ₹ 60,000 per month. The variable costs of product C was estimated at ₹ 21 per unit.

Required:

(i) Calculate the profit as per draft budget for the next month.

(ii) Revise the product mix based on data given P and Q to yield optimum profit.

(iii) The company decides to discontinue either product P or Q whichever is giving lower profit and proposes to substitute product C instead. Fix the selling price of C in such a way to yield 15% return on additional capital employed besides maintaining the same overall profit as envisaged in (ii) above.

Solution:

(i) Computation of profit as per draft budget:

	P	Q	Total
	₹	₹	₹
Selling Price	25	50	
Total Cost	20	40	
Profit	5	10	
Budgeted Units	40,000	80,000	
Profit	2,00,000	8,00,000	10,00,000

(ii) Statement showing computation of contribution per machine hr.

	P	Q
Fixed Cost P. U.	12	6
Variable Cost P. U.	8	34
Contribution P. U. (S.P. – V.C.)	17	16
Contribution Per machine hour	8.5	16
Priority	II	I

Fixed Cost per machine hour = [9,60,000/(40,000 × 2) + (80,000 × 1) = ₹6 per machine hour

Statement showing optimum mix and relevant profit:

		P	Q	Total
No. of units		30,000	1,00,000	
Contribution P. U.	₹	17	16	
Total Contribution	₹	5,10,000	16,00,000	21,10,000
Fixed Cost	₹			9,60,000
Profit	₹			11,50,000

Working Notes:

Available hours = (40,000 x 2) + (80,000 x 1) = ₹1,60,000

(-) Utilised for Q = ₹1,00,000

Balance Available hours = ₹ **60,000**

No. of units of P = 60,000 / 2 = 30,000 units

(iii) Computation of Selling Price of product C:

Out of products P & Q, P is less profitable and hence can be replaced by c.

Variable Cost ₹21

FC ₹60,000

Machine hours released = 60,000 hrs.

No. of units of C = 60,000 / 1.5 = 40,000 units

In order to get the profit as above, the contribution to be recovered is as follows:

	₹
Total Contribution	21,10,000
(+) Fixed Cost (addnl.)	60,000
(+) Return on capital employed (@ 15% of 2,00,000)	30,000
Total required contribution	22,00,000
(-) Recovered from Q	16,00,000
	6,00,000

C per unit = 6,00,000 / 40,000 = ₹15

(+) Variable Cost = ₹21

Selling Price **₹36**

Illustration 6.

Domestic political trouble in the country of an overseas supplier is causing concern in your company because it is not known when further supplies of raw material 'x' will be received. The current stock held of this particular raw material is 17,000 kilograms, which costs ₹ 1,36,000. Based on raw material 'x', your company makes five different products and the expected demand for each of these, for the next three months, it given below together with other relevant information:

Product code	Kilogram of raw material 'x' per unit of finished product	Direct labour hours per unit of finished product	Selling price per unit	Expected demand over three month
	Kg.	Hours	₹	units
701	0.7	1.0	26	8,000
702	0.5	0.8	28	7,200
821	1.4	1.5	34	9,000
822	1.3	1.1	38	12,000
937	1.5	1.4	40	10,000

The direct wages rate per hour is ₹ 5 and production overhead is based on direct wages cost - The variable overhead absorption rate being 40% and the fixed overhead absorption rate being 60%. Variable selling costs, including sales commission, are 15% of selling price.

Budgeted fixed selling and administration costs are ₹3,00,000 per annum. Assume that the fixed production overhead incurred will equal the absorbed figure.

You are required to:

(a) Show what quantity of the raw material on hand ought to be allocated to which products in order to maximize profits for the forthcoming three months.

(b) Present a brief statement showing contribution and profit for the forthcoming three months, if your suggestion in (a) is adopted;

Solution:

(a) Statement showing computation of contribution per koilogram of material and determination of priority for profitability

	701	702	821	822	937
	₹	₹	₹	₹	₹
Selling price	**26.00**	**28.00**	**34.00**	**38.00**	**40.00**
Variable cost					
Direct material	5.60	4.00	11.20	10.40	12.00
Direct labour	5.00	4.00	7.50	5.50	7.00
Production overheads	2.00	1.60	3.00	2.20	2.80
Selling expenses	3.90	4.20	5.10	5.70	6.00
Total Variable Cost	**16.50**	**13.80**	**26.80**	**23.80**	**27.80**
Contribution	**9.50**	**14.20**	**7.20**	**14.20**	**12.20**
Contribution per kilogram of material	**13.57**	**28.40**	**5.14**	**10.90**	**8.13**
Priority	2	1	5	3	4

(b) Statement showing optimum mix under given conditions and computation of profit at that mix

	701	702	822	Total
No. of units	8,000.00	7,200.00	6,000.00	
Contribution per Unit (₹)	9.50	14.20	14.20	
Total contribution(₹)	76,000.00	1,02,240.00	85,200.00	2,63,440.00
Fixed cost(₹)				1,36,080.00
Profit(₹)				1,27,360.00

Working Notes:

Computation of material apportion on the basis of priority

	(Kg.)
Available material	17,000.00
Less : used for 702 (7,200 x 0.5)	3,600.00
	13,400.00
701 (8,000 x 0.7)	5,600.00
	7,800.00

Therefore no. of units of 822 to be produced from remaining material (7,800/1.3) = 6,000 Units

Fixed Cost

	(₹)
Selling and adm. Overheads [(3,00,000/12) × 3]	75,000.00
Factory overheads [(8,000 × 5 × 60%) + (7,200 × 4 × 60%) + (6,000 × 5.5 × 60%)]	61,080.00
	1,36,080.00

Illustration 7.

Z Ltd., makes a range of five products to which the following standards apply:

PER UNIT

	A	B	C	D	E
	₹	₹	₹	₹	₹
Sales price	50	60	70	80	90
Direct materials	9	10	17	12	21
Direct Wages	16	20	24	28	32
Variable production overheads	8	10	12	14	16
Variable selling and distribution overheads	5	6	7	8	9
Fixed overheads	4	5	6	7	8
	42	51	66	69	86

The direct labour wage rate is ₹4 per hour. Fixed overheads have been allocated on the basis of direct labour hours. The company has commitments to produce a minimum of 400 units of each product per month. Direct labour hours cannot exceed 13,000 hrs. per month due to restriction of space. The Board is now considering an offer of a new three-year contract to produce an additional 400 units of product B per month at a selling price of ₹ 58 per unit. The contract would involve an outlay of ₹1,00,000 on

the lease of additional factory premises and purchase of new plant and equipment. There would be residual value at the end of the contract. Variable production costs would be in accordance with existing standards, variable selling and distribution costs would be one-half of the existing rate and cash outflows on fixed costs would be ₹ 20,000 per annum. There would be no change to existing production arrangements. An outside supplier has offered to supply 400 units of product B per month at a price of ₹ 48 per unit. If purchased externally cash flows on additional fixed costs will be ₹ 25,000 per annum.

Required:

(a) Give recommendations, supported by calculations, to show how direct labour hours in the existing factory should be utilised in order to maximize profits.

(b) Show the budgeted trading results on the basis of your recommendations in (a)

(c) Give calculations to show whether or not the proposed contract for product B should be accepted and, if so, whether it should be purchased externally or manufactures in the new premises. The company's cost of capital is 10% (the present value of an annuity of ₹1 for three years at 10% is ₹2.49). Ignore taxation and inflation.

Solution:

(a) Statement showing contribution per labour hour and determination of priority for profitability

	A	B	C	D	E
	₹	₹	₹	₹	₹
(i) Selling price	50.00	60.00	70.00	80.00	90.00
(ii) Variable cost					
(a) Direct material	9.00	10.00	17.00	12.00	21.00
(b) labour	16.00	20.00	24.00	28.00	32.00
(c)Variable production overheads	8.00	10.00	12.00	14.00	16.00
(d) Variable selling & dis. Overheads	5.00	6.00	7.00	8.00	9.00
Total Variable Cost	38.00	46.00	60.00	62.00	78.00
(iii) Contribution	12.00	14.00	10.00	18.00	12.00
(iv) Contribution per labour hour	3.00	2.80	1.66	2.57	1.50
(v) Priority	I	II	IV	III	V

(b) Statement showing optimum mix under given conditions and computation of profit at that mix.

	A	B	C	D	E	Total
Minimum no. of units	4,800.00	4,800.00	4,800.00	4,800.00	4,800.00	
Units in remain hours (w/n)	3,000.00					
No. of units	7,800.00	4,800.00	4,800.00	4,800.00	4,800.00	
Contribution per Unit(₹)	12.00	14.00	10.00	18.00	12.00	
Total contribution(₹)	93,600.00	67,200.00	48,000.00	86,400.00	57,600.00	352,800.00
Fixed cost (156000 hours x 1) (₹)						156,000.00
Profit(₹)						196,800.00

Working notes:

Available hours (13,000 × 12)	1,56,000.00 hrs.
Hours utilised for minimum production [(4+5+6+7+8)x4,800]	1,44,000.00 hrs.
Remaining hours	12,000.00 hrs.
Therefore units of A to be produced (12,000/4)	3,000 units

(c)

Option I	(₹)
Selling price offered	58.00
Less : Variable cost (46-(6/2))	43.00
Contribution	15.00
No. of units	4,800.00
Total contribution	72,000.00
Less : Fixed cost	20,000.00
Profit	52,000.00

Present value of profit for three years contract

	(₹)
In flow (52,000x2.49)	1,29,480.00
Less : outflow	1,00,000.00
Net present value	29,480.00

Option II	(₹)	
Contract value (4800x48)	2,30,400.00	
Add : Fixed cost	25,000.00	
	2,55,400.00	
Present value for three years	(2,55,400x2.49)	(₹) (6,35,946.00)
Present value of inflows	(4,800x58x2.49)	(₹)6,93,216.00
Net present value		(₹)57,270.00

It is better to accept the order for product-B and to supply them by sub-contracting the order.

Illustration 8.

Allplay Ltd., are specialists in the manufacture of dolls for children. They manufacture and market four types of dolls patented the names, Dolly, Molly, Jolly, Polly and a doll dress sewing kit. They require your assistance as a Cost Accountant for determining the appropriate sales and product-mix of their products for the coming year. From the production standards established market forecasts and pricing policies, you get the following data:

Doll's name	Estimated demand for next year	Standard material cost per unit	Standard labour cost per unit	Estimated net price per unit
	Unit	₹	₹	₹
Dolly	50,000	1.40	0.80	5.20
Molly	42,000	0.70	0.50	2.40
Jolly	35,000	2.70	1.40	8.50
Polly	40,000	1.00	1.00	4.00
Sewing kit	3,25,000	0.60	0.40	3.00

(i) To promote sales of the sewing kit, there is a 15% discount offered in the established price of a kit, purchased at the same time along with a doll and it is expected that all the customers will avail this benefit.

(ii) The labour rate of ₹2.00 per hour is expected to continue without change in the next year. The plant has an effective capacity of 1,30,000 labour hours on a single shift basis. Present equipment can produce all of the products. Overtime worked is paid at double the normal rate.

(iii) Next year's fixed cost is estimated at ₹30,000 in the factory, ₹20,000 in administration and ₹ 50,250 in selling and distribution.

(iv) Variable costs will be equivalent to 50% of standard Direct Labour cost.

(v) The company has a very small inventory of its products that can be ignored.

Required :

(a) You are required to draw a conservative estimate for the next year of the total contribution that would be made by each product line and the net income that would earned by the company.

(b) The company is at present having some industrial relations problem and if this continues in the next year, it would not then be possible to arrange for overtime work. Anticipating that eventuality, you are required to suggest a product-mix that would absolutely minimize the drop in the income already envisaged. With that product-mix, work out product-wise contribution and the new net income that would be earned as a result.

Solution:

Statement Showing computation of contribution per hour, determination of priority and profit at conservative estimate.

		Dolly	Molly	Jolly	Polly	Sewing kit		Total
						with Discount	No Discount	
Selling price	₹	**5.20**	**2.40**	**8.50**	**4.00**	**2.55**	**3.00**	
Variable cost	₹							
(a) direct material	₹	1.40	0.70	2.70	1.00	0.60	0.60	
(b) direct wages	₹	0.80	0.50	1.40	1.00	0.40	0.40	
(c) variable overheads	₹	0.40	0.25	0.70	0.50	0.20	0.20	

	₹	**2.60**	**1.45**	**4.80**	**2.50**	**1.20**	**1.20**	
Contribution	₹	**2.60**	**0.95**	**3.70**	**1.50**	**1.35**	**1.80**	
Hours per unit		0.40	0.25	0.70	0.50	0.20	0.20	
Contribution per hour	₹	**6.50**	**3.80**	**5.29**	**3.00**	**6.75**	**9.00**	
No. of units		50,000.00	42,000.00	35,000.00	40,000.00	167,000.00	158,000.00	
Total contribution	₹	**130,000.00**	**39,900.00**	**129,500.00**	**60,000.00**	**225,450.00**	**284,400.00**	**869,250.00**
Fixed cost	₹							100,250.00
Profit before considering O.T	₹							**769,000.00**
Less : O.T premium (w/n)	₹							20,000.00
Profit at conservative estimate	₹							**749,000.00**

Computation of over time premium

		hrs.
Available hours (A)		130,000
Less : Utilised for		
Dolly	(50,000 × 0.4)	20,000
Molly	(42,000 × 0.25)	10,500
Jolly	(35,000 × 0.7)	24,500
Polly	(40,000 ×0.5)	20,000
Sewing kit (discount)	(1,67,000 ×0.2)	33,400
Sewing kit (no discount)	(1,58,000 × 0.2)	31,600
Total hours utilised (B)		1,40,000
Shortage of labour hours (B) - (A)		10,000

Therefore overtime premium (10000 × 2) = ₹ 20000

Computation of profit when no over time is available

						Sewing kit		
		Dolly	Molly	Jolly	Polly	Discount	No Discount	Total
a. No. of units		50,000.00	42,000.00	35,000.00	20,000.00	1,47,000.00	1,78,000.00	
b. Contribution per unit	₹	2.60	0.95	3.70	1.50	1.35	1.80	
c. Total contribution	₹	130,000.00	39,900.00	1,29,500.00	30,000.00	1,98,450.00	3,20,400.00	8,48,250
d. Fixed cost	₹							1,00,250
e. Profit	₹							7,48,000

Illustration 9.

PH Ltd., has a productive capacity of 2,00,000 units of product BXE per annum. The company estimated its normal capacity utilisation at 90% for 2012-13. The variable costs are ₹ 22 per unit and the fixed factory overheads were budgeted at ₹ 7,20,000 per annum. The variable selling overheads amounted to ₹ 6 per unit and the fixed selling expenses were budgeted at ₹ 5,04,000. The operating data for 2012-13 are as under:

Production	1,60,000 units
Sales @ ₹40 per unit	1,50,000 units
Opening stock of finished goods	10,000 units

The cost analysis revealed an excess spending of variable factory overheads to the extent of ₹ 80,000. There are no variances in respect of other items of cost.

Required:

(i) Determine the budgeted break-even point for 2012-13

(ii) What increase in price would have been necessary to achieve the budgeted profit?

(iii) Present statements of profitability for 2012-13 using:

(a) Marginal costing basis.

(b) Absorption costing basis.

Solution:

(i) Fixed cost = Fixed overheads + selling expenses = 7,20,000 + 5,04,000 = 12,24,000

	₹
I Selling price	40.00
II Variable cost	28.00
III Contribution	12.00

Break even at budget= (12,24,000/12) = 1,02,000 units

(ii) Contribution at budget = [(2,00,000 × 90%) ×12] = 21,60,000

	₹
Contribution per unit (21,60,000/1,50,000)	14.40
Add : Variable cost	28.00
Selling Price	42.40
Increase in Price	2.40
Standard variable production cost	22.00
Add: Standard fixed cost (7,20,000/2,00,000x90%)	4.00
	26.00

Profit under Absorption Costing

		Units	₹	₹
Standard Variable cost	(1,60,000x22)			35,20,000.00
Add : Variance				80,000.00
				3,600,000.00
Add : Fixed production cost absorbed	(1,60,000x4)		6,40,000.00	
Add : Under recovery	(7,20,000-680,000)		80,000.00	7,20,000.00
		1,60,000.00		43,20,000.00
Add : Opening stock		10,000.00		2,60,000.00
				45,80,000.00

Less : Closing stock		20,000.00	(43,20,000 / 1,60,000x20,000)	5,40,000.00
				40,40,000.00
Add : selling & dis. Cost				
Variable	(1,50,000x6)		9,00,000.00	
Fixed			5,04,000.00	14,04,000.00
Total cost				54,44,000.00
profit (b/f)				5,56,000.00
Sales	(1,50,000x40)			60,00,000.00
Profit under Marginal Costing				
i) Sales (A)				60,00,000.00
ii) Variable cost				
Production			36,00,000.00	
Add : opening	(10,000x22)		2,20,000.00	
			38,20,000.00	
Less : closing	20,000 x 36,00,000 / 1,60,000		4,50,000.00	33,70,000.00
Selling & distribution				9,00,000.00
Total Variable Cost (B)				42,70,000.00
iii) Contribution [(A) – (B)]				17,30,000.00
iv) Fixed cost				12,24,000.00
v) Profit				5,06,000.00

Illustration 10.

SV Ltd engaged in the manufacture of four products has prepared the following budget for 2012.

	A	B	C	D
Production Units	20,000	5,000	25,000	15,000
Selling price ₹/unit	21.75	36.75	44.25	64.00
Direct Materials ₹/unit	6.00	13.50	10.50	24.00
Direct Wages ₹/Unit	7.50	10.00	18.00	24.00
Variable Overheads ₹/unit	2.25	5.00	6.00	6.50
Fixed Overheads ₹ p.a.	75,000	25,000	2,25,000	1,80,000

When the budget was discussed, it was proposed that the production should be increased by 10,000 units for which capacity existed in 2012.

It was also decided that for the next year i.e.2013, the production capacity should be further increased by 25,000 units over and above the increase of 10,000 units envisaged as above for 2012. The additional production capacity of 25,000 units should be used for the manufacture of product 'B' for which new production facilities were to be created at an annual fixed overhead cost of ₹35,000. The direct material costs of all the four products were expected to increase by 10% in 2013 while the other costs and selling prices would remain the same.

Required:

(a) Find the profit of 2012 on the assumption that the existing capacity of 10,000 units is utilised to maximize the profit.

(b) Prepare a statement of profit for 2013.

(c) Assuming that the increase in the output of product 'B' may not fully materialise in the year 2013, find the number of units of product B to be sold in 2013 to earn the same overall profit as in 2012.

Solution:

(a) Statement showing computation of profit for the year 2012

			A	B	C	D	Total
I.	Selling Price	₹	21.75	36.75	44.25	64.00	
II.	Variable Cost	₹	15.75	28.50	34.50	54.50	
III.	Contribution	₹	6.00	8.25	9.75	9.50	
IV.	No. of units		20,000	5,000	35,000	15,000	
V.	Total Contribution	₹	1,20,000	41,250	3,41,250	1,42,500	6,45,000
VI.	Fixed Cost	₹	75,000	25,000	2,25,000	1,80,000	5,05,000
VII.	Profit	₹					1,40,000

(b) Profit for the year 2013

			A	B	C	D	Total
I.	No. of Units		20,000	30,000	35,000	15,000	
II.	Contribution Per Unit	₹	5.4	6.9	8.7	7.1	
III.	Total Contribution	₹	1,08,000	2,07,000	3,04,500	1,06,500	7,26,000
IV.	Fixed Cost	₹					5,40,000
V.	Profit	₹					1,86,000

(c) In order to get the profit of 2012, the 'Contribution' to be recovered as follows:

	₹
Profit for the year 2012	1,40,000
Existing Fixed Cost	5,05,000
Additional Fixed Cost	35,000
	6,80,000
(-) 'Contribution' Recovered from A,C,D	5,19,000
To be recovered from 'B'	1,61,000

No. of units of B required = 1,61,000 / 6.9 = 23,333units

Additional units minimum required = 23,333 – 5,000 = 18,333units

Illustration 11.

AB Ltd. manufactures three products. The standard selling prices and costs have been estimated for 2013 as follows:

	Per Unit		
	X	Y	Z
Selling Price	₹ 28	₹ 60	₹ 125
Direct materials	8	15	20
Direct wages	10	20	50
Variable overheads	5	10	25

Direct wages are paid at the rate of ₹ 2 per hour in each case. Fixed overheads are budgeted at ₹ 25,000 for the coming year.

In short run, the company cannot increase its direct labour strength and as a result, only 35,000 direct labour hours will be available in the coming year. The company has commitments to produce 500 units of each product.

It has been suggested that after meeting the minimum requirements for X, Y and Z, the balance of available direct labour hours should be used to produce the product Z.

You are required to:

(a) Prepare an income statement showing the expected results if the proposal is adopted

(b) Comment on the statement you have produced in (a) and prepare an income statement for any alternative policy which you consider would be more profitable.

(c) Basing your calculations on your suggestion in (b), show the company's BEP in terms of units and sales value.

(d) Show the sales value which is required to produce an after tax return of 10% on capital employed of ₹ 1,00,000 assuming tax rate of 30%.

Solution:

(a) Statement showing computation of Contribution per hour & determination of priority for profitability:

		X	Y	Z
		₹	₹	₹
I.	Selling Price	28	60	125
II.	Variable Cost	23	45	95
III.	Contribution	5	15	30
IV.	Contribution per hour	1	1.5	1.25
	Priority	III	I	II

Computation of Profit at the proposal

			X	Y	Z	Total (₹)
	Minimum Units to be produced		500	500	500	
	Units in Remaining time		--	--	600	
I.	No. of Units		500	500	1100	
II.	Contribution Per Unit	₹	5	15	30	
III.	Total Contribution	₹	2,500	7,500	33,000	43,000
IV.	Fixed Cost	₹				25,000
V.	Profit	₹				18,000

Working Notes:

Available Hours	=	35,000
(-) Hours for Minimum units	=	20,000
[(5 + 10 + 25) x 500]		15,000

Units of Z = 15,000 / 25 = 600 units.

(b) Computation of profit at Optimum Mix

			X	Y	Z	Total (₹)
	Minimum Units to be produced		500	500	500	
	Units in Remaining time		--	1,500	--	
I.	No. of Units		500	2,000	500	
II.	Contribution Per Unit	₹	5	15	30	
III.	Total Contribution	₹	2,500	30,000	15,000	47,500
IV.	Fixed Cost	₹				25,000
V.	Profit	₹				22,500

Units of Y = 15000 / 10 = 1500 units

In order to break even 'Contribution' must be equal to Fixed Cost

'Contribution' recovered from minimum units of each product.

X = 500 x 5 = 2,500
Y = 500 x 15 = 7,500
Z = 500 x 30 = 15,000
25,000
Fixed Cost = 25,000

(c) Break Even Units & Value

	Units	Value (₹)
X	500	14,000
Y	500	30,000
Z	500	62,500
	1,500	1,06,500

(d) Required Return before tax = 1,00,000 x 10% / 0.3 = ₹ 33,333
Sales of Y required to get this profit = 33,333 / 15 x 60 = ₹ 1,33,332
Total sales required = 1,06,500 + 1,33,332 = ₹ 2, 39,832

Illustration 12.

Novelties Ltd. seeks your advice on production mix in respect of the three products Super, Bright and Fine. You have the following information:

Data for Standard Costs per Unit:

	Super	Bright	Fine
Direct Materials (₹)	320	240	160
Variable overhead (₹)	16	40	24
Direct Labour: (₹)			
Department: Rate per Hour	Hours	Hours	Hours
A (₹) 8.00	6	10	5
B (₹) 16.00	6	15	11
From current budget, you have further details as below:			
	Super	Bright	Fine
Annual production (No.s)	5,000	6,000	10,000
Selling price per unit (₹)	624	800	480
Fixed Overhead: ₹16,00,000			
Sales department's estimate of maximum			
possible sales in the coming year (No.s)	6,000	8,000	12,000

You are also to note that there is a constraint on supply of labour in Department A and its manpower cannot be increased beyond its present level. Suggest the best production and sales mix from the standpoint of maximum profitability. Prepare statements setting out the profits resulting from the budgeted production and the best alternative suggested by you.

Solution:

Statement showing computation of Contribution per hour in Dept-A & determination of priority for profitability.

		Super	Bright	Fine
		₹	₹	₹
I	Selling Price	624	800	480
II	Variable Cost			
	Direct Material	320	240	160
	Variable Overhead	16	40	24
	Direct Labour			
	Dept – A	48	80	40
	Dept – B	96	240	176
		480	600	400
III	Contribution	144	200	80
IV	Contribution per labour hour in Dept. A	24	20	16
V	Priority	I	II	III

Statement showing computation of profit at current budgeted production:

			Super	Bright	Fine	Total
I	No. of units		5,000	6,000	10,000	
II	Contribution	₹	144	200	80	
III	Total Contribution	₹	7,20,000	12,00,000	8,00,000	27,20,000
IV	Fixed Cost	₹				16,00,000
V	Profit	₹				11,20,000

No. of hours in Department A at budget = 6 x 5,000 + 10 x 6,000 + 5 x 10,000 = 1,40,000.

Statement showing optimum mix under the given condition & computation of profit at that mix:

			Super	Bright	Fine	Total
I	No. of units		6000	8000	4800	
II	Contribution Per unit	₹	144	200	80	
III	Total Contribution	₹	864000	1600000	384000	2848000
IV	Fixed Cost	₹				1600000
V	Profit	₹				1248000

Available hours	1,40,000
(-) used for super (6000x6)	36,000
	1,04,000
(-) used for Bright (8000x10)	80,000
	24,000

No. of units of fine = 24,000/5 = 4800 Units

Illustration 13.

The following is a Control Report prepared by an Accountant of Department X in a factory:

	₹	₹
Overhead directly assigned to Department X:		
Indirect Materials (based on actual requisitions)	1,000	
Indirect Labour (Job tickets)	900	
Overtime Charges	100	
Depreciation on Equipment	500	2,500
Allocated Factory Overhead(38% of Factory space)		4,300
Allocated Overhead of Repair Shop (62% of repairs in repair shop done for Department X)		1,200
Allocated Office and Administration Overhead (on an agreed basis)		5,000
Total Departmental Expenses		13,000

Revise the report treating Department X as a Responsibility Centre.

Solution:

Department X

Revised Control Report

	₹	₹
Fully Controllable Costs		
Indirect Material	1,000	
Indirect Labour	900	
Overtime Charges	100	2,000
Partially Controllable Costs		
Allocated Overhead of Repair Shop		1,200
Total Cost		3,200

Note: Department X has no control over depreciation on equipment, allocated factory overhead and allocated office and administration overhead since their allocation to department X is based on overall management policy. They have, therefore, been excluded from the Revised Control Report.

Illustration 14.

A production department of a large manufacturing organisation has furnished the following data for May, 2013:

	Budget ₹	**Actual** ₹
Direct Materials	4,00,000	5,10,000
Direct wages	2,50,000	3,25,000
Repairs and Maintenance (₹ 1,00,000 Fixed)	2,00,000	2,20,000
Supervision (Fixed)	1,00,000	1,10,000
Consumable stores (Variable)	75,000	95,000
Factory Rent (Fixed)	50,000	50,000
Depreciation (Fixed)	1,00,000	1,00,000
Tools (Variable)	25,000	30,000
Power and Fuel (Variable)	1,50,000	1,80,000
Administration (Fixed)	2,50,000	2,65,000

The department has 50 identical machines. During May, 2013 the budgeted and actual production of the department are 10,000 and 12,500 units respectively. However, if the department was closed and the machine production services were hired from outside, the cost of hiring the services of similar machines would be ₹ 150 per unit.

(i) You are required to present reports showing the evaluation of the performance of the department based on the concept of (a) Cost Centre (b) Profit Centre and (c) Responsibility Centre.

(ii) It is felt that since the total budgeted cost of production per unit is greater than the cost of hired services, the possibility of closing down the department and use of hired services should be explored if the budgeted production cannot be increased in June, 2013. Assuming that the budgeted expenses and level of output planned for May, 2013 will hold for June 2013 also, calculate the volume of output required to justify the continuance of the department.

Solution:

(i) Report showing evaluation of Department Performance on different concepts

(a) Cost centre basis

	Budget Output 10,000 ₹	**Allowed Cost 12,500** ₹	**Actual 12,500** ₹
Variable Cost			
Direct materials	4,00,000	5,00,000	5,10,000
Direct Labour	2,50,000	3,12,500	3,25,000
Repairs and Maintenance	1,00,000	1,25,000	1,20,000
Consumable stores	75,000	93,750	95,000
Tools	25,000	31,250	30,000
Power and Fuel	1,50,000	1,87,500	1,80,000
Total Variable Cost	10,00,000	12,50,000	12,60,000
Fixed Cost			
Repairs and Maintenance	1,00,000	1,00,000	1,00,000
Supervision	1,00,000	1,00,000	1,10,000
Factory Rent	50,000	50,000	50,000
Depreciation	1,00,000	1,00,000	1,00,000
Administration	2,50,000	2,50,000	2,65,000
Total Fixed Cost	6,00,000	6,00,000	6,25,000
Grand Total	16,00,000	18,50,000	18,85,000

Expense variance 18,50,000 – 18,85,000 = ₹ 35,000 A.

(b) Profit Centre Basis

	₹
Cost of Production on hired machine services (12,500 × 150)	18,75,000
Actual	18,85,000
Profit variance	10,000 A

(c) Responsibility centre

Controllable

	Budget	Actual	Variance
Direct Materials	5,00,000	5,10,000	10,000 A
Direct wages	3,12,500	3,25,000	12,500 A
Repairs & Maintenance	2,25,000	2,20,000	5,000 F
Consumable stores	93,750	95,000	1,250 A
Tools	31,250	30,000	1,250 F
Power & Fuel	1,87,500	1,80,000	7,500 F
Supervision	1,00,000	1,10,000	10,000 A
	14,50,000	14,70,000	20,000 A

Non controllable

	Budget ₹	Actual ₹	Variance ₹
Factory Rent	50,000	50,000	—
Depreciation	1,00,000	1,00,000	—
Administration	2,50,000	2,65,000	15,000 A
	4,00,000	4,15,000	15,000 A

(ii) Volume of output required to justify continuance of Department.

Variable cost of Making on own Machine as per budget = ₹100

Variable cost of making on hired services = ₹150

Saving if manufactured on own machines = ₹(100 - 150) = ₹50

Fixed Costs = ₹6,00,000

Minimum No. of units to justify continuance of the Deptartment = ₹6,00,000 ÷ ₹50 = 12,000

Illustration 15.

Plan for Profit Ltd. as has the following Divisions:

Marketing, Manufacturing, Materials Management, Dispatch and Warehousing, Research and Engineering, Finance and Secretarial Personnel and General Administration.

All the seven divisional Heads after many meetings amongst themselves and due deliberations submit through the managing director, for the consideration of the Board of Directors, the budget for the year 2014, indicating therein a pre-tax profit for the year of ₹225 lakhs.

The Directors are not satisfied with the figure of profit shown in the budget. They feel that the profit can be improved upon by at least 25% and as the Divisional Heads to have another look at the budget, as the budget for 2014 has been prepared simply on the 2013 basis.

Meanwhile the Finance manager finds that the profit figure shown in the budget has not taken into account the carry over effects of certain actions taken in 2013:

(a) The effect of salaries and wages increase in total would be ₹5 lakhs, comprising ₹20,000 in each of the Marketing, Materials Management and Finance and Secretarial Division, ₹4 lakhs in Manufacturing Division, ₹30,000 in Research and Engineering and ₹10,000 in personnel Division

(b) Machine tools reconditioning programme undertaken already would increase the profit by ₹4 lakhs.

(c) Sales price increase effected would add ₹3 lakhs to profit

(d) Net impact of other actions would result in a saving of ₹4.5 lakhs. Actions taken in Manufacturing, Engineering, Personnel and General Administration contributed to cost saving of ₹4.7 lakhs, ₹20,000 and ₹2.1 lakhs respectively, while correspondingly cost increase resulted in Marketing, Material Management, Dispatch and Warehousing to an extent of ₹30,000, ₹2 lakhs and ₹20,000 respectively.

Scanning the indications of environmental changes in 2014, the Marketing Manager envisages as market demand which would increase the sales by ₹33 lakhs, out of which, one third should be clean profit. On the other hand, Material Manager envisages an inevitable rise in Material cost of ₹8 lakhs.

Even when these are incorporated, as the profit comes nowhere near the target set by the Board, the Managing Director in concurrence with the Divisional Heads draw out a Management Plan of Action to improve the profit:

(a) An increase in sales price will result in a profit of ₹7 lakhs.

(b) A deeper Market penetration to bring in an additional sale of ₹90 lakhs with a clean profit of one third.

(c) Reduction in Material usage would save ₹5 lakhs.

(d) Improvement in manpower utilization would bring in a saving of ₹5.5 lakhs.

(e) Expenditure towards additional sales promotion would be ₹1.5 lakhs and expenditure towards training in Manufacturing Division would be ₹2 lakhs and in Marketing ₹50,000.

(f) Other actions taken in the Division would net a saving of ₹7 lakhs-Machinery to a tune of ₹35 lakhs (cash outgo to ₹25 lakhs) would be installed and this will effect a saving of ₹7 lakhs in Manufacturing operations, ₹60,000 in Dispatch and Warehousing and ₹20,000 in engineering while streamlining in Marketing, Finance and General Administration would increase the cost by ₹40,000 and ₹20,000 each respectively.

Keeping the pre-tax profit of ₹225 lakhs given in the budget as the base, you are required to prepare:

(a) A simple Statement of the Directors detailing the improvement on profit, item-wise, as aforesaid under the three heads-carry over effect of actions in 2013, Environmental changes in 2014, and changes resulting from Management action plan.

(b) A profit impact summary by Divisional Accountability, item-wise, under the three heads, to enable each Divisional head to know his contribution or otherwise, towards profit improvement, for which he is responsible.

Solution:

(a) A simple statement of detailing the improvement on profit: (₹ in lakhs)

	Pre-tax profit		**225.00**
1.	Carry over effects of action plan in 2013:		
	(a) Wages increase	(5.00)	
	(b) Machine tool reconditioning	4.00	
	(c) Sale price increase	3.00	
	(d) Other actions	4.50	6.50
2.	Environmental changes in 2014:		
	(a) Market demand (33÷3)	11.00	

	(b) Rise in material cost	(8.00)	3.00
3.	Management's action plan:		
	(a) Increase in selling price	7.00	
	(b) Market penetration (90÷3)	30.00	
	(c) Reducing Material cost	5.00	
	(d) Improvement in manpower utilization	5.50	
	(e) Sales promotion	(1.50)	
	(f) Training expenses	(2.50)	
	(g) Other actions-Net	7.00	50.50
	Revised profit		285.00

(b) **Profit impact summary by divisional accountability** (₹ in lakhs)

			Divisions						
		Total	Marketing	Manu-facturing	Material manage-ment	Dispatch & warehouse	Research & Eng.	Finance & secretarial	Personnel general Adm.
1.	Carryover effect								
	(a) Salaries & wages	(5.00)	(0.20)	(4.00)	(0.20)	—	(0.30)	(0.20)	(0.10)
	(b) Machine Tools reconditioning	4.00	—	4.00	—	—	—	—	—
	(c) Sale price increase	3.00	3.00	—	—	—	—	—	—
	(d) Other actions	4.50	(0.30)	4.70	(2.00)	(0.20)	0.20	—	2.10
		6.50	2.50	4.70	(2.20)	(0.20)	(0.10)	(0.20)	2.00
2.	Environmental changes								
	(a) Market demand (33÷3)	11.00	11.00	—	—	—	—	—	—
	(b) Rise in cost	(8.00)	—	—	(8.00)	—	—	—	—
		3.00	11.00	—	(8.00)	—	—	—	—
3.	Management action plan								
	(a) Sale price	7.00	7.00	—	—	—	—	—	—
	(b) Deeper Market penetration (90÷3)	30.00	30.00	—	—	—	—	—	—
	(c) Material usage	5.00	—	—	5.00	—	—	—	—
	(d) Manpower utilization	5.50	—	—	—	—	—	—	5.50
	(e) Sales promotion	(1.50)	(1.50)	—	—	—	—	—	—
	(f) Training	(2.50)	(0.50)	(2.00)	—	—	—	—	—
	(g) Other actions	7.00	(0.40)	7.00	—	0.60	0.20	(0.20)	(0.20)
		50.50	34.60	5.00	5.00	0.60	0.20	(0.20)	5.30
	Total	60.00	48.10	9.70	(5.20)	0.40	0.10	(0.40)	7.30

Illustration 16.

A company using a detailed system of standard costing finds that the cost of investigation of variances is ₹20,000. If after investigation an out of control situation is discovered, the cost of correction is ₹30,000. If no investigation made, the present value of extra cost involved is ₹1,50,000. The probability of the process being in control is 0.82 and the probability of the process being out of control is 0.18. You are required to advise:

(i) Whether investigation of the variances should be undertaken or not:

(ii) The probability at which it is desirable to institute investigation into variances.

Solution:

(i) Pay of Matrix

Action	In control (0.82)	Out of control (0.18)
Investigate	₹20,000	₹20,000 + 30,000 = ₹50,000
Do not investigate	—	₹1,50,000

If we investigate the expected value is

$20,000 \times 0.82 + 50,000 \times 0.18$

= ₹16,400 + ₹9,000 = ₹25,400

If we do not investigate the expected value is

$0 + 1,50,000 \times 0.18$ = ₹27,000

Hence it is advisable to investigate

(ii) The point where the expected values of each action are same is the breakeven point where the investigation is desirable.

Cost of investigation (C) ₹20,000

Cost of correction (M) ₹30,000

Extra cost if no investigation (L) = ₹1,50,000

Probability of being in control = $P_1 = (1 - P_2)$

Probability of being out of control = P_2

Expected value of investigation

$C (1 - P_2) + (C + M) P_2 = LP_2$

or, $C - CP_2 + CP_2 + MP_2 = LP_2$

or, $C + MP_2 = LP_2$

or, $C = LP_2 - MP_2$

or, $P_2(L - M) = C$

$$\text{or, } P_2 = \frac{C}{L - M} = \frac{20,000}{1,50,000 - 30,000} = \frac{20,000}{1,20,000} = 0.17$$

Investigation is desirable when the probability of being out of control exceeds 0.17

If the Break Even probability is known, then without calculating the expected value of cost of investigation and not investigation, we can decide. In the problem since probability of out of control (0.18) exceeds the Break Even probability (0.17) decision is to investigate.

Illustration 17.

Country preserves produce jams, marmalade and preserves. All products are produced in a similar fashion — the fruits are low temperature cooked in vaccum process and then blended with glucose syrup with added citric acid and pectin to help setting.

Margins are tight and the firm operates a system of standard costing for each batch of jam.

The standard cost data for batch of raspberry jam are

Fruit extract	400 kg @ Re. 0.16 per kg
Glucose Syrup	700 kg @ Re. 0.10 per kg
Pectin	99 kg @ Re. 0.332 per kg
Citric acid	1kg @ ₹2.00 per kg
Labour	18 hrs @ ₹3.25 per hour

Standard processing loss 3%

The summer of 2013 proved disastrous for the raspberry crop with a late frost and cool, cloudy conditions at the ripening period, resulting in low national yield. As a consequence, normal prices in the trade were Re. 0.19 per kg. for fruit extracts although good buying could achieve some savings. The impact of exchange rates on imports of sugar has caused the price of syrup to increase by 20%

The actual results for the batch were:

Fruit Extracts	428 kg. @ Re. 0.18 per kg
Glucose syrup	742 kg. @Re. 0.12 per kg
Pectin	125 kg @ Re. 0.328 per kg
Citric acid	1 kg @ Re. 0.95 per kg
Labour	20 hrs @ ₹3.00 per hour

Actual output was 1,164 kg raspberry jam.

You are required to:

(a) Calculate the ingredients planning variances that are deemed uncontrollable

(b) Calculate the ingredients operating variances that are deemed controllable.

(c) Calculate the mixture and yield variances.

(d) Calculate the total variance for batch.

Solution:

Workings

Statement showing original, revised and actual data

Original Standard			**Revised Standard**			**Actual**		
(1)	(2)	(3)=(1)×(2)	(4)	(5)	(6)=(4)×(5)	(7)	(8)	(9)=(7)×(9)
400	Re.0.16	₹64.000	400	Re.0.19	₹76.000	428	Re.0.18	₹77.04
700	Re.0.10	₹70.000	700	Re.0.12	₹84.000	742	Re.0.12	₹89.04
99	Re.0.332	₹32.868	99	Re.0.332	₹32.868	125	Re.0.328	₹41.00
1	₹2.000	₹2.000	1	₹2.0	₹2.000	1	Re.0.95	₹0.95

1,200		₹168.868	1,200		₹194.868	1,296		₹208.03
	Labour	₹58.500		Labour	₹58.500		Labour	₹60.00
1,200		₹227.368	1,200		₹253.368	1,296		₹268.03
36	Loss 3%		36	Loss 3%		132		
1,164			1,164			1,164		

(a) Planning Variance = Original cost – Revised cost

Fruit Extract	₹64-₹76	₹12(A)
Glucose syrup	₹70-₹84	₹14 (A)
Total	₹227.368- ₹253.368	₹26 (A)

(b) Ingredients Operating Variances: Revised- Actual = ₹194.868 - ₹208.03 = ₹13.162 (A)

For calculation of variances

M_1	Actual cost of actual material	₹208.03
M_2	Standard cost of material used	
	428× 0.19	₹81.32
	742×0.12	₹89.04
	125×0.332	₹41.50
	1×2.0	₹2.00
		₹213.86
M_3	Standard cost of material if it had been used in standard proportion	
	(400 ÷ 1,200) x 1,296 x 0.19	₹82.080
	(700 ÷1200) x 1,296 x 0.12	₹90.720
	(99 ÷ 1,200) x 1,296 x 0.332	₹35.497
	(1 ÷ 1,200) x 1,296 x 2	₹2.160
		₹210.457
M_4	Standard material cost of output	
	(1,94.868 ÷ 1,164) × 1,164	194.868

(1) Material price variance = M_1-M_2 = ₹208.03 - ₹213.86 = 5.83 (F)

(2) Material usage variance = M_2-M_4 = ₹213.86 - ₹194.868 = ₹18.992 (A)

(3) Labour Cost variance = Actual cost-Standard cost = ₹60 - ₹58.50 = ₹1.50 (A)

(c) (1) Mixture variance = M_2-M_3 = ₹213.86 - ₹210.457 = ₹3.403 (A)

(2) Yield variance = M_3 - M_4 = ₹210.457 - ₹194.868 = ₹15.589 (A)

(3) Usage variance = 3.403(A) + 15.589(A) = ₹18.992(A) (Checked)

(d) Total variance = Original Standard Cost-Actual cost = ₹227.368 - ₹268.03 = ₹40.662 (A)

Note: Planning variance is the difference between an original and revised standard cost. It arises when an interim adjustment of a standard cost made without adjusting the budget and is required to allow full analysis of the difference between budget and actual profit. By ingredients and operating variance, the effort has made to ask for constituent variance like material and labour in broad category. The detailed usage variance has been asked in (c).

Illustration 18.

In October 2011, Better Budget Ltd. prepared its budget for the year 2012 at the then prevailing prices as under:

Sales revenue (20,000 units @ ₹9 per unit)		1,80,000
Less: Variable Cost		
Material	50,000	
Labour	51,000	
Variable overheads	30,000	
Selling Expenses	6,000	1,37,000
Contribution		43,000
Less: Fixed Cost		24,000
Budgeted Profit		19,000

It was felt that adjustments should be made to this Budget in view of the rising price changes.

Accordingly the budget was revised taking into account the impact of anticipated inflation on costs as follows:

(i) The price per lb. of material was expected to rise during 2012 from Re. 0.50 (the price put in the original budget) to Re. 0.53 and finally to Re. 0.55. As 1,00,000 lb. of material is required to produce 20,000 units, it was envisaged that 25,000 lb. would be bought at Re. 0.50 per lb., 50,000 lb. at Re. 0.53 per lb., and 25,000 lb. at Re. 0.55 per lb.

(ii) The cost of labour was expected to rise from ₹2.25 per hour (the figure in the original budget) to ₹2.85 per hour. As each completed unit required 1 hour of labour it was envisaged that 10,000 units would be produced at the old rate of ₹2.55 per hour and the balance would be at the new rate of ₹2.85 per hour.

(iii) It was envisaged that the variable overheads would rise in line with the anticipated level of 20% inflation in 2012 and in effect, the increased will be worked out on an average 10%.

(iv) Fixed cost would be affected likewise and a similar treatment would be used to record the increase.

The revised budget brought down the profit figure to ₹7,850 and the actual working in 2012 resulted in profit of ₹7,350.

An analysis of the actual figures revealed the following:

(i) The sales revenue of ₹1,85,000 arises from the sales of 10,000 units at ₹9 per unit and 10,000 units at ₹9.50 per unit

(ii) The cost of material made up 27,500lb. at Re. 0.50 per lb., 55,000 lb. at Re. 0.53 and 27,500 lb. at Re. 0.56 per lb.

(iii) The cost of labour is made up of 10,000 hours at ₹2.55 per hour and 8,333 hour at ₹3.15 per hour.

(iv) The general inflation rate was 24% instead of the anticipated 20%- in effect 12% on an average. The actual figures 2012 of variable overheads was ₹33,600 and fixed cost ₹28,000.

You are required to draw up the revised budget, the actual figure for 2012, make a comparison and account for the drop in profit viz. ₹500 from the revised budget by analyzing the variance as controllable and non-controllable.

Solution: **2012**

	Revised		Actual	
	₹	₹	₹	₹
Sales revenue (20,000 units)		1,80,000		1,85,000
Less: Variable cost:				
Direct material	52,750		58,300	
Direct labour	54,000		51,750	
Variable overheads	33,000		33,600	
Selling expenses	6,000	1,45,750	6,000	1,49,650
Contribution		34,250		35,350
Less: Fixed cost		26,400		28,000
Profit		7,850		7,350

Variance Analysis: (Refer to working notes for computations)

Variance	Total	Non-controllable	Controllable
Selling price	5,000 (F)	5,000 (F)	
Material price	275 (A)	275 (A)	
Material usage	5,275 (A)		5,275 (A)
Labour rate	2,500 (A)	2,500 (A)	
Labour efficiency	4,750 (F)		4,750 (F)
Variable overhead	600 (A)	600 (A)	
Fixed overhead Expenditure	1,120 (A)	1,120 (A)	
Fixed overhead Volume	480 (A)		480 (A)
	500 (A)	505 (F)	1,005 (A)

Working Notes:

Material cost variance

M_1	Actual material cost incurred (27,500×0.50)+(55,000×0.53)+(27,500×0.56)	₹58,300
M_2	Material used at standard cost (27,500×0.50)+(55,000×0.53)+(27,500×0.55)	₹58,025
M_3	Standard material cost (revised) for output (25,000×0.50)+(50,000×0.53)+(25,000×0.55)	₹52,750

Material price Variance=	M_1-M_2	₹58,300-58,025	275 (A)
Material usage Variance=	M_2-M_3	58,025-52,750	5,275 (A)

Labour cost variance

L_1	Actual Labour cost incurred (10,000×2.55)+(8,333×3.15)	51,750 (Appx.)
L_2	Actual hours at standard rate (10,000×2.55)+(8,333×2.85)	49,250 (Appx.)
L_3	Standard Labour cost for output (10,000×2.55)+(10,000×2.85)	₹54,000

Labour Rate Variance =	L_1-L_2 =	₹51,750-49,250	2,500 (A)
Labour Efficiency Variance =	L_2-L_3 =	₹49,250-54,000	4,750 (F)

For Variable Overhead Variance

VO_1	Actual Variable Overhead incurred	33,600
VO_2	Variable overhead for production as per revised budgeted [30,000 × (110÷100)]	33,000

Variable Overhead Expenditure Variance =	VO_1-VO_2 =	₹33,600-33,000	600 (A)

For Fixed Overhead Variances

FO_1	Fixed Overhead incurred	28,000
FO_2	Fixed Overhead for the period or Revised Budget at given inflation rate [26,400×(112÷110)]	26,880
FO_3	Std. Fixed Overhead for production (revised) (24,000×1.10)	26,400

F.O Expenditure Variance =	FO_1-FO_2 =	₹28,000-26,880	1,120 (A)
F.O Volume Variance =	FO_2-FO_3 =	₹26,880-26,400	480 (A)

Illustration 19.

A manufacturing company has the following budgeted costs for one month which are based on a normal capacity level of 40,000 hours. A departmental overhead absorption rate of ₹4.40 per hour has been calculated as follows:

	Fixed (₹ '000)	Variable per hour (₹)
Management and supervision	30	—
Shift premium	—	0.10
ESI & pension costs	6	0.22
Inspection	20	0.25
Consumable supplies	6	0.18
Power for machinery	—	0.20
Lighting and heating	4	—
Rates	9	—
Repairs and maintenance	8	0.15
Materials handling	10	0.30
Depreciation of machinery	15	—
Production administration	12	—
	120	1.40
Overhead rate per hour :		
Variable		1.40
Fixed		3.00
Total		4.40

During the month of April, the company actually worked 36,000 hours producing 36,000 standard hours of production and incurred the following overhead costs:

	(₹ '000s)
Management and supervision	30.00
Shift premium	4.00
ESI and pension costs	15.00
Inspection	28.00
Consumable supplies	12.70
Power for machinery	7.80
Lighting and heating	4.20
Rates	9.00
Repairs and maintenance	15.10
Materials handling	21.40
Depreciation of machinery	15.00
Production administration	11.50
Idle time	1.60
	175.30

You are required to:

(a) Prepare a statement showing the flexible budget for the month of April, the actual costs and the variance for each overhead item;

(b) Comment on each variance of ₹1,000 or more by suggesting possible reasons for the variances reported;

(c) State, for control purposes, with reasons to support your conclusions;

  (i) whether (b) above is adequate; and

  (ii) whether the statement prepared in respect of the request in (a) above could be improved, and if so, how;

(d) Calculate :

  (i) the overhead absorbed;

  (ii) the total amount under/over-spent;

  (iii) the overhead volume variance.

Solution:

(a) Budget Statement

	Budget				**Variance**	
	Fixed ₹	**Variable** ₹	**Total** ₹	**Actual** ₹	**Adv.** ₹	**Fav.** ₹
Overhead						
Management	30,000	—	30,000	30,000	—	—
Shift premium	—	3,600	3,600	4,000	400	—
ESI and pension costs	6,000	7,920	13,920	15,000	1,080	—

Inspection	20,000	9,000	29,000	28,000	—	1,000
Consumable supplies	6,000	6,480	12,480	12,700	220	—
Power for machinery	—	7,200	7,200	7,800	600	—
Light and heat	4,000	—	4,000	4,200	200	—
Rates	9,000	—	9,000	9,000	—	—
Repairs and maintenance	8,000	5,400	13,400	15,100	1,700	—
Material handling	10,000	10,800	20,800	21,400	600	—
Depreciation	15,000	—	15,000	15,000	—	—
Administration	12,000	—	12,000	11,500	—	500
Idle Time	—	—	—	1,600	1,600	—
	1,20,000	50,400	1,70,400	1,75,300	6,400	1,500
						4,900 A

(b) **ESI:** It appears that ESI rates have increased. If this assumption is correct then the variance will be beyond control of management. Note that actual activity is less than budgeted activity. It is therefore unlikely that total wages will have increased because of an increase in the number of labour hours worked. It is possible that wage rates might have increased, thus increasing the ESI payments.

Inspection: It is possible that the standard inspection has been lowered, thus resulting in a saving in costs. If this has not been a policy decision taken by management then the variance should be investigated. Another possibility is that a number of staff has resigned. Consequently the actual labour cost will be less than the budget.

Repairs and maintenance: This variance may be due to unexpected repairs which were not envisaged when the budget was set. It is likely that variances for repairs and maintenance will fluctuate considerably from month to month. It is therefore appropriate to compare budgeted and actual expenditure for several months rather than focus on a single month.

Idle time: No allowance for normal idle time is included in the budget. Consequently the idle time must be of an abnormal nature. Possible uncontrollable causes include a power failure or machine breakdowns. Controllable cause includes bottlenecks arising from poor production scheduling or a lack of materials.

(c)

(i) Commenting on variances in excess of a specific figure may not be satisfactory for control purposes. Variances should only be investigated if the investigation is likely to yield benefits in terms of identifying inefficiencies and remedying them. It may be preferable to use statistical tests to establish the probability that the variance is out of control.

(ii) The statement could be improved by the expense items into their controllable and non-controllable elements. Where possible variances should be analysed according to whether they are due to price and quantity changes. The statement should also include non financial measures such as a comparison of actual hours worked with standard hours produced.

(d)

(i) Overhead absorbed = ₹1,58,400 (₹4.40 x 36,000 hours)

(ii) Overspending = ₹4,900

(iii) Actual production was 4,000 standard hours less than budgeted production and this decline in output has resulted in a failure to recover ₹12,000 fixed overheads. This under recovery of ₹12,000 is also known as the volume variance.

Illustration 20.

You have been provided with the following data for S Plc. for September 2012:

Accounting method:	Absorption	Marginal
Variances	₹	₹
Selling price	1,900 (A)	1,900 (A)
Sales volume	4,500 (A)	7,500 (A)
Fixed overhead expenditure	2,500 (F)	2,500 (A)
Fixed overhead volume	1,800 (A)	Not applicable

During September 2012 production and sales volume were as follows:

	Sales	Production
Budget	10,000	10,000
Actual	9,500	9,700

Calculate:

(i) The standard contribution per unit,

(ii) The standard profit per unit,

(iii) The actual fixed overhead cost total.

Solution:

For Sales Profit/Contribution Variance

		Absorption Costing	Marginal Costing
SP_1	Actual Sales×(Actual Profit)	9,500×Actual profit	9,500×Actual contribution
SP_2	Actual Sales ×(Standard Profit)	9,500×Std. profit	9,500×Std. Contribution
SP_3	Budgeted Sales× (Standard Profit)	10,000×Std. profit	10,000× Std. Margin
	Sales Price Variance=SP_1-SP_2	1,900 (A)	1,900 (A)
	Sales Volume Variance=SP_2-SP_3	4,500 (A)	7,500 (A)
	For Fixed Overhead Variances		
FO_1	Actual Fixed Overhead incurred	Actual incurred	Actual incurred
FO_2	Budgeted Fixed Overhead for the period	Budgeted production× std. fixed overhead rate per unit	Budgeted production× std. fixed overhead rate per unit
FO_3	Budgeted Fixed Overhead for production	Actual production× Std. fixed overhead rate per unit i.e. 9,700×Std. fixed overhead rate per unit	No fixed overhead volume variance is calculated under marginal costing

(i) The standard contribution per unit:

Suppose standard contribution per unit= x (say)

SP_2-SP_3=Sales margin variance

or, 9,500x – 10,000x= 7,500 (A)

(In sales variance, it will be a negative variance if SP_2 (i.e., actual) is less than budget or standard)

9,500x-10,000x=-7,500 or x=₹15

∴ Standard contribution per unit (under marginal costing) is ₹15

Contribution variance arises when marginal costing is used.

(ii) The standard profit per unit:

(It is relevant in absorption costing)

Suppose standard profit per unit= x

SP_2-SP_3= Sales volume variance

9,500x- 10,000x=4,500 (A)

or, 9,500x-10,000x= -4,500 or x=₹9

∴ Standard profit per unit=₹9

(iii) The actual fixed overhead cost (total):

Suppose standard fixed overhead per unit=x

FO_2	Budgeted fixed overhead for the period	10,000×x
FO_3	Fixed overhead for the production	9,700×x
FO_3-FO_2	Fixed overhear volume variance	1,800 (A)

∴ 9,700x -10,000x = -1,800

or, x = ₹6

It means that FO_2 i.e., budgeted fixed overhead for the period= 10,000×₹6= ₹60,000

Fixed overhead Expenditure variance= FO_2-FO_1

or, ₹60,000-FO_1=₹2,500

or, FO_1=₹57,500

Illustration 21.

Fair view Corporation manufactures a single product and the Standard Costing System is allowed. Standard cost per unit is worked out as under:

	₹	₹
Standard Selling price		104
Less: Standard cost		
Material (5 kgs. @₹4 per kg)	20	
Labour (4 hours @₹8 per hour)	32	
Variable Overhead (4 hours @₹3 per hour)	12	
Fixed Overhead (4 hours @ ₹3 per hour)	12	76
Standard Profit		28

Overheads are allocated on the basis of direct labour hours. In the month of April there was no difference between the budgeted and actual selling price and there were no opening and closing stock during the period.

The order details for the month of April are as under:

	Budget	**Actual**
	2,000 units	**1,800 units**
Production and sales		
Direct Materials	10,000 kgs. @₹4 per kg	10,000 kgs. @ ₹4 per kg.
Direct Labour	8,000 hours @ ₹8 per hour	7,400 hours @ ₹8 per hour
Variable Overheads	₹24,000	₹22,200
Fixed Overheads	₹24,000	₹24,000

You are required to calculate the Variance and reconcile the Budgeted and actual profit according to each of the following methods:

(a) The Conventional methods

(b) The relevant cost method assuming that:

(i) Material are scared and restricted to a supply of 10,000 kgs. for the period.

(ii) Labour hours are limited and the available labour are only 8,000 hours for the period

(iii) There are no scarce inputs.

Solution:

(a) **Reconciliation between the budgeted and actual profit based on the Conventional method**

	Budgeted Profit (2,000×₹28)				₹56,000
	For Material cost variance				
M_1	Material cost incurred		₹40,000		
M_2	Standard cost of Material used		₹40,000		
M_3	Standard Material cost of output	1,800 ×₹20	₹36,000		
	Material Usage Variance	M_2-M_3	₹40,000-36,000	₹4,000 (A)	
	For Direct wage variance:				
L_1	Actual payment for labour	7,400 hrs×₹8	₹59,200		
L_2	Payment involved, if the workers had been paid at standard rate	7,400 hrs× ₹8	₹59,200		
L_3	Standard labour cost of output achieved	1,800 units×₹32	₹57,600		
	Labour Efficiency variance	L_2-L_3	₹59,200-₹57,600	₹1,600 (A)	
	For variable overheads variance:				
VO_1	Actual variable overhead incurred		₹22,200		
VO_2	Actual hours worked at standard variable overhead	7,400 hrs. ×₹3	₹22,200		

VO_3	Standard variable overhead for output	1,800 units×₹12	₹21,600		
	Variable overhead Efficiency Variance	VO_2 - VO_3	₹22,200-₹21,600	₹600 (A)	
	For fixed overhead variance:				
FO_1	Actual fixed overhead incurred		₹24,000		
FO_2	Budgeted fixed overhead		₹24,000		
FO_3	Actual hours worked at standard fixed overhead rate	7,400 hrs. ×₹3	₹22,200		
FO_4	Standard fixed F.O for production	1,800×₹12	₹21,600		
	Fixed overhead capacity variance	FO_2-FO_3	₹24,000-₹22,200	₹1,800 (A)	
	F.O Efficiency Variance	FO_3-FO_4	₹22,200-₹21,600	₹600 (A)	
	For sales margin variance:				
SM_1	Actual sales margin on actual sales	1,800× (₹104-₹76)	₹50,400		
SM_2	Standard sales margin on actual sales	1,800× (₹104-₹76)	₹50,400		
SM_3	Sales margin as per budget or standard	2,000×(₹104-₹76)	₹56,000		
	Sales margin volume variance	SM_2-SM_3	₹50,400-₹56,000	₹5,600 (A)	₹14,200 (A)
	Actual profit				₹41,800

Note: Idle Time Variance and Sales Margin Mix Variance is Nil

(b) **Statement showing comparative reconciliation of budgeted profit and actual profit**

Items	**Conventional Method**	**Reconciliation based on different hypothesis of relevant cost**		
		Scarce material	**Scarce labour hours**	**No Scarce input or sales limiting factor**
	₹	₹	₹	₹
Budgeted profit	56,000	56,000	56,000	56,000
Direct material usage variance	4,000 (A)	12,000 (A)	4,000 (A)	4,000 (A)
Direct labour Efficiency variance	1,600 (A)	1,600 (A)	3,600 (A)	1,600 (A)
V.O Efficiency Variance	600 (A)	600 (A)	600 (A)	600 (A)
F.O Capacity variance	1,800 (A)	-	6,000 (A)	-
F.O Efficiency Variance	600 (A)	-	-	-
Sales Margin Volume Variance	5,600 (A)	-	-	8,000(A)
Actual Profit	41,800	41,800	41,800	41,800

Note:

(i) Scarce Material: Based on conventional method, direct material usage variance is ₹4,000 (A) i.e., 1,000 kg × ₹4. In this situation material is scarce, and therefore, material cost variance based on relevant cost method should also include contribution lost per unit of material.

	₹	₹
Selling price		104
Less: Variable cost		
Material (5kg. x ₹4)	20	
Labour (4 hrs. x ₹8)	32	
Variable overhead (4 hrs. x ₹3)	12	64
Contribution per unit		40
Material used per unit		5 kgs.
Contribution per kg. (₹40 ÷ 5)		8

∴ Excess usage of 1,000 kg. leads to lost contribution of ₹8,000 i.e., 1,000 × ₹8.

∴ Total material variance based on relevant cost method, when material is scarce will be:

₹8,000 (A) + ₹4,000 (A)=₹12,000(A)

Since labour is not scarce, labour variance are identical to conventional method.

(ii) Scarce labour: Material is no longer scarce and therefore the direct material method. In conventional method excess labour hours used are: 7,400 hrs. - (1,800 units × 4 hrs.)=200 hrs. Contribution lost per hour=₹40 ÷ 4=₹10. Therefore contribution lost per unit, when labour is scarce will be: 200 hrs × ₹10=₹2,000

Therefore, total labour efficiency variance, when labour hours are scarce will be ₹3,600 i.e., ₹1,600 (as per conventional method) + ₹2,000. Variable efficiency variance will not change due to scarce labour hours. Fixed overhead is a sunk cost. Relevant Fixed overhead capacity variance will be ₹6,000 (A) i.e., 600 hrs x ₹10. Sales margin variances etc. are irrelevant in case of scarce labour hours, as it is not the function of sales manager to use labour hour efficiently.

Sales limiting factor: As material and labour are not the limiting factors, the same conventional variance hold good i.e., material usage variance, labour efficiency variance, variable overhead variance will remain the same. The lost sales volume is 200 units. Therefore contribution lost will be ₹8,000 i.e., 200 units × ₹40.This difference from sales margin variance of ₹5,600 as shown in conventional method.

Illustration 22.

A firm has developed a product for which the following standard cost estimates have been made for first batch to be manufactured in month 1.

Standard cost per batch	
500 labour hours @ ₹8 per hour	₹4,000
55 units of direct materials @₹100 per unit	₹5,500
Variable overhead 500 hours @ ₹15 per hour	₹7,500
	₹17,000

From experience the firm knows that labour will benefit from a learning effect and labour time will be reduced. This is expected to approximate to an 80% learning curve and to follow the general function.

$Y=ax^b$

Where,

Y=Average labour hours per batch

a=Number of labour hours for the first batch

x=Cumulative number of batches

b=learning coefficient

(The learning coefficient is found as follows:

$$b=\frac{\log(1-\text{proportionate decrease})}{\log 2}$$

The coefficient for 80% learning curve is b=0.322)

In addition, the growing expertise of labour is expected to improve the efficiency with which materials are used. The usage of material is expected to approximate to a 95% learning curve and to follow the general function

$Y = ax^b$

Where,

Y = Average units of material per batch

a = number of units for the first batch

And x and b are explained previously.

The actual production for the first six months was as follows:

Month 1	20 batches	Month 4	24 batches
Month 2	30 batches	Month 5	33 batches
Month 3	25 batches	Month 6	28 batches

During month 6 the following results were recorded for the last batch made:

Actual result of last batch

Labour hours	115
Direct wages	₹978
Direct materials(41 units)	₹3,977
Variable overhead	₹1,685

You are required:

(i) To calculate the learning coefficient for materials,

(ii) To derive the standard cost of the last batch in Month 6,

(iii) To calculate what variances have arisen in connection with the last batch,

(iv) To explain what information the variances provide for management.

Solution:

(Calculation made up to nearest rupee)

(i) The learning coefficient for materials is given by the following equation:

$$b = \frac{\log (1-0.05)}{\log 2} = \frac{-1+0.9777}{0.3010} = -0.074$$

(ii) Standard cost of last batch

Cumulative number of batches	20+30+25+24+33+28	160
Average labour hours per batch	$500\times160^{-0.322}$	97.55
Average units of material per batch	$55\times160^{-0.074}$	37.78

Cost of batch:

97.55 labour hours @₹8 per hour	₹780
37.78 units of material @₹100 per unit	₹3,778
97.55 labour hours @₹15 per hour	₹1,463
	₹6,021

(iii) For calculation of labour variances

L_1	Actual hours at actual rate	₹978
L_2	Actual hours at standard rate (115 hours @₹8 per hour)	₹920
L_3	Standard labour cost for production (97.55 hours @₹8 per hour)	₹780

Labour rate variance	L_1-L_2	₹978-₹920	₹58 (A)
Labour Efficiency variance	L_2-L_3	₹920-₹780	₹140 (A)

For calculation of Material Variances

M_1	Actual units of material at actual rate		₹3,977
M_2	Actual units of material at standard rate	41×₹100	₹4,100
M_3	Standard material cost of production	37.78 units×₹100	₹3,778

Material price variance	M_1-M_2	₹3,977-₹4,100	₹123 (F)
Material volume variance	M_2-M_3	₹4,100-₹3,778	₹322 (A)

For calculation of variable overhead variance

VO_1	Actual hours at actual variable overhead rate		₹1,685
VO_2	Actual hours at standard variable overhead rate	115 hours@₹15 per hour	₹1,725
VO_3	Standard variable overhead for production	97.55×₹15	₹1,463

Variable overhead expenditure variance	VO_1-VO_2	₹1,685-₹1,725	₹40 (F)
Variable overhead efficiency variance	VO_2-VO_3	1,725-1,463	₹262 (A)

Summary of variance

	₹	₹
Standard cost		6,021
Direct Labour Variance:		
-Rate	58 (A)	
-Efficiency	140 (A)	198 (A)
Direct Material Variances		
-Price	123 (F)	
-Volume	322 (A)	199 (A)
Variable overhead variances:		
-Expenditure	40 (F)	
-Efficiency	262 (A)	222 (A)
Actual cost of last batch		6,640

(iv)

(a) Labour efficiency variance, variable overhead efficiency variance and material usage variance indicate that learning effect was not obviously as high as expected.

(b) The labour rate variance is adverse. It indicates that labour rate paid was higher than expected.

(c) Direct material price variance is favourable. It means that actual price of direct material was lower than expected

(d) The variable overhead expenditure variance is favourable. It means that expenditure on variable overhead was less than expected.

Illustration 23.

Based on the data given below, to show the calculation of:

(i) Efficiency ratio;

(ii) Production volume ratio;

(iii) Idle capacity ratio.

Data	**Standard hours of output**	**Hours of actual operation**
Theoretical capacity	100	100
Theoretical capacity less unavoidable lost time	95	95
Planned activity for period	81	90
Actual activity for period	68	85

Solution:

(i) $$\text{Efficiency ratio} = \frac{\text{Standard hours of production achieved}}{\text{Actual number of working hours}} \times 100 = \frac{68}{85} \times 100 = 80\%$$

(ii) $$\text{Production volume ratio} = \frac{\text{Standard hours of production achieved}}{\text{Budgeted number of standard hours}} \times 100 = \frac{68}{81} \times 100 = 84\%$$

(iii) $$\text{Idle capacity ratio} = \frac{\text{Practical capacity standard hours less budgeted standard hours}}{\text{Practical capacity standard hours}} \times 100$$

$$= \frac{95 - 81}{95} \times 100 = \frac{14}{95} \times 100 = 14.74\%$$

Illustration 24.

NAB Limited has produced the following figures relating to production for the week ended 21st May:

	Production (in units)	
	Budgeted	Actual
Product A	400	400
Product B	400	300
Product C	100	140

Standard production times were:

	Standard hours per unit
Product A	5.0
Product B	2.5
Product C	1.0

During the week, 2,800 hours were worked on production

You are required to

(i) Calculate the production volume ratio and the efficiency ratio for the week ended 21st May.

(ii) Explain the significance of the two ratios you have calculated and to state which variance may be related to each of the ratios.

Solution:

(i) Production Volume Ratio $= \frac{\text{Standard hours produced}}{\text{Budgeted hours}} \times 100$

$$= \frac{(400 \times 5) + (300 \times 2.5) + (140 \times 1)}{(400 \times 5) + (400 \times 2.5) + (100 \times 1)} \times 100$$

$$= \frac{(2,000 + 750 + 140)}{(2,000 + 1,000 + 100)} \times 100 = 93.23.\%$$

Efficiency Ratio $= \frac{\text{Standard hour produced}}{\text{Actual hours taken (given)}} \times 100$

$$= \frac{(400 \times 5) + (300 \times 2.5) + (140 \times 1)}{2,800} \times 100$$

$$= \frac{(2,000 + 750 + 140)}{2,800} \times 100 = 103.21\%$$

(ii) The production volume ratio indicates the relationship between the standard hours produced and original budgeted hours. This shows how far the original expectations relating to volume of output have been met. This could also be measured by fixed overhead volume variance.

The efficiency ratio shows the significance of any change from original budget level of efficiency. It is calculated by comparing the actual hours taken to produce the output with standard time allowance for that output. This can also by represented by overhead efficiency variance or labour efficiency variance.

Illustration 25.

The following data have been obtained from the records of a machine shop for an average month:

Budget	
No. of working days	25
Working hours per day	8
No. of direct workers	16
Efficiency	One standard hour per clock hour
Down time	20%
Overheads:	
Fixed	₹15,360
Variable	₹20,480
The actual data for the month of September 2012 are as under:	
Fixed	₹16,500
Variable	₹14,500
Net operator hours worked	1,920
Standard hours produced	2,112
There was a special holiday in September 2014.	

Required to present reports to Departmental manager:

(i) Showing the cost ratios.

(ii) Setting out the analysis of variances.

Solution:

(i) **Report to Departmental Manager showing cost Ratios**

(a) Efficiency ratio:

$$= \frac{\text{Output expressed in standard hours}}{\text{Actual hours worked}} \times 100 = \frac{2,112}{1,920} \times 100 = 110\%$$

(b) Activity ratio:

$$= \frac{\text{Actual output in standard hours}}{\text{Budgeted output in standard hours}} \times 100 = \frac{2,112}{2,560} \times 100 = 82.50\%$$

(c) Calendar ratio

$$= \frac{\text{Actual working days in a period}}{\text{No. of working days in related budget period}} \times 100 = \frac{24}{25} \times 100 = 96\%$$

(d) Standard capacity usage variance

$$= \frac{\text{Budgeted hours}}{\text{Max. No. of hours in related period}} \times 100 = \frac{2,560}{3,200} \times 100 = 80\%$$

(e) Actual usage of budgeted capacity ratio $= \frac{\text{Actual working hours}}{\text{Budgeted hours}} \times 100 = \frac{1,920}{2,560} \times 100 = 75\%$

(f) Idle capacity ratio = 100% - 80% = 20%

Workings

Maximum hours(25×8×16)	3,200
Budgeted hours (3,200 hrs. – 20% of 3,200)	2,560
Actual hours (given)	1,920
Standard hours (produced)	2,112
Budgeted working days	25
Actual working days (25 – 1 special holiday)	24

(ii) **Report to Departmental Manager setting out the analysis of variance**

(A) Fixed overhead variance

FO_1	Actual fixed overhead incurred		₹16,500
FO_2	Budgeted fixed overhead for the period (given)		₹15,360
FO_3	Fixed overhead for the day/hrs available at standard rate during the period	(24/25×₹15,360)	₹14,746
FO_4	Fixed overhead for actual hrs worked at standard rate	(₹15,360/2,560× 1,920)	₹11,520
FO_5	Standard fixed overhead for production	(₹15,360/2,560× 2,112)	₹12,672

Variances

Fixed overhead expenditure variance = $FO_1 - FO_2$ = ₹16,500 - ₹15,360 = ₹1,140 (A)

Fixed overhead calendar variance = $FO_2 - FO_3$ = ₹15,360 - ₹14,746 = ₹614 (A)

Fixed overhead capacity variance = $FO_3 - FO_4$ = ₹14,746 - ₹11,520 = ₹3,226 (A)

Fixed overhead efficiency variance = $FO_4 - FO_5$ = ₹11,520 - ₹12,672 = ₹1,152 (F)

Fixed overhead variance = $FO_1 - FO_5$ = ₹16,500 - ₹12,672 = ₹3,828 (A)

Fixed overhead volume variance = $FO_2 - FO_5$ = ₹15,360 - ₹12,672 = ₹2,688 (A)

(B) Variable overheads

VO_1	Actual variable overhead		₹14,500
VO_2	Actual hours worked at standard variable overhead rate	₹ 20,480/2,560 hrs. × 1,920 hrs.	₹15,360
VO_3	Standard variable overhead for production	₹ 20,480/2,560 hrs. × 2,112 hrs.	₹16,896

Variances

Variable overhead expenditure variance = $VO_1 - VO_2$ = ₹14,500 - ₹15,360 = ₹860 (F)

Variable overhead efficiency variance = $VO_2 - VO_3$ = ₹15,360 - ₹16,896 = ₹1,536 (F)

Variable overhead variance = $VO_1 - VO_3$ = ₹14,500 - ₹16,896 = ₹2,396 (F)

Illustration 26.

The following information is available from the records of Stand Cost Ltd. which follows the Partial Plan of accounting for Standard costs, for October 2014:

Material purchased:	₹
10,000 pieces at ₹2.20 each	22,000.00
Material consumed:	
9,500 pieces at ₹2.20 each	20,900.00
Actual wages paid:	
2,475 hours at ₹2.50 per hour	6,187.50
Factory overhead incurred	11,000.00
Factory overhead budgeted	10,000.00
Standard rate and prices are:	
Direct material rate	₹2.00 per unit
Standard input	10 pieces per unit
Direct labour rate	₹2.00 per unit
Standard requirement	2.5 hours per unit
Overheads	₹4.00 per labour hour

During the month 900 units were produced and sold at ₹50 per unit.

Required:

(a) Show the standard cost card.

(b) Compute cost variance for October 2014.

(c) Show the journal entries to record the transactions and disposal of the variances (Narrations are required for journal entries).

(d) Show:

(i) The material control,

(ii) The work in progress control account.

Solution:

(a) Standard cost card (per unit)

Direct material	(10 pieces×₹2.00)	₹20.00
Direct labour	(2.5 hrs×₹2.00)	₹5.00
Overhead	(2.5 hrs×₹4.00)	₹10.0
		₹35.00

(b) For Material cost variance

M_1	Actual cost of material used	(9,500 pieces×₹2.20)	₹20,900
M_2	Standard cost of material used	(9,500 pieces×₹2.00)	₹19,000
M_3	Standard material cost of production	(900 units×₹20)	₹18,000

For direct wage variance

L_1	Actual payment made to worker	(2,475 hrs×₹2.50)	₹6,187.50
L_2	Payment involved, if the worker had been paid at std. rate	(2,475 hrs×₹2)	₹4,950.00
L_3	Standard labour cost of production	(900×₹5)	₹4,500.00

For factory overhead variances

FO_1	Actual fixed overhead incurred		₹11,000
FO_2	Fixed overhead as per budget		₹10,000
FO_3	Fixed overhead for actual hours worked at standard rate	(2,475 hrs×₹4.00)	₹9,900
FO_4	Standard fixed overhead for production	900 units×₹10.00	₹9,000

Computation of variance:

Material cost variance = M_1-M_3 = 20,900-18,000 = ₹2,900 (A)

Material price variance = M_1-M_2 = 20,900-19,000 = ₹1,900 (A)

Material usage variance = M_2-M_3 = 19,000-18,000 = ₹1,000 (A)

Labour cost variance = L_1-L_3 = 6,187.50-4,500 = ₹1,687.50 (A

Labour rate variance = L_1-L_2 = 6,187.50-4,950 = ₹1,237.50 (A)

Labour Efficiency variance = L_2-L_3 = 4,950-4,500 = ₹450.00 (A)

Factory O.H. cost variance = FO_1-FO_4=11,000-9,000 = ₹2,000 (A)

Factory O.H. Expenditure variance = FO_1-FO_2 = 11,000-10,000 = ₹1,000 (A)

Factory O.H capacity variance = FO_2-FO_3 = 10,000-9,900 = ₹100 (A)

Factory O.H. Efficiency variance = FO_3-FO_4=9,900-9,000 = ₹900 (A)

Total cost variance = Material price variance+ Material Usage variance+ Labour rate variance + Efficiency variance +O.H. Expenditure variance+ Capacity variance + O.H. Efficiency variance = 1,900 (A)+1,000 (A)+ 1,237.50 (A)+ 450 (A)+ 1,000 (A)+ 100 (A)+ 900 (A)= ₹6,587.50 (A)

(c) The company uses Partial Plan i.e., (i) W.I.P. Account is credited with actual cost and credited with standard cost of production, (ii) material price variance is calculated when material is used in goods completed and goods in progress, and (iii) Balancing figures of W.I.P. A/c are cost variances, which are analysed according to cause.

Journal Entries

	Particulars		Dr. (₹)	Cr. (₹)
(i)	Material control A/c	Dr.	22,000	
	To General Ledger Adjustment A/c			22,000
	(Being purchase of 10,000 pieces at ₹2.20 per piece)			
(ii)	W.I.P. A/c	Dr.	20,900	
	To Material Control A/c			20,900
	(Being 9,500 pieces consumed @ ₹2.20 per piece)			
(iii)	W.I.P. A/c	Dr.	6,187.50	
	To Direct wage control A/c			6,187.50
	(Being 2,475 hours worked at ₹2.50 per hour)			

(iv)	W.I.P. A/c	Dr.	11,000	
	To overhead control A/c			11,000
	(Being factory overhead incurred)			
(v)	Finished goods A/c	Dr.	31,500	
	To W.I.P. A/c			31,500
	(Being 900 finished pieces @ ₹35 per unit)			
(vi)	Cost of sales A/c	Dr.	31,500	
	To Finished goods A/c			31,500
	(Being the cost of 900 units sold during the period)			
(vii)	Material Price Variance A/c	Dr.	1,900.00	
	Material Usage Variance A/c		1,000.00	
	Labout Rate Variance		1,237.50	
	Labour Efficiency Variance A/c		450.00	
	Factory Overhead Expenditure Variance A/c		1,000.00	
	Factory Overhead Capacity Variance A/c		100.00	
	Factory Overhead Efficiency Variance A/c		900.00	
	To W.I.P. A/c			6,587.50
	(Being transaction for the cost variance under partial plan)			

(d) Ledger

Material control A/c

Particulars	₹	Particulars	₹
To, General Ledger Adj. A/c	22,000	By, W.I.P.A/c	20,900
		By, Balance c/d	1,100
	22,000		22,000

W.I.P. A/c

Particulars	₹	Particulars	₹
To, Material Control A/c	20,900.00	By, Finished Goods Control A/c	31,500.00
To, Wages Control A/c	6,187.50	By, Material Price Variance A/c	1,900.00
To, Overhead Control A/c	11,000.00	By, Material Usage Variance A/c	1,000.00
		By, Labour Rate Variance A/c	1,237.50
		By, Labour Efficiency variance A/c	450.00
		By, Factory O.H. Exp. Variance A/c	1,000.00
		By, Factory O.H. Capacity Variance A/c	100.00
		By, Factory O.H. Efficiency Variance A/c	900.00
	38,087.50		38,087.50

Illustration 27.

A manufacturer has an order for one lakh units. With his present equipment they cost 80 paise each to make and there is a 6% fraction defective. However, he may install special controls which together with their cost of development, cost ₹18,000 . His variable cost per unit, then falls to 60 paise each; but the process may be less reliable. How much less reliable can the process be, before he should reject the special controls?

Solution:

Let the break-even fraction defective = x

Manufacturer's order = 1,00,000 units

In order to get 1,00,000 goods unit $\frac{1,00,000}{1-x}$ items should be made

Cost without special controls = $\frac{1,00,000 \times 0.80}{1-0,06}$ = 85,106

Cost with special controls = ₹18,000 + (0.60) $\frac{1,00,000}{1-x}$

By equating both proposals

₹85,106 = ₹18,000 + (0.60) $\frac{1,00,000}{1-x}$

or, 67,106 = $\frac{60,000}{1-x}$

or, 1-x = 0.894

or, x = 1- 0.894

or, x = 0.106

or, x = 10.6%

Illustration 28.

To produce 1,000 units of product X, the standard materials input is 1,200 units at a standard price of ₹6 per unit. The standard allows for rejects at the rate of 25% of input; it is estimated that one-third of total rejects can be reworked at an additional standard cost of ₹2 per unit. Scrapped units can be sold for Re. 0.50p each.

During the period just ended, 19,500 units of X were produced. 24,000 units of material were issued to production, at the cost of ₹6 per unit; 7,000 units were rejected on initial inspection and of these, 2,500 were reworked, at a cost of ₹5,100. The remainder were sold as scrap for Re. 0.50 per unit.

Calculate the relevant variances.

Solution:

The standard cost of product X is as follows:

		Units	Price ₹	Cost ₹
Material		1,200	6	7,200
Rejection	(25% of 1,200)	300		
		900		
Reworked	(1/3 ×25% × 1,200)	100	2	200
		1,000		7,400
Scrapped proceeds from 200 units i.e.	(200×0.50)			(100)
Net processing cost		1,000		7,300
The standard yield for the process is 5/6 of input				
Material cost variance is:				
Material		24,000	6	1,44,000

Rejection		7,000		
		17,000		
Reworked		2,500		5,100
		19,500		1,49,100
Less: Scraped proceeds (4,500 × Re. 0.50)				(2,250)
Actual cost		19,500		1,46,850

In this situation material cost variance is called "Quality cost variances" which comprise of material usage variance, scrap variance and rework cost variance.

M_1	Actual cost of material		1,46,850
M_2	Actual material cost	(19,500×7.3)	1,42,350

Material Quality variance=M_1-M_2=₹1,46,850-₹1,42,350=4,500 (A)

For material usage variance

(1) Actual quantity used at standard rate	24,000×₹6	₹1,44,000
(2) Standard quantity for output of 19,500 at standard rate	(19,500× 6/5) ×₹6	₹1,40,400
Material usage variance	₹1,44,000-₹1,40,400	₹3,600 (A)

For Scrap variance

(1) Actual Scrap at actual disposal value	4,500×Re. 0.50	₹2,250
(2) Scrap value as per standard	19,500×(100÷1,000)	1,950
Scrap variance	₹2,250-₹1,950	₹300 (F)

For Rework cost variance

(1) Actual rework cost		₹5,100
(2) Standard rework cost	19,500×(200÷1,000)	₹3,900
Rework cost variance	₹5,100-₹3,900	₹1,200 (A)

The three variances should total back to quality cost variance i.e.,

Quality Cost variance=Material usage variance+ Scrap variance+ Rework cost variance

= 3,600 (A)+ 300 (F)+1,200 (A) = 4,500 (A)

Illustration 29.

From the information given below relating to manufacturing company, you are required to:

(a) Write up the Cost Ledger and prepare a Costing Profit and Loss A/c showing the appropriate variances for the year ended 30th April.

(b) Ascertain the profit stated in the financial accounts for the year ended, 30th April, and reconcile this with the profit shown in your answer to (a) above.

In addition to the normal financial accounts, the company kept Cost Control Account. The balances on these accounts on 30th April of the previous year were as follows:

Particulars	At standard cost	
	₹	₹
General Ledger Control A/c		69,00,000
Raw material	20,50,000	

Work in progress	36,80,000	
Finished goods	11,70,000	
	69,00,000	69,00,000

The following is a summary of transactions during the current year ended 30th April.

	₹
(1) Purchase of raw materials on credit	80,90,000
(2) Material price variance, calculated at the time of purchase (adverse)	1,90,000
(3) Material usage variance (adverse)	50,000
(4) Direct wages actual (13,00,000 hrs)	67,80,000
(5) Standard (@₹5 per hour)	65,50,000
(6) Indirect wages	23,10,000
(7) Depreciation	10,50,000
(8) Indirect material and expenses	19,30,000
(9) Administration, selling and distribution expenses	58,50,000
(10) Debenture interest	3,60,000
(11) Donations	20,000
(12) Grant to staff benevolent fund	2,50,000
(13) Material issued to production at standard prices	80,00,000
(14) Factory overhead absorbed to production at ₹4.00 per standard direct labour hour	52,40,000
(15) Sales on credit	3,14,70,000
(16) Payment received from borrowers (interest on loans)	70,000
(17) Abnormal loss account	1,00,000

Note:

(i) The following items of expenditure and income will not be considered in cost books: (a) Debenture interest, (b) Donation (c) Grant to staff benevolent fund (d) Income from interest.

(ii) All variances, viz. material price variance, material usage variance, direct wage variance, overhead variance and abnormal loss will be charged to Costing Profit and Loss A/c. Adm. and selling and distribution overhead will be charged to Costing Profit and Loss A/c.

Opening Stock:	At Standard Cost	At Actual Cost
Raw materials	₹20,50,000	₹21,00,000
Work in progress	₹36,80,000	₹36,50,000
Finished goods	₹11,70,000	₹12,50,000
Closing Stock:		
Raw materials	₹18,00,000	₹17,90,000
Work in progress	₹34,50,000	₹35,10,000
Finished goods	₹11,90,000	₹12,00,000

Solution:

It is presumed that single plan is followed.

(a) **Cost Ledger**

General Ledger Adjustment Account

Particulars	₹	Particulars	₹
To, Costing P & L A/c	3,14,70,000	By, Balance c/d	69,00,000
To, Balance c/d	64,40,000	By, Raw Material Control A/c	80,90,000
		By, Direct Wages	67,80,000
		By, Factory Overhead Control A/c	
		-Indirect wages	23,10,000
		-Depreciation	10,50,000
		-Indirect Material	19,30,000
		By, Adm. & selling overhead	58,50,000
		By, Costing P & L A/c	50,00,000
	3,79,10,000		3,79,10,000

Work-in-progress Account

Particulars	₹	Particulars	₹
To, Opening Stock	36,80,000	By, Finished Goods Stock A/c	2,00,20,000
To, Direct Material Control A/c	80,00,000		
To, Direct Wage A/c	65,50,000	By, Balance c/d	34,50,000
To, Fixed Overhead A/c	52,40,000		
	2,34,70,000		2,34,70,000

Finished Goods Account

Particulars	₹	Particulars	₹
To, Balance b/d	11,70,000	By, Cost of Goods Sold A/c	2,00,00,000
To, Work-in-progress A/c	2,00,20,000		
		By, Balance c/d	11,90,000
	2,11,90,000		2,11,90,000

Raw Material Control Account

Particulars	₹	Particulars	₹
To, Balance c/d	20,50,000	By, Material Price Variance A/c	1,90,000
To, General Ledger Adjustment A/c	80,90,000	By, Material usage Variance A/c	50,000
		By, Work-in-progress A/c	80,00,000
		By, Costing P & L A/c (Abnormal Loss)	1,00,000
		By, Balance c/d	18,00,000
	1,01,40,000		1,01,40,000

Material Price Variance Account

Particulars	₹	Particulars	₹
To, Raw Material Control A/c	1,90,000	By, Costing P & L A/c	1,90,000
	1,90,000		1,90,000

Material usage variance Account

Particulars	₹	Particulars	₹
To, Raw Material Control A/c	50,000	By, Costing P & L A/c	50,000
	50,000		50,000

Direct Wages Control Account

Particulars	₹	Particulars	₹
To, General Ledger Adjustment A/c	67,80,000	By, Work-in-progress A/c	65,50,000
		By, Wages Cost Variance	2,30,000
	67,80,000		67,80,000

Wages Cost Variance Account

Particulars	₹	Particulars	₹
To, Direct Wages Control A/c	2,30,000	By, Costing P & L A/c	2,30,000
	2,30,000		2,30,000

Factory Overhead Control Account

Particulars	₹	Particulars	₹
To, Cost Ledger Control A/c		By, Work-in-progress A/c	52,40,000
-Indirect Wages	23,10,000	By, Overhead Variance	50,000
-Depreciation	10,50,000		
-Indirect Material	19,30,000		
	52,90,000		52,90,000

Overhead Variance Account

Particulars	₹	Particulars	₹
To, Factory O.H Control A/c	50,000	By, Costing P & L A/c	50,000
	50,000		50,000

Adm. Selling & Distribution O.H. Account

Particulars	₹	Particulars	₹
To, General Ledger Adjustment A/c	58,50,000	By, Costing P & L A/c	58,50,000
	58,50,000		58,50,000

Cost of goods sold Account

Particulars	₹	Particulars	₹
To, Finished Goods A/c	2,00,00,000	By, Costing P & L A/c	2,00,00,000
	2,00,00,000		2,00,00,000

Sales Account

Particulars	₹	Particulars	₹
To, Costing P & L A/c	3,14,70,000	By, General Ledger Adjustment A/c	3,14,70,000
	3,14,70,000		3,14,70,000

Costing Profit and Loss Account

Particulars	₹	Particulars	₹
To, Cost of goods sold	2,00,00,000	By, General Ledger Adjustment A/c	3,14,70,000
To, Adm. and selling overhead A/c	58,50,000		
To, Material price variance A/c	1,90,000		
To, Material usage A/c	50,000		
To, Wages cost variance	2,30,000		
To, Overhead variance A/c	50,000		
To, Abnormal loss A/c	1,00,000		
To, General Ledger Adjustment A/c(Net profit)	50,00,000		
	3,14,70,000		3,14,70,000

Profit and Loss Account for the period ending 30th April

Particulars	₹	Particulars	₹
To, Opening Inventories		By, Sales	3,14,70,000
-Raw materials	21,00,000	By, Closing Inventories	
-Work-in-progress	36,50,000	-Raw Material	17,90,000
-Finished Goods A/c	12,50,000	-Work-in-progress	35,10,000
To, Purchase of raw material	80,90,000	-Finished Goods	12,00,000
To, Direct Wages	67,80,000	By, Interest on loans	70,000
To, Indirect wages	23,10,000		
To, Indirect Materials	19,30,000		
To, Depreciation	10,50,000		
To, Adm. & Selling	58,50,000		
To, Debenture Interest	3,60,000		
To, Donations	20,000		
To, Grant to Staff	2,50,000		
To, Net Profit	44,00,000		
	3,80,40,000		3,80,40,000

Statement showing Reconciliation of profit as per Cost and Financial Accounts

	₹	₹
Profit as per Cost Account		50,00,000
Add:		
(i) Difference in Valuation of Closing Stock:		
Work-in-progress	60,000	
Finished Goods	10,000	
(ii) Difference in opening W.I.P.	30,000	
(iii) Income from Interest	70,000	1,70,000
		51,70,000
Less:		
(i) Difference in Closing Stock of Raw Material	10,000	
(ii) Difference in Opening Stock:		
(a) Raw Material	50,000	
(b) Finished	80,000	
(iii) Purely financial transactions		
(a) Debenture Interest	3,60,000	
(b) Donations	20,000	
(c) Grant to Staff benevolent fund	2,50,000	7,70,0000
Profit as per Financial Ledger		44,00,000

Illustration 30

One kilogram of product 'K' requires two chemicals A and B.The following were the details of product 'K' for the month of June,2013:

(a) Standard mix Chemical 'A' 50% and Chemical 'B' 50%

(b) Standard price per kilogram of Chemical 'A' ₹ 12 and Chemical 'B' ₹ 15

(c) Actual input of Chemical 'B' 70 kilograms.

(d) Actual price per kilogram of Chemical 'A' ₹ 15

(e) Standard normal loss 10% of total input.

(f) Materials Cost variance total ₹ 650 adverse.

(g) Materials Yield variance total ₹ 135 adverse.

You are required to calculate:

(1) Materials mix variance total

(2) Materials usage Variance total

(3) Materials price variance total

(4) Actual loss of actual input

(5) Actual input of chemical 'A'

(6) Actual price per kilogram of Chemical 'B'

Solution:

Let, actual output of chemical A be a kgs

Actual price per Kg of chemical B be ₹ b

Standard input be 100 Kgs

Actual output be 90Kgs

	Standard			Actual		
	Quantity	**Price**	**Value**	**Quantity**	**Price**	**Value**
A	50	12	600	a	15	15a
B	50	15	750	70	b	70b
	100		1,350	70 + a		15a + 70b
(-) normal loss	10	--	--	a – 20	--	--
	90		1,350	90		15a + 70b

	(1)	**(2)**	**(3)**	**(4)**
	SQSP	RSQSP	AQSP	AQAP
A		12 × (70 + a/100) × 50	12 × a	
B		15 × (70 + a/100) × 50	15 × 70	
	1350	945 + 13.5a	1,050 + 12a	15a + 70b

Given material cost variance = (1) – (4) = ₹ -650

= 15a + 70b = ₹ 2,000

Material yield variance = (1) – (2) = ₹ -135

= 1,350 - 945 - 13.5a = ₹ – 135

$\Rightarrow$ a = 40

$\Rightarrow$ b = 20

(a) SQSP = ₹ 1,350

(b) RSQSP = 945 + (13.5 x 40) = ₹ 1,485

(c) AQSP = 1,050 + (12 x 40) = ₹ 1,530

(d) AQAP = (15 x 40) + (70 x 20) = ₹ 2,000

(1) Material mix variance = ₹ 45(A) = RSQSP – AQSP

(2) Material usage variance = ₹ 180(A) = SQSP – AQSP

(3) Material price variance = ₹ 470(A) = AQSP – AQAP

(4) Actual loss of actual input = ₹ 20

(5) Actual input of chemical A = 40Kgs

(6) Actual price per Kgs of chemical B = ₹ 20

Illustration 31

Compute the missing data indicated by the Question marks from the following.

	Product 'R'	Product 'S'
Sales quantity		
Std.(units)	?	400
Actual (Units)	500	?
Price (Unit)		
Standard	₹ 12	₹ 15
Actual	₹ 15	₹ 20
Sales price variance	?	?
Sales volume variance	₹ 1,200 F	?
Sales value variance	?	?

Sales mix variance for both the products together was ₹ 450 (F),'F' denotes Favourable.

Solution:

Let the standard units of product R be r

Actual units of product S be s

	Standard			Actual		
	Quantity	Price	Value	Quantity	Price	Value
R	r	12	12r	500	15	7,500
S	400	15	6,000	s	20	20s
	400 + r		6,000 + 12r	500 + s		7,500 + 20s

Given sales volume variance for R = ₹ 1,200(F)

$\Rightarrow$ AQSP –SQSP = ₹ 1,200

r = ₹ 400

Sales mix variance = AQSP - RSQSP = ₹ 450(F)

	AQSP	**RSQSP**
R	12 x 500	12 x [(500+s)/(400+r)] x 400
S	15 x s	15 x [(500+s)/(400+r)] x 400
	6,000 + 15s	6,750 + 13.5s

Then s = 800

- Standard units of product R, r = 400
- Actual units of product S, s = 800
- Sales price variance for R = AQ(AP - SP) = ₹ 1,500(F)
  S = 4000(F)
- Sales volume variance for S = SP(AQ – SQ) = ₹ 6,000(F)
- Sales value variance for R = AQAP – SQSP = ₹ 2,700(F)
  For S = ₹ 10,000(F)

Illustration 32

The assistant management accountant of your company has been preparing the profit and loss account for the week ended 31st October. Unfortunately, he has had a traffic accident and is now in a hospital, so as senior cost analyst you have been asked to complete this statement. The uncompleted statement and relevant data are shown below.

Week ended 31st October

	₹	₹
Sales		50,000
Standard Cost:		
Direct materials		
Direct wages		
Overhead	—	—
Standard profit		
Variances	Fav./(adv.)	Fav./(adv.)
	₹	₹
Direct materials: Price	(400)	
Usage	(300)	
Total:		(700)
Direct Labour:		
Rate		
Efficiency		
Total		---
Overhead expenditure		
Volume		
Total	___	
Total variance		
Actual Profit		

Standard Data

The standard price of direct material used is ₹ 600 per tonne. From each tonne of material it is expected that 2,400 units will be produced. A forty hour week is operated. Standard labour rate per hour is ₹ 4. There are 60 employees working as direct labour.

The standard performance is that each employee should produce one unit of product in 3 minutes. There are 4 working weeks in October. The budgeted fixed overhead for October is ₹ 19,200.

Actual data

Materials used during the week were 20 tones at ₹ 620 per tone. During the week 4 employees were paid of ₹ 4.2 p.h and 6 were paid ₹ 3.8 p.h and Remaining were paid at Standard Rate Overheads incurred was ₹ 18,000.

You are required to complete the P & L Statement for the week ended 31st October

Solution:

Actual cost of material 620 × 20		₹ 12,400
(-) direct material: price variance	400	
Usage variance	300	(700)
		11,700

For ₹ 600/- production = 2,400 units

For ₹ 11,700/- production = (2,400/600) × 11,700 = 46,800 units

Labour variances

(1)	(2)	(3)
SRSH	SRAH	ARAH
4 X 2340	4 x (40 x 60)	[(4 x 4.20) + (6 x 3.80) + (50 x 4)] × 40
₹ 9,360	₹ 9,600	₹ 9,584

Labour rate variance (2) – (3): 16(F)

Labour efficiency variance: (1) – (2): 240(A)

Overhead variances:

(1)	(2)	(3)	(4)
SRSH	SRAH	SRBH	ARAH
8 x 2,340	8 x 2,400		
₹ 18,720	₹ 19,200	₹ 19,200	₹ 18,000

OHs expenditure variance: (3) – (4): 1,200(F)

OHs volume variance: (1) – (3): 480(A)

P&L statement for the week ended 31st October:

		₹	₹
Sales			50,000
Standard cost			
direct material		11,700	
direct wages		9,360	
overheads		18,720	39,780
Standard profit			10,220

Variances	F/(A)	F/(A)	
direct material:			
price	(400)		
usage	(300)		
total		(700)	
Direct labour:			
rate	16		
efficiency	(240)		
Total		(224)	
Overheads:			
Expenditure	1200		
Volume	(480)		
Total		720	
Total variance			(204)
Actual profit			10,016

Illustration 33

	(₹ In lakhs)	
	31-3-2013	**31-3-2014**
	₹	₹
Sales	120	129.6
Prime cost of sales	80	91.1
Variable Overheads	20	24.0
Fixed expenses	15	18.5
PROFIT	5	(4.0)

During 2013-14, average prices increased over these of the previous years

(1) 20% in case of sales (2) 15% in case of prime cost (3) 10% in case of Overheads.

Prepare a profit variance statement from the above data.

Solution:

Calculation of variances:

(1) Sales Price Variance : 129.60 – (129.60 x 100/120) = ₹ 21.60 (F)

(2) Sales Volume Variance : (129.60 x 100/120) - 120 = ₹ 12 (A)

(3) Total Sales Variance : 129.60 –120 = ₹ 9.60 (F)

Decrease in volume = $\frac{12}{120} \times 100$ = 10%

(4) Prime Cost price Variance : (91.10 × 100/115) – 91.10 = ₹ 11.88 (A)

(5) Prime Cost Volume Variance = 80 × 10/100 = ₹ 8 (F)

(6) Prime Cost Usage or efficiency Variance = (80 x 90/100) - (91.10 x 100/115)= ₹ 7.22 (A)

(7) Prime Cost Variance : 80 – 91.1 = ₹ 11.1 (A)

(8) Variable Overhead Price Variance = (24 x 100/110) - 24 = ₹ 2.18 (A)

(9) Variable Overhead Volume Variance = 20 x 10/100 = ₹ 2 (F)

(10) Variable Overhead Efficiency Variance = (20 x 90/100) - (24 x 100/110) = ₹ 3.82 (A)

(11) Variable Overhead Cost Variance = 20-24 = ₹ 4 (A)

(12) Fixed Overhead Price Variance = (18.50 x 100/110) – 18.50 = ₹ 1.68 (A)

(13) Fixed Overhead Efficiency Variance = 15 - (18.50 x 100/110) = ₹ 1.82 (A)

(14) Fixed Overhead Cost Variance = 15 – 18.50 = ₹ 3.5 (A)

Profit Variance Statement:

		₹
Budgeted Profit		5.00
Add: Sales Price Variance	21.60	
Prime Cost Volume Variance	8.00	
Variable Overhead Volume Variance	2.00	31.60
		36.60
Less: Sales Volume Variance	12.00	
Prime Cost Price Variance	11.88	
Prime Cost usage Variance	7.22	
Variable Overhead Price Variance	2.18	
Variable Overhead Efficiency Variance	3.82	
Fixed Overhead Price Variance	1.68	
Fixed Overhead Efficiency Variance	1.82	40.60
Actual Loss		4.00

Illustration 34

ABC Ltd; adopts a standard costing system. The standard output for a period is 20,000 units and the standard cost and profit per unit is as under:

	₹
Direct Material (3 units @ ₹ 1.50)	4.50
Direct Labour (3 H ₹ @ Re.1.00)	3.00
Direct Expenses	0.50
Factory Overheads : Variable	0.25
Fixed	0.30
Administration Overheads	0.30
TOTAL COST	8.85
PROFIT	1.15
SELLING PRICE (FIXED BY GOVERNMENT)	10.00

The actual production and sales for a period was 14,400 units. There has been no price revision by the Government during the period.

The following are the variances worked out at the end of the period.

Direct Material		Favourable (₹)	Adverse(₹)
	Price		4,250
	Usage	1,050	
Direct labour			
	Rate		4,000
	Efficiency	3,200	
Factory Overheads			
	Variable – Expenditure	400	
	Fixed – Expenditure	400	
	Fixed – Volume		1,600
Administration Overheads			
	Expenditure		400
	Volume		1,600

You are required to:

(a) Ascertain the details of actual costs and prepare a Profit and Loss Statement for the period showing the actual Profit/Loss. Show working clearly.

(b) Reconcile the actual Profit with standard profit.

Solution:

(a) **Statement Showing the actual profit and loss statement:**

Particulars	**Amount**	**Amount**
	₹	₹
Standard Material Cost (14,400 x 4.50)	64,800	
Add: Price Variance	4,250	
Less: Usage Variance	(1,050)	68,000
Standard Labour Cost (14,400 x 3)	43,200	
Add: Rate Variance	4,000	
Less: Efficiency Variance	(3,200)	44,000
Direct Expenses (14,400 x 0.50)		7200
Factory Overhead:		
Variable (14,400 x 0.25)	3,600	
Less: Expenditure Variance	(400)	3,200
Fixed (14,400 x 0.30)	4,320	
Add: Volume Variance	1,680	
Less: Expenditure Variance	(400)	5,600
Administration Overhead (14,400 x 0.3)	4,320	
Add: Volume Variance	1,680	
Add: Exp. Variance	400	6,400
Total Cost		1,34,400
Profit (B/F)		9,600
Sales		1,44,000

(b) **Statement showing reconciliation of standard profit with actual profit**

Particulars	Amount	Amount
	₹	₹
Standard Profit (14400 x 1.15)		16,560
Add: Material Usage Variance	1,050	
Labour Efficiency Variance	3,200	
Variable Overhead Expenditure Variance	400	
Fixed Overhead Expenditure Variance	400	5,050
		21,610
Less: Material price variance	4,250	
Labour Rate Variance	4,000	
Fixed Overhead volume variance	1,680	
Administration Expenditure Variance	400	
Administration Volume Variance	1,680	12,010
Actual Profit		9,600

Illustration 35

The profitability of a company for two years ended 31st March after eliminating the effects of inflation is as under:

	Years ended 31st March	
	2013	2014
	₹ in lacs	₹ in lacs
Sales	1,200	1,540
Direct Materials	600	648
Direct wages and variable overhead	360	412
Fixed overheads	160	300
Profit	80	180

Consequent upon the reorganisation of production methods and improvement in quality the company has been able to secure an increase in the selling prices by 10% during the year ended 31st March 2014. The position of consumption of materials and utilisation of direct labour hours during the two years is as under:

	2013	2014
Direct Materials(Tonnes)	4,80,000	5,40,000
Direct Labour Hours	72,00,000	80,00,000

Required:

(i) Keeping the year ended 31st March, 2013 as the base year, analyse the result of the year ended 31st March, 2014 to show the amount which each factor has contributed to the change in the profit.

(ii) Find the break-even sales for both the year in ₹

(iii) Calculate the percentage increase in selling price that would have been further necessary over the sales value for the year ended 31st March 2013 to earn a margin of safety of 40%

Solution:

(i)

Sales price variance = 1,540 – (1,540 x 100/110) = ₹ 140 lacs (F)
Sales Volume variance = (1,540 x 100/110) – 1,200 = ₹ 200 lacs (F)
% increase in volume = 200/1,200 x 100 = 16.67% or 1/6
Material cost variance = 648 – 600 = ₹ 48 lacs (A)
Material Volume variance = 600 x 1/6 = ₹ 100 lacs (A)
Standard Price = 6,00,00,000/4,80,000 = ₹ 125
The quantity of Material expected to be used = 1,400/1,200 x 4,80,000 = 5,60,000
Material Usage variance = (5,60,000 – 5,40,000) × 125 = ₹ 25,00,000 (F)
Therefore, Material Cost Variance = Material Volume + Material Usage + Material Price Variance
-48 = -100 + 25 + Material Price
-48 + 100 – 25 = Material Price
Therefore Material Price = ₹ 27 lacs (F)
Wages and Variable Overhead Cost Variance = 360-412 = ₹ 52 lacs (A)
Wages and Variable Overhead Volume Variance = 360 x1/6 = ₹ 60 lacs (A)
Standard Rate Or Rate in 2013 = 3,60,00,000/72,00,000 = ₹ 5
Hours expected to be used in 2014 = 1,400/1,200 x 72,00,000 = 84,00,000
Wages or Variable Overhead efficiency variance = (84,00,000 – 80,00,000) × 5 ₹ = 20,00,000 (F)
Wages or Variable Overhead Cost Variance = Volume + efficiency + labour Rate
-52 = -60 + 20 + labour Rate
-52 + 60 – 20 = labour Rate
12 lacs (A) = Labour Rate Variance
Fixed Overhead Cost Variance = 160-300 = ₹ 140 lacs (A)

Reconciliation of profit in 2012 with 2013:

Particulars	Amount	Amount
	₹ (in lacs)	₹ (in lacs)
Profit in 2013		80
Add: Sales Price Variance	140	
Sales Volume Variance	200	
Material Usage Variance	25	
Material Price Variance	27	
Labour Overhead Efficiency Variance	20	412
		492
Less: Material Volume Variance	100	
Labour Overhead Volume Variance	60	
Labour Overhead Rate Variance	12	
Fixed Overhead Cost Variance	140	312
Actual Profit		180

(ii) Break-even Sales:

2013 = 160 x 1200/240 = 800 lacs

2014 = 300 x 1540/480 = 962.50 lacs

(iii) In order to maintain M/S of 40%, the Break-Even should be at 60%. Therefore, total sales required

Let total sales be 'x'

$\frac{60}{100} \times = 962.50$

or × = 1604.1666.

Current Sales = 1,540 lacs

Sales required to increase = 1,604.1666 - 1,540

= 64.1666 lacs

percentage increase in selling price = 64.1666 / 1,200 x 100 =5.35 %

Illustration 36.

M/s Premier Book Ltd intended to introduce the system of Zero base budgeting. The company has only ₹11,00,000 available for different items of expenses for the current year. From the following separate estimates of expenses for maintaining (i) the minimum viability and (ii) the quality and image of the company, you are required to rank the different proposals and prepare a budget with zero base.

Proposal	At minimum viable level (₹)	Cost At quality image level (₹)
(a) Purchase of 3,00,000 paperbacks	6,00,000	6,00,000
(b) Postage for dispatch of goods to customers:		
1st class Mail		2,40,000
2nd class mail	1,70,000	
(c) Collecting orders on telephone		
4 hours a day	10,000	
8 hours a day		20,000
(d) Packing of goods		
Wooden boxes		2,40,000
Jute Bags	30,000	
(e) Accounting:		
Manual	35,000	
Computerised		95,000
(f) Display of goods		
In showroom only	1,00,000	
In showroom and distribution of brochures		1,50,000
(g) Customer collection service		
Not at all	-	
Full		30,000
(h) Painting of premises		
Not at all	-	
Regularly		35,000
	9,45,000	14,10,000

The company can afford to spend more than that required for minimum viable level for some items but not for all. However, it hopes to make a reasonable profit if ₹11,00,000 is spent.

Solution: **Ranking of Decision Packages**

SL. No.	Decision Package		Rank Rational	Item Cost (₹)	Cumulative Costs (₹)
(a)	Purchase of paperbacks	1	Basic necessity for functioning	6,00,000	6,00,000
(b)	Collecting orders on telephone(4 hours a day)	2	Basic requirement for sales	10,000	6,10,000
(c)	Postage for dispatch of goods(2nd class mail)	3	Critical to customer supplies	1,70,000	7,80,000
(d)	Packing in jute bags	4	Critical to customer supplies	30,000	8,10,000
(e)	Display of goods in showroom	5	Must for stimulating demand	1,00,000	9,10,000
(f)	Accounting manual	6	Necessary for proper control	35,000	9,45,000
(g)	Taking extra orders (for 4 more hours)	7	Likely to push up sales	10,000	9,55,000
(h)	Improved packaging in wooden cases (in place of jute bags)	8	Minimise transit loss and/ improve company's image with customers.	2,10,000	11,65,000
(i)	Distribution of brochures	9	Likely to bring extra business	50,000	12,15,000
(j)	Painting regularly of premises	10	Improve company's image	35,000	12,50,000
(k)	Full customer collection service	11	Improve sales besides saving in postage and packing costs	30,000	12,80,000
(l)	Despatch through 1st class mail	12	Will speed up deliveries, cause savings in transit losses and thus improve company's image	70,000	13,50,000
(m)	Accounting computerised	13	Improved record keeping	60,000	14,10,000

The company may decide to adopt any of the following steps:-

(1) It may accept decision package from (a) to (g) in full and allocate ₹1,45,000 for improved packaging. It may reject all decision packages from (i) to (m).

(2) On reviewing decision packages from (i) to (m), the company may decide to opt-for distribution of brochures and reduce the allocation to packaging. In other words, it may allocate ₹95,000 for packaging and another ₹50,000 for distribution of brochures for promoting sales. If the company opts for these options, the revised ZBB rankings will be as follows:

Decision package	Rank	Rationale	Item cost (₹)	Cumulative cost (₹)
Items (a) to (g)	1-7	Core service		9,55,000
Improved packaging [item (h)]	8	Savings in transit loss and improvement in company's image with the customers	95,000	10,50,000
Promotional Brochures [item (i)]	9	Likely to bring extra business	50,000	11,00,000

Study Note - 9

PROCESS CONTROL AND ACTIVITY BASED COST MANAGEMENT, JIT & ERP

This Study Note includes

9.1 PROCESS CONTROL

Process control is a statistics and engineering discipline that deals with architectures, mechanisms and algorithms for maintaining the output of a specific process within a desired range.

Process control is extensively used in industry and enables mass production of continuous processes such as oil refining, paper manufacturing, chemicals, power plants and many other industries. Process control enables automation, with which a small staff of operating personnel can operate a complex process from a central control room.

For example, heating up the temperature in a room is a process that has the specific, desired outcome to reach and maintain a defined temperature (e.g. 20°C), kept constant over time. Here, the temperature is the **controlled variable**. At the same time, it is the **input variable** since it is measured by a thermometer and used to decide whether to heat or not to heat. The desired temperature (20°C) is the **setpoint**. The state of the heater (e.g. the setting of the valve allowing hot water to flow through it) is called the **manipulated variable** since it is subject to control actions.

A commonly used control device called a programmable logic controller, or a PLC, is used to read a set of digital and analog inputs, apply a set of logic statements, and generate a set of analog and digital outputs. Using the example in the previous paragraph, the room temperature would be an input to the PLC. The logical statements would compare the setpoint to the input temperature and determine whether more or less heating was necessary to keep the temperature constant. A PLC output would then either open or close the hot water valve, an incremental amount, depending on whether more or less hot water was needed. Larger more complex systems can be controlled by a Distributed Control System (DCS).

To study the subject of industrial process control effectively, you must first gain a general understanding of its basic principles. To present these control principles clearly and concisely, an intuitive approach to process control is used. First, however, some basic definitions and concepts of process control are presented.

Definition of Process Control

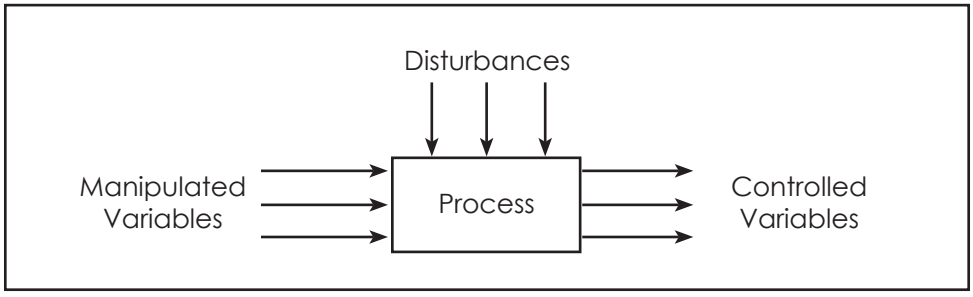
The operations that are associated with process control have always existed in nature. Such "natural" process control can be defined as any operation that regulates some internal physical characteristic that is important to a living organism. Examples of natural regulation in humans include body

temperature, blood pressure, and heart rate. Early humans found it necessary to regulate some of their external environmental parameters to maintain life. This regulation could be defined as "artificial process control" or more simply as "process control". This type of process control is accomplished by observing a parameter, comparing it to some desired value, and initiating a control action to bring the parameter as close as possible to the desired value. One of the first examples of such control was early man's use of fire to maintain the temperature of his environment.

The term *automatic process control* came into wide use when people learned to adapt automatic regulatory procedures to manufacture products or process material more efficiently. Such procedures are called automatic because no human (manual) intervention is required to regulate them. All process systems consist of three main factors or terms: the manipulated variables, disturbances, and the controlled variables.

Typical manipulated variables are valve position, motor speed, damper position, or blade pitch. The controlled variables are those conditions— such as temperature, level, position, pressure, pH, density, moisture content, weight, and speed—that must be maintained at some desired value.

For each controlled variable there is an associated manipulated variable. The control system must adjust the manipulated variables so the desired value or "set point" of the controlled variable is maintained despite any disturbances.



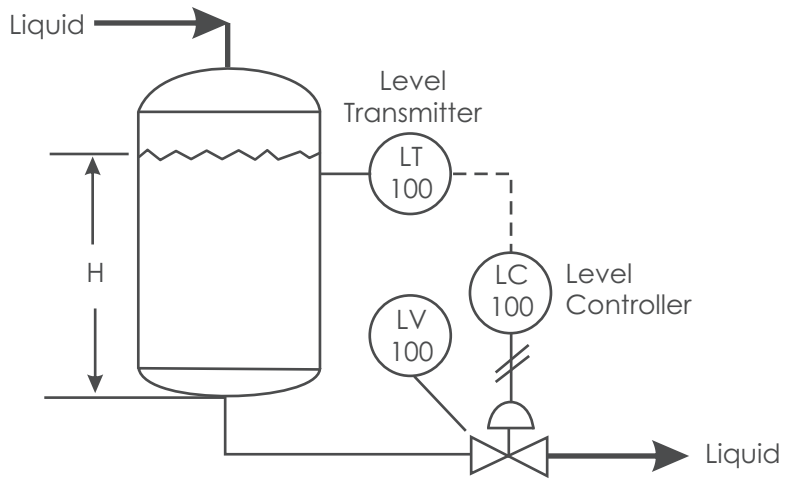
Process control variables

Disturbances enter or affect the process and tend to drive the controlled variables away from their desired value or set point condition. Typical disturbances include changes in ambient temperature, in demand for product, or in the supply of feed material. The control system must adjust the manipulated variable so the set point value of the controlled variable is maintained despite the disturbances. If the set point is changed, the manipulated quantity must be changed to adjust the controlled variable to its new desired value.

For each controlled variable the control system operator selects a manipulated variable that can be paired with the controlled variable. Often the choice is obvious, such as manipulating the flow of fuel to a home furnace to control the temperature of the house. Sometimes the choice is not so obvious and can only be determined by someone who understands the process under control. The pairing of manipulated and controlled variables is performed as part of the process design.

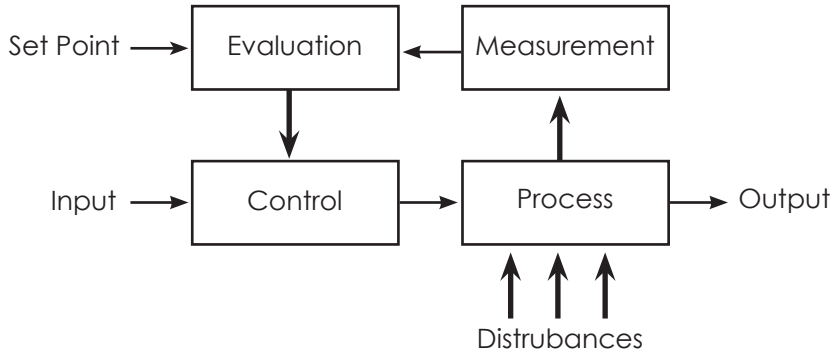
Elements of a Process Control System

The following figure illustrates the essential elements of a process control system. In the system shown, a level transmitter (LT), a level controller (LC), and a control valve (LV) are used to control the liquid level in a process tank. The purpose of this control system is to maintain the liquid level at some prescribed height (H) above the bottom of the tank. It is assumed that the rate of flow into the tank is random. The level transmitter is a device that *measures* the fluid level in the tank and converts it into a useful measurement signal, which is sent to a level controller. The level controller *evaluates* the measurement, compares it with a desired set point (SP), and produces a series of corrective actions that are sent to the control valve. The valve *controls* the flow of fluid in the outlet pipe to maintain a level in the tank.



Process level control : Example

Thus, a process control system consists of four essential elements: *process, measurement, evaluation,* and *control*. A block diagram of these elements is shown in the following figure. The diagram also shows the disturbances that enter or affect the process. If there were no upsets to a process, there would be no need for the control system. The figure also shows the input and output of the process and the set point used for control.



Four elements of a control system

In general, a process consists of an assembly of equipment and material that is related to some manufacturing operation or sequence. In the example presented in the previous figure, the process whose liquid level is placed under control includes such components as a tank, the liquid in the tank, the flow of liquid into and out of the tank, and the inlet and outlet piping. Any given process can involve many dynamic variables, and it may be desirable to control all of them. In most cases, however, controlling only one variable will be sufficient to control the process to within acceptable limits. One occasionally encounters a multivariable process in which many variables, some interrelated, require regulation.

Measurement

To control a dynamic variable in a process, you must have information about the entity or variable itself. This information is obtained by measuring the variable.

Measurement refers to the conversion of the process variable into an analog or digital signal that can be used by the control system. The device that performs the initial measurement is called a *sensor* or *instrument*. Typical measurements are pressure, level, temperature, flow, position, and speed. The result of any measurement is the conversion of a dynamic variable into some proportional information that is required by the other elements in the process control loop or sequence.

Evaluation

In the evaluation step of the process control sequence, the measurement value is examined, compared with the desired value or set point, and the amount of corrective action needed to maintain proper control is determined. A device called a *controller* performs this evaluation. The controller can be a pneumatic, electronic, or mechanical device mounted in a control panel or on the process equipment. It can also be part of a computer control system, in which case the control function is performed by software.

Control

The control element in a control loop is the device that exerts a direct influence on the process or manufacturing sequence. This final control element accepts an input from the controller and transforms it into some proportional operation that is performed on the process. In most cases, this final control element will be a control valve that adjusts the flow of fluid in a process. Devices such as electrical motors, pumps, and dampers are also used as control elements.

Types of control systems

In practice, process control systems can be characterized as one or more of the following forms:

- **Discrete –** Found in many manufacturing, motion and packaging applications. Robotic assembly, such as that found in automotive production, can be characterized as discrete process control. Most discrete manufacturing involves the production of discrete pieces of product, such as metal stamping.
- **Batch –** Some applications require that specific quantities of raw materials be combined in specific ways for particular durations to produce an intermediate or end result. One example is the production of adhesives and glues, which normally require the mixing of raw materials in a heated vessel for a period of time to form a quantity of end product. Other important examples are the production of food, beverages and medicine. Batch processes are generally used to produce a relatively low to intermediate quantity of product per year (a few pounds to millions of pounds).
- **Continuous –** Often, a physical system is represented through variables that are smooth and uninterrupted in time. The control of the water temperature in a heating jacket, for example, is an example of continuous process control. Some important continuous processes are the production of fuels, chemicals and plastics. Continuous processes in manufacturing are used to produce very large quantities of product per year (millions to billions of pounds).

Advanced Process Control

In control theory **Advanced Process Control** (APC) refers to a broad range of techniques and technologies implemented within industrial process control systems. Advanced process controls are usually deployed optionally and in addition to *basic* process controls. Basic process controls are designed and built with the process itself, to facilitate basic operation, control and automation requirements. Advanced process controls are typically added subsequently, often over the course of many years, to address particular performance or economic improvement opportunities in the process.

Process control (basic and advanced) normally implies the process industries, which includes chemicals, petrochemicals, oil and mineral refining, food processing, pharmaceuticals, power generation, etc. These industries are characterized by continuous processes and fluid processing, as opposed to discrete parts manufacturing, such as automobile and electronics manufacturing. The term process automation is essentially synonymous with process control.

Process controls (basic as well as advanced) are implemented within the process control system, which usually means a distributed control system (DCS), programmable logic controller (PLC), and/or a supervisory control computer. DCSs and PLCs are typically industrially hardened and fault-tolerant. Supervisory control computers are often not hardened or fault-tolerant, but they bring a higher level of computational capability to the control system, to host valuable, but not critical, advanced control applications. Advanced controls may reside in either the DCS or the supervisory computer, depending on the application. Basic controls reside in the DCS and its subsystems, including PLCs.

Types of Advanced Process Control

Following is a list of the best known types of advanced process control:

- Advanced regulatory control (ARC) refers to several proven advanced control techniques, such as feedforward, override or adaptive gain. ARC is also a catch-all term used to refer to any customized or non-simple technique that does not fall into any other category. ARCs are typically implemented using function blocks or custom programming capabilities at the DCS level. In some cases, ARCs reside at the supervisory control computer level.
- Multivariable Model predictive control (MPC) is a popular technology, usually deployed on a supervisory control computer, that identifies important independent and dependent process variables and the dynamic relationships (models) between them, and uses matrix-math based control and optimization algorithms, to control multiple variables simultaneously. MPC has been a prominent part of APC ever since supervisory computers first brought the necessary computational capabilities to control systems in the 1980s.
- Inferential control: The concept behind inferentials is to calculate a stream property from readily available process measurements, such as temperature and pressure, that otherwise would require either an expensive and complicated online analyzer or periodic laboratory analysis. Inferentials can be utilized in place of actual online analyzers, whether for operator information, cascaded to base-layer process controllers, or multivariable controller CVs.
- Sequential control refers to dis-continuous time and event based automation sequences that occur within continuous processes. These may be implemented as a collection of time and logic function blocks, a custom algorithm, or using a formalized Sequential function chart methodology.
- Compressor control typically includes compressor anti-surge and performance control.

9.2 PROCESS MODELING & SIMULATION

In every organization there exists a well defined Business Process Management System (BPMS). But ironically, the BPMS of most organizations start and end with process documentation. Minimal emphasis is placed on Process Optimization which is the most critical part in maintaining the bottom line figures. Process Modeling and Simulation is an effective way of ensuring that Process Optimization is quick & effective and yields desired results in the most cost effective manner.

Process simulation **is used for the design, development, analysis, and optimization of technical processes and is mainly applied to chemical plants and chemical processes, but also to power stations, and similar technical facilities.**

Process simulation is a **model**-based representation of chemical, physical, biological, and other technical processes and unit operations in software. Basic prerequisites are a thorough knowledge of chemical and physical properties of pure components and mixtures, of reactions, and of mathematical models which, in combination, allow the calculation of a process in computers.

Process simulation software describes processes in flow diagrams where unit operations are positioned and connected by product or educt streams. The software has to solve the mass and energy balance to find a stable operating point. The goal of a process simulation is to find optimal conditions for an examined process. This is essentially an optimization problem which has to be solved in an iterative process.

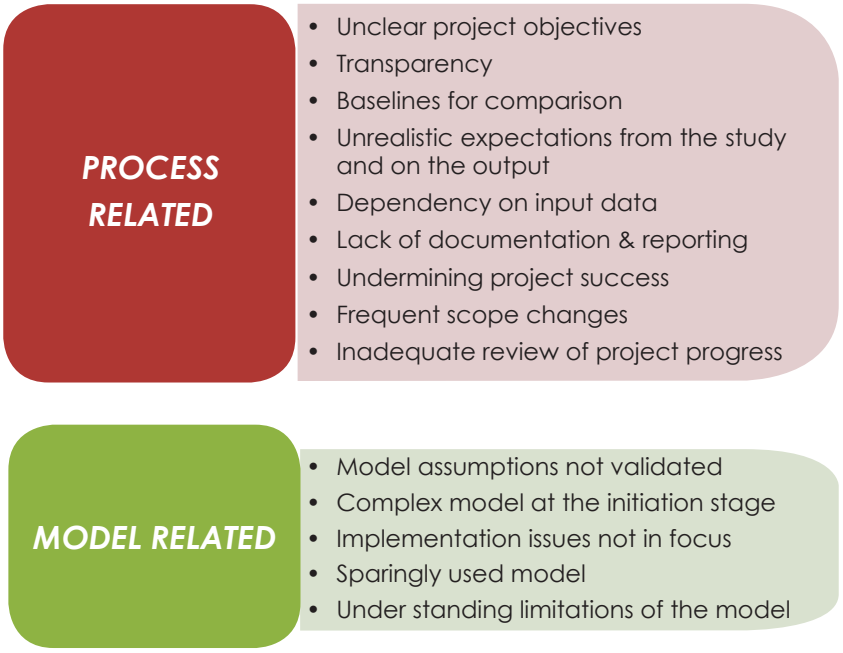
Process simulation always use models which introduce approximations and assumptions but allow the description of a property over a wide range of temperatures and pressures which might not be covered by real data. Models also allow interpolation and extrapolation - within certain limits - and enable the search for conditions outside the range of known properties.

Issues & Challenges

Before considering a simulation exercise one should explore the need for simulation in detail. This helps in understanding and harnessing the power and benefits that are associated with this technology. Imagine a virtual world in which you can visualize your processes in an accelerated environment and predict its long term performance. Such experimentations when done in real world consume unnecessary time and expenses that invariably lead to compromises. Moreover the dependency on manual calculations increases substantially impacting the performance predictability factor of the process. Although manual calculations provide an insight to the process performance, often, real life scenarios are complicated and have several constraints. This makes it almost impossible to perform a manual calculation and predict the exact performance. On the other hand, there are unlimited constraints and scenarios that can be built into a virtual environment. Moreover an activity that takes several days using the manual route, in fact can be completed in a matter of minutes using a virtual scenario.

Failure Areas

In a modeling exercise, key failure areas can be classified into two categories such as Process Related & Model Related failures.



Modeling

The development of models for a better representation of real processes is the core of the further development of the simulation software. Model development is done on the chemical engineering side but also in control engineering and for the improvement of mathematical simulation techniques. Process simulation is therefore one of the few fields where scientists from chemistry, physics, computer science, mathematics, and several engineering fields work together.

A lot of efforts are made to develop new and improved models for the calculation of properties. This includes for example the description of

- thermophysical properties like vapor pressures, viscosities, caloric data, etc. of pure components and mixtures
- properties of different apparatuses like reactors, distillation columns, pumps, etc.

- chemical reactions and kinetics
- environmental and safety-related data

Two main different types of models can be distinguished:

1. Rather simple equations and correlations where parameters are fitted to experimental data.
2. Predictive methods where properties are estimated.

The equations and correlations are normally preferred because they describe the property (almost) exactly. To obtain reliable parameters it is necessary to have experimental data which are usually obtained from factual data banks or, if no data are publicly available, from measurements.

Using predictive methods is much cheaper than experimental work and also than data from data banks. Despite this big advantage predicted properties are normally only used in early steps of the process development to find first approximate solutions and to exclude wrong pathways because these estimation methods normally introduce higher errors than correlations obtained from real data.

Process simulation also encouraged the further development of mathematical models in the fields of numerics and the solving of complex problems.

Modeling is the process of producing a model; a model is a representation of the construction and working of some system of interest. A model is similar to but simpler than the system it represents. One purpose of a model is to enable the analyst to predict the effect of changes to the system. On the one hand, a model should be a close approximation to the real system and incorporate most of its salient features. On the other hand, it should not be so complex that it is impossible to understand and experiment with it. A good model is a judicious tradeoff between realism and simplicity. Simulation practitioners recommend increasing the complexity of a model iteratively. An important issue in modeling is model validity. Model validation techniques include simulating the model under known input conditions and comparing model output with system output.

Generally, a model intended for a simulation study is a mathematical model developed with the help of simulation software. Mathematical model classifications include deterministic (input and output variables are fixed values) or stochastic (at least one of the input or output variables is probabilistic); static (time is not taken into account) or dynamic (time-varying interactions among variables are taken into account). Typically, simulation models are stochastic and dynamic.

Simulation

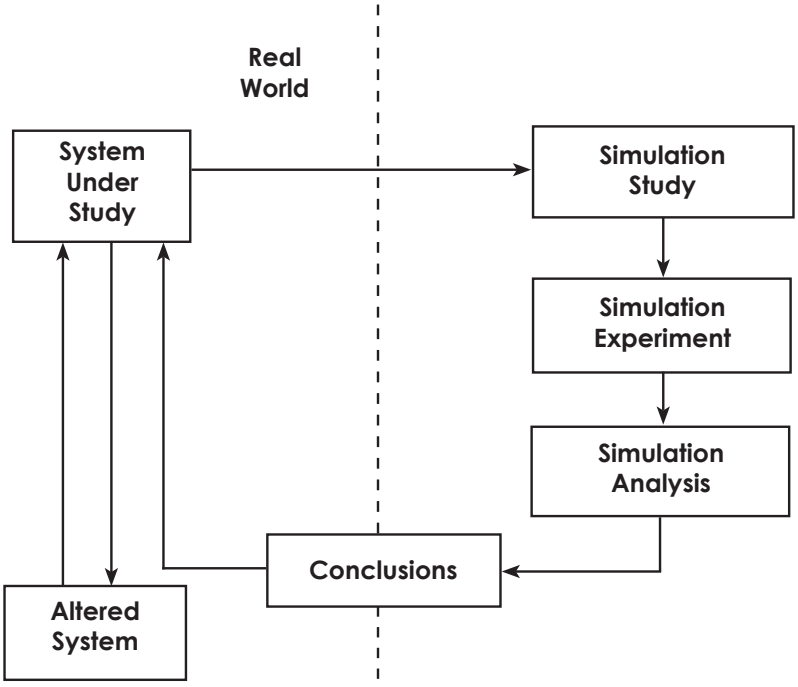
A simulation of a system is the operation of a model of the system. The model can be reconfigured and experimented with; usually, this is impossible, too expensive or impractical to do in the system it represents. The operation of the model can be studied, and hence, properties concerning the behavior of the actual system or its subsystem can be inferred. In its broadest sense, simulation is a tool to evaluate the performance of a system, existing or proposed, under different configurations of interest and over long periods of real time.

Simulation is used before an existing system is altered or a new system built, to reduce the chances of failure to meet specifications, to eliminate unforeseen bottlenecks, to prevent under or over-utilization of resources, and to optimize system performance. For instance, simulation can be used to answer questions like: What is the best design for a new telecommunications network? What are the associated resource requirements? How will a telecommunication network perform when the traffic load increases by 50%? How will a new routing algorithm affect its performance? Which network protocol optimizes network performance? What will be the impact of a link failure?

In the discrete event simulation the central assumption is that the system changes instantaneously in response to certain discrete events. For instance, in an M/M/1 queue – a single server queuing process in which time between arrivals and service time are exponential - an arrival causes the system to change instantaneously. On the other hand, continuous simulators, like flight simulators and weather

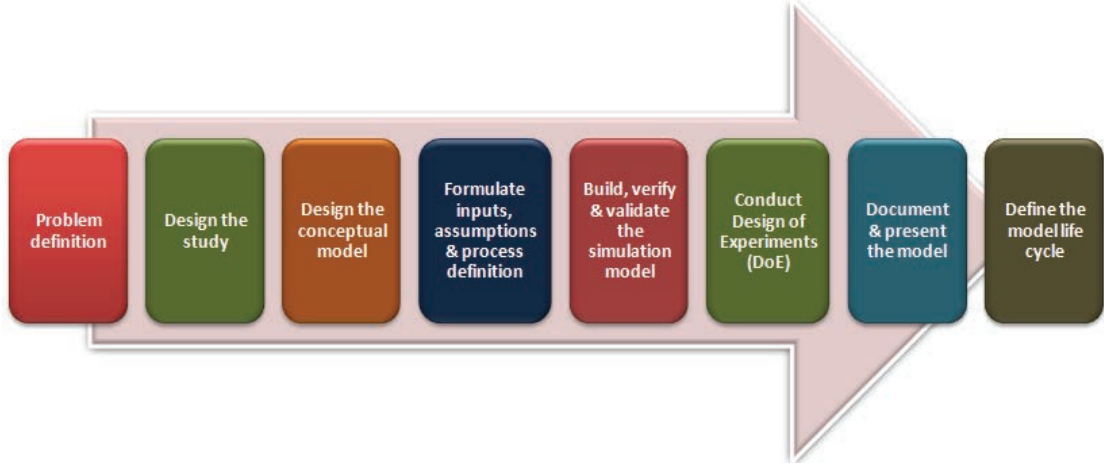
simulators, attempt to quantify the changes in a system continuously over time in response to controls. Discrete event simulation is less detailed (coarser in its smallest time unit) than continuous simulation but it is much simpler to implement, and hence, is used in a wide variety of situations.

The following figure is a schematic of a simulation study. The iterative nature of the process is indicated by the system under study becoming the altered system which then becomes the system under study and the cycle repeats. In a simulation study, human decision making is required at all stages, namely, model development, experiment design, output analysis, conclusion formulation, and making decisions to alter the system under study. The only stage where human intervention is not required is the running of the simulations, which most simulation software packages perform efficiently. The important point is that powerful simulation software is merely a hygiene factor - its absence can hurt a simulation study but its presence will not ensure success. Experienced problem formulators and simulation modelers and analysts are indispensable for a successful simulation study.



Simulation Methodology

Typical steps in developing a simulation model are listed below.



Step 1: Problem Definition – The first step to simulation is to define the objective by identifying critical problem areas in a process. Once the problem areas are identified it facilitates data collection and analysis for mapping the process steps in detail.

Step 2: Design the study - Once the objective of simulation is clear, the next step is to design the study. This includes data collection, finalizing the model and the duration of the simulation exercise.

Step 3: Design the conceptual model – During this stage, the first level of process mapping is done to understand the dependencies that exist in the process and to validate the data collected.

Step 4: Formulate inputs, assumptions and process definition – In this phase, the simulation team feeds the data collected into the model to generate the simulation. A critical step here is to consider the assumptions made while simulating the process. This step determines the predictability and accuracy of the simulation model.

Step 5: Build, Verify and validate the simulation model – The output of the simulation model is used to validate the model accuracy. The simulation model should be able to replicate the real world scenario of the process as closely as possible. The final acceptance of modeling accuracy depends on the assumptions made and the objective of the simulation.

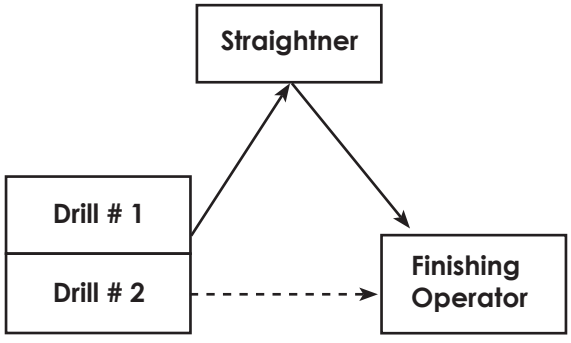
Step 6: Conduct the Design of Experiments (DOE) - Once the model is finalized it can then be leveraged by conducting various "What-If" analyses. This needs to be done in a structured DoE (Design of Experiment) way to ensure that all "To-Be" scenarios are simulated and the most appropriate model is selected. It is important to note that the final "To-Be" model may not replicate the most optimized scenario. This is due to the fact that some process constraints cannot be excluded in real time.

Step 7: Document and present the model - Documentation is another critical step which ensures that the team is able to leverage the learning from the model in the long run.

Step 8: Define the model life cycle - Every model is true only within the process boundaries defined in the first 3 steps. It is important to clearly define the boundaries of the process and when the boundaries change, the model should be re-developed.

An Example

A machine shop contains two drills, one straightener, and one finishing operator. The figure shows a schematic of the machine shop. Two types of parts enter the machine shop.



Type 1 parts require drilling, straightening, and finishing in sequence. Type 2 parts require only drilling and finishing. The frequency of arrival and the time to be routed to the drilling area are deterministic for both types of parts.

Step 1. Identify the problem. The utilization of drills, straightener, and finishing operator needs to be assessed. In addition, the following modification to the original system is of interest: the frequency of arrival of both parts is exponential with the same respective means as in the original system.

Step 2. Formulate the problem. The objective is to obtain the utilization of drills, straightener, and finishing operator for the original system and the modification. The assumptions include:

- The two drills are identical
- There is no material handling time between the three operations.
- Machine availability implies operator availability.
- Parts are processed on a FIFO basis.
- All times are in minutes.

Step 3. Collect and process real system data. At the job shop, a Type 1 part arrives every 30 minutes, and a Type 2 part arrives every 20 minutes. It takes 2 minutes to route a Type 1 part and 10 minutes to route a Type 2 part to the drilling area. Parts wait in a queue till one of the two drilling machines becomes available. After drilling, Type 1 parts are routed to the straightener and Type 2 parts are routed to the finishing operator. After straightening, Type 1 parts are routed to the finishing operator. The operation times for either part were determined to be as follows. Drilling time is normally distributed with mean 10.0 and standard deviation 1.0. Straightening time is exponentially distributed with a mean of 15.0. Finishing requires 5 minutes per part.

Step 4. Formulate and develop a model. A model of the system and the modification was developed using a simulation package. A trace verified that the parts flowed through the job shop as expected.

Step 5. Validate the model. The utilization for a sufficiently long run of the original system was judged to be reasonable by the machine shop operators.

Step 6. Document model for future use. The models of the original system and the modification were documented as thoroughly as possible.

Step 7. Select appropriate experimental design. The original system and the modification described above were studied.

Step 8. Establish experimental conditions for runs. Each model was run three times for 4000 minutes and statistical registers were cleared at time 1000, so the statistics below were collected on the time interval [1000, 4000]. At the beginning of a simulation run, there were no parts in the machine shop.

Step 9. Perform simulation runs. Runs were performed as specified in Step 8 above.

Step 10. Interpret and present results. The following table contains the utilization statistics of the three operations for the original system and the modification (in parentheses).

Utilization Statistics

	Drilling	**Straightening**	**Finishing**
Mean Run #1	0.83 (0.78)	0.51 (0.58)	0.42 (0.39)
Mean Run #2	0.82 (0.90)	0.52 (0.49)	0.41 (0.45)
Mean Run #3	0.84 (0.81)	0.42 (0.56)	0.42 (0.40)
Std. Dev. Run #1	0.69 (0.75)	0.50 (0.49)	0.49 (0.49)
Std. Dev. Run #2	0.68 (0.78)	0.50 (0.50)	0.49 (0.50)
Std. Dev. Run #3	0.69 (0.76)	0.49 (0.50)	0.49 (0.49)

Mean utilization represents the fraction of time a server is busy, i.e., busy time/total time. Furthermore, the average utilization output for drilling must be divided by the number of drills in order to get the utilization per drill. Each drill is busy about 40% of the time and straightening and finishing operations are busy about half the time. This implies that for the given work load, the system is underutilized. Consequently, the average utilization did not change substantially between the original system and the modification; the standard deviation of the drilling operation seems to have increased because of the increased randomness in the modification. The statistical significance of these observations can be determined by computing confidence intervals on the mean utilization of the original and modified systems.

Step 11. Recommend further course of action. Other performance measures of interest may be: throughput of parts for the system, mean time in system for both types of parts, average and maximum queue lengths for each operation. Other modifications of interest may be: the flow of parts to the machine shop doubles, the finishing operation will be repeated for 10% of the products on a probabilistic basis.

Benefits of Simulation Modeling and Analysis

According to practitioners, simulation modeling and analysis is one of the most frequently used operations research techniques. When used judiciously, simulation modeling and analysis makes it possible to:

- Obtain a better understanding of the system by developing a mathematical model of a system of interest, and observing the system's operation in detail over long periods of time.
- Test hypotheses about the system for feasibility.
- Compress time to observe certain phenomena over long periods or expand time to observe a complex phenomenon in detail.
- Study the effects of certain informational, organizational, environmental and policy changes on the operation of a system by altering the system's model; this can be done without disrupting the real system and significantly reduces the risk of experimenting with the real system.
- Experiment with new or unknown situations about which only weak information is available.
- Identify the "driving" variables - ones that performance measures are most sensitive to - and the inter-relationships among them.
- Identify bottlenecks in the flow of entities (material, people, etc.) or information.
- Use multiple performance metrics for analyzing system configurations.
- Employ a systems approach to problem solving.
- Develop well designed and robust systems and reduce system development time.

Pitfalls of Simulation

Simulation can be a time consuming and complex exercise, from modeling through output analysis, that necessitates the involvement of resident experts and decision makers in the entire process. Following is a checklist of pitfalls to guard against.

- Unclear objective.
- Using simulation when an analytic solution is appropriate.
- Invalid model.
- Simulation model too complex or too simple.
- Erroneous assumptions.
- Undocumented assumptions. This is extremely important and it is strongly suggested that assumptions made at each stage of the simulation modeling and analysis exercise be documented thoroughly.
- Using the wrong input probability distribution.
- Replacing a distribution (stochastic) by its mean (deterministic).
- Using the wrong performance measure.
- Bugs in the simulation program.
- Using standard statistical formulas that assume independence in simulation output analysis.
- Initial bias in output data.
- Making one simulation run for a configuration.
- Poor schedule and budget planning.
- Poor communication among the personnel involved in the simulation study.

9.3 ACTIVITY BASED COST MANAGEMENT

Introduction

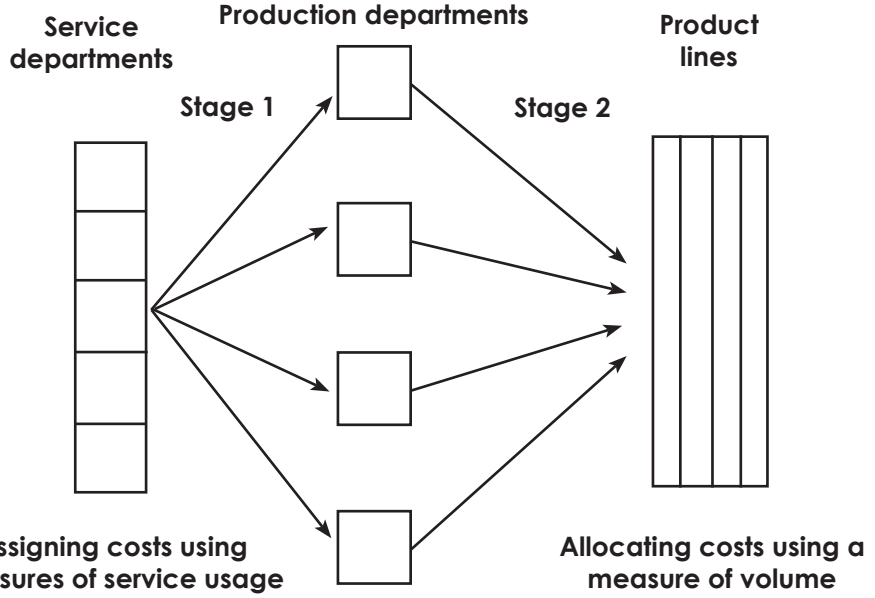
A powerful tool for measuring performance, Activity-Based Costing (ABC) is used to identify, describe, assign costs to, and report on agency operations. A more accurate cost management system than traditional cost accounting; ABC identifies opportunities to improve business process effectiveness and efficiency by determining the "true" cost of a product or service. Activity Based Costing is a method for developing cost estimates in which the project is subdivided into discrete, quantifiable activities or a work unit. ABC systems calculate the costs of individual activities and assign costs to cost objects such as products and services on the basis of the activities undertaken to produce each product or services. It accurately identifies sources of profit and loss.

Limitations of Traditional Costing System

The cost of product arrived in traditional accounting system is not so accurate due to following reasons :

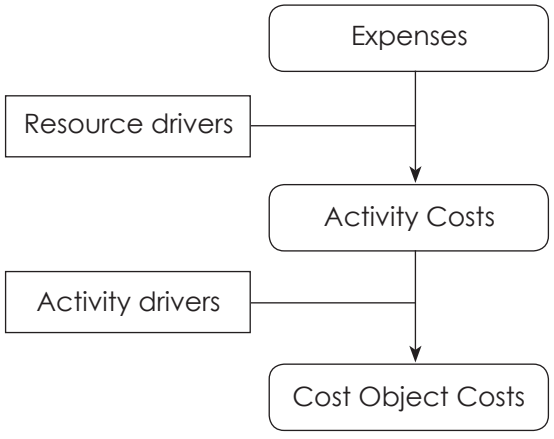
- The present Costing system has developed convenient overhead recovery basis and blanket overhead recovery are acceptable when valuing stocks for financial reporting, but they are inappropriate when used for decision making and typical product strategy decisions. Such decisions have implications over 3-5 years and over this period many fixed costs become variable.
- The traditional fixed verses variable cost split is often unrealistic since, as business grows they often become more complex.
- In case of companies manufacturing and selling multiple products usually make decisions on pricing, product-mix, process technology etc., based on distorted cost information due to difficulties in traditional costing system in collection, classification, allocation and recovery of overheads to individual products.
- The cost structure is changing especially when making direct labour component to small proportion.
- Traditional accounting was confined merely to furnishing information at product level. The new manufacturing technology demands the feed back of performance while production is still in progress rather than history.
- There is also an urgent need to integrate the activity measurement and financial measurement.

Therefore, in order to overcome the inadequacies of traditional methods of overhead absorption and short-term biasing of marginal costing, Activity Based Costing (ABC) has been researched.



Activity-Based Costing

The concepts of ABC were developed in the manufacturing sector of the United States during the 1970s and 1980s.It is a practice in which activities are identified and all related costs of performing them are calculated, providing actual costs chargeable. The focus of activity based costing is activities. Thus identifying activities is a logical first step in designing an activity based costing. An activity is an event, task or unit of work with a specified purpose. For example; designing products, setting up machines, operating machines and distributing products.



The CIMA terminology defines ABC as a cost attribution to cost units on the basis of benefit received from indirect activities. Peter B. B. Turney defines ABC as "a method of measuring the cost and performance of activities and cost objects. Assigns cost to activities based on their use of resources and assigns cost to cost objects based on their use of activities. ABC recognizes the causal relationship of cost drivers to activities." ABC can be defined by the following equation:

C/A = HD + M + E + S

Where C/A = Estimated cost per activity

H = Number of labor hours required to perform the activity one time

D = Wages per labor hour

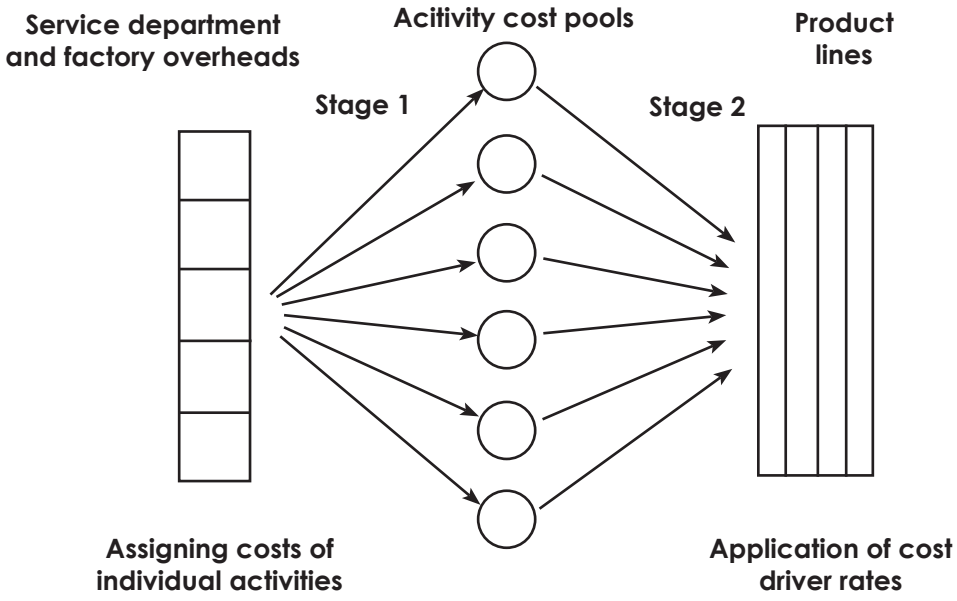
M = Material costs required to perform the activity one time

E = Equipment costs to perform the activity one time

S = Subcontracting costs to perform the activity one time

The total cost for performing the activity will be based on the number of times the activity is performed during a specific time frame. An activity based costing system first traces costs to activities and then to products and other cost objects. The following figure diagrammatically explains the basic flow of Activity-Based Costing.

Activity-based Costing



Important Terms in Activity Based Costing

The operation of the ABC system involves the use of the following terms:

Activity: An activity means an aggregate of closely related tasks having some specific functions which are used for completion of goal or objectives. For example, customer order processing is an activity. It includes receiving order from customers, interacting with production department regarding capacity to produce and giving commitment to the customer regarding delivery time. Other activities may be assembling, packaging, advertising etc.

Resource : Resources are elements that are used for performing the activities or factors helping in the activities. For example, order receiver, telephone, computers etc. are resources in customer order processing activity. It may include material, labour, equipment, office supplies etc.

Cost : Cost is amount paid for resource consumed by the activity. For example, salaries, printing stationary, telephone bill etc. are cost of customer order processing activity. It is also known as activity cost pool.

Cost object: It refers to an item for which cost measurement is required. e.g. a product, a service, or a customer.

Cost pool: A cost pool is a term used to indicate grouping of costs incurred on a particular activity which drives them.

Cost driver: Any element that would cause a change in the cost of activity is cost driver. Actually cost drivers are basis of charging cost of activity to cost object. Cost drivers are used to trace cost to product by using a measure of resources consumed by each activity. For example, frequency of order, number of order etc. may be cost driver of customer order processing activity. Cost driver may be involved two parts:

1. Resource cost driver

2. Activity cost driver

A resource cost driver is a measure of the quantity of resources consumed by an activity. An activity cost driver is a measure of the frequency and intensity of demand, placed on activities by cost objects.

For example

Activities	Resources	Cost pools	Cost driver
Consulting	Consultant, computer	Employee cost, maintenance cost	Level of consultant, time spent
Laser printing	Printing staff, printer	Colour cost, maintenance cost, printing stationary	No. of pages printed, font
Accounting administration	Administration staff	Salaries	No. of times account produced
Customer service	Telephone, staff	Telephone bill, salaries	Frequency of order, no. of order, time spent in servicing, no. of service calls
Research development	Staff, equipment, material	Salaries, maintenance cost, material cost	No. of research projects, time spent on a project, technical complexities of project

The cost drivers for various functions i.e., production, marketing, research, and developments are given below.

Production	Number of units Number of set-ups
Marketing	Number of sales personnel Number of sales orders
Research& development	Number of research projects Personnel hours spend on projects Technical complexities of the projects
Customer service	Number of service calls Number of products serviced Hours spend on servicing products

Let's illustrate the concept of activity based costing by looking at two common manufacturing activities: (1) the setting up of a production machine for running batches of products, and (2) the actual production of the units of product.

We will assume that a company has annual manufacturing overhead costs of ₹2,000,000—of which ₹200,000 is directly involved in setting up the production machines. During the year the company expects to perform 400 machine setups. Let's also assume that the **batch sizes** vary considerably, but the setup efforts for each machine are similar.

The cost per setup is calculated to be ₹500 (₹200,000 of cost per year divided by 400 setups per year). Under activity based costing, ₹200,000 of the overhead will be viewed as a **batch-level cost**. This means that ₹200,000 will first be allocated to batches of products to be manufactured (referred to as a **Stage 1 allocation**), and then be assigned to the units of product in each batch (referred to as **Stage 2 allocation**). For example, if Batch X consists of 5,000 units of product, the setup cost per unit is ₹0.10 (₹500 divided by 5,000 units). If Batch Y is 50,000 units, the cost per unit for setup will be ₹0.01 (₹500 divided by 50,000 units). For simplicity, let's assume that the remaining ₹1,800,000 of manufacturing overhead is caused by the production activities that correlate with the company's 100,000 machine hours.

For our simple two-activity example, let's see how the rates for allocating the manufacturing overhead would look with activity based costing and without activity based costing:

	With ABC	Without ABC
Mfg overhead costs assigned to setups	₹200,000	₹–0–
Number of setups	400	Not applicable
Mfg overhead cost per setup	**₹500**	**₹–0–**
Total manufacturing overhead costs	₹2,000,000	₹2,000,000
Less: Cost traced to machine setups	**200,000**	**–0–**
Mfg O/H costs allocated on machine hours	₹1,800,000	₹2,000,000
Machine hours (MH)	100,000	100,000
Mfg overhead costs per MH	**₹18**	**₹20**
Mfg Overhead Cost Allocations	**₹500 setup cost per batch + ₹18 per MH**	**₹20 per MH**

Next, let's see what impact these different allocation techniques and overhead rates would have on the per unit cost of a specific unit of output. Assume that a company manufactures a batch of **5,000** units and it produces 50 units per machine hour, here is how the cost assigned to the units with activity based costing and without activity based costing compares:

	With ABC	Without ABC
Mfg overhead for setting up machine	₹500	₹–0–
No. of units in batch	**5,000**	Not applicable
Mfg O/H caused by Setup – Per Unit	**₹0.10**	Not applicable
Mfg overhead costs per machine hour	₹18	₹20
No. of units produced per machine hour	50	50
Mfg O/H caused by Production – Per Unit	**₹0.36**	**₹0.40**
Total Mfg O/H Allocated – Per Unit	**₹0.46**	**₹0.40**

Stages of Activity Based Costing

The different steps or stages in ABC system can be given as follows:

1. **Identify the chosen cost objects**

   The cost objects of any organization are the products or services and the goal is to first calculate the total cost of manufacturing and distributing these products and their unit cost.

2. **Identify the different activities within the organization**

   After the identification of cost objects, the main activities, which are being performed in the organization, have to be identified. Usually the number of activities over cost centers in ABC will

be much more as compared to traditional overhead system. The exact number will depend on how the management subdivides the organizations activities.

3. Identifying the direct cost of products

The direct cost of products or objects may comprise direct material cost, direct labor cost and direct expenses. Classification of as many of the total costs as direct costs as is economically feasible should be made. It reduces the amount of costs classified as indirect.

4. Relating the overhead to the activities

After identifying the organizations activities, the various items of overhead are related to activities both support and primary, that caused them. As a result of relating the items of overhead to various activities, cost pool or cost buckets are created.

5. Spreading the support activities across the primary activities

The spreading of support activities (i.e., activities which support or assist manufacturing) across the primary activities (correlated to the number of units produced) is done on some suitable base which reflects the use of support activity. The base is the cost driver and is measured of how the support activities are used.

6. Determining the activity cost drivers

The determination of the activity cost drivers is done in order to relate the overhead collected in cost pools to the cost objects of products. It is done on the basis of the factor that drives the consumption of the activities.

7. Calculating the activity cost driver rates

The activity cost rates for each activity are calculated in the way in which overhead absorption rates would be calculated under the traditional system. It can be presented as follows:

Activity cost driver rate = Total cost of activity/Activity driver

These activity cost driver rates are to be used for ascertaining the amount of overhead chargeable to various cost objects or products.

8. Computing the total cost of products or cost objects

The total costs of the products shall be computed by adding all direct and indirect costs assigned to them. The amount of overhead chargeable to a product or cost object shall be calculated by multiplying the activity cost drivers rates by different amounts of each activity that each product or other cost object consumes.

Significance of Activity Based Costing

The following list reflects the results of several surveys of practice in the United States, the United Kingdom, and Canada to determine why companies choose ABC.

- Cost Reduction: ABC measures how much activities that are costly and then take steps to reduce their costs by changing the productions process or outsourcing those activities.
- Product pricing and decisions of whether to continue producing a product or keeping a particular customer. ABC implementers generally believe that ABC provides more accurate cost information than conventional costing does. Management can use this information to negotiate price increases with customers or to drop unprofitable products.
- Budgeting and performance measurement: Management can use more accurate cost information to improve budgets and measures of department and division performance.

Advantages of Activity Based Costing

(i) It provides more accurate product costing information by reducing arbitrary cost allocations.

(ii) It improves the quality of information available for decision making by answering the questions such as what activities and events are driving cost and where efforts should be made to control cost ?

(iii) It is easiest way to allocate overhead in the product.

(iv) It helps to identify the activities that can be eliminated.

(v) It links up cause and effect relationship.

(vi) ABC helps to identify the value added activities (that increase the customer's satisfaction) and non- value added activities (that creates the problems in customer's satisfaction)

(vii) ABC translates cost in to a language that people can understand and that can be linked up to business activities.

Limitations of Activity Based Costing

- More time consuming to collect data
- Cost of buying, implementing and maintaining activity based system
- In some cases, the establishment of cause and effect relationship between cost driver and costs not be a simple affair.
- ABC does not conform to generally accepted accounting principles in some areas.

Conclusion

Activity based costing has revolutionized product costing, planning, and forecasting in the last decade. It is based on a philosophy of estimation that: "it is better to be approximately right, than precisely wrong." In summary, activity-based costing is a management decision-making tool. It provides financial support data structured in a fashion fundamentally different from accounting data provided in the general ledger. By associating cost to the activity, a clear relationship can be established between sources of activity demand and the related costs. This association can benefit the distributor in determining where costs are being incurred, what is initiating the costs and where to apply efforts to curb inflationary costs. This can be of particular value in tracking new products or customers.

Traditional vs. Activity Based Costing

Activity-Based Costing (ABC) is a system that focuses on activities as the fundamental cost objects and uses the cost of these activities for computing the costs of products. There are several reasons why managers are preferring ABC to traditional system.

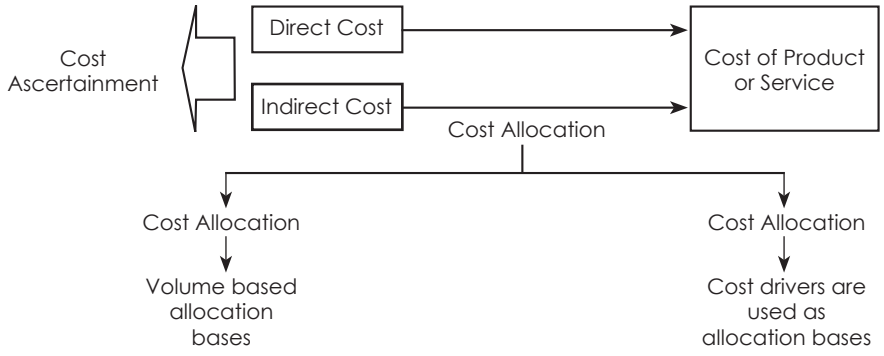
(i) In the traditional system cost analysis is done by product. In ABC managers focus attention on activities rather than products because activities in various departments may be combined and costs of similar activities ascertained, e.g. quality control, handling of materials, repairs to machines etc. If detailed costs are kept by activities, the total company costs for each activity can be obtained, analysed, planned and controlled.

(ii) Managers manage activities and not products. Changes in activities lead to changes in costs. Therefore, if the activities are managed well, costs will fall and resulting products will be more competitive.

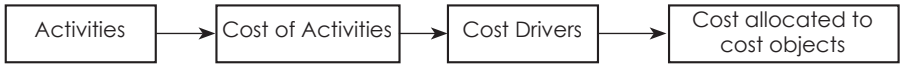
(iii) Allocating overhead cost to production based on a single cost driver (allocation base, such as unit basis, percentage of material, percentage of prime cost, labour hour rate, machine hour rate etc.) can result in an unrealistic product cost because the traditional system fails to capture cause-and-effect relationships. To manage activities better and to make wiser economic decisions, managers need to identify the relationships of causes (activities) and effects (costs) in a more detailed and accurate manner.

(iv) ABC highlights problem areas that deserve management's attention and more detailed analysis. Many actions are possible, on pricing, on process technology, on product design, on operational movements and on product mix.

Traditional costing can lead to undercosting or overcosting of products or services. Over or under costing of products distorts cost information. A poor quality of cost information causes management to make poor decisions for pricing, product emphasis, make or buy etc. ABC differs from the traditional system only in respect of allocations of overheads or indirect costs. Direct costs are identified with, or assigned to, the cost object, in the same manner as is done in case of traditional costing system. Overhead costs are linked to the cost objects based on activities. This is shown in the following figure:



The following figure explains the entire process of cost allocation under ABC.



Activity Based Budgeting

One of the benefits of an activity-based costing (ABC) exercise is that it makes explicit information about the extent of the activities which must be performed in order to achieve certain levels of operations (such as production or customer service). ABC further involves measuring the cost of the resources which must be consumed in order to perform these activities. As its title suggests, activity-based **budgeting** (ABB) involves incorporating (into the budgetary process) information about the resources required in order to perform the activities necessary in order to enable operations to occur at the budgeted level. In the first instance, ABB is an operational exercise – in other words, things are measured in physical (rather than financial) terms, and this enables the resulting budget to be used to assess whether there are any excess resources (i.e., spare capacity) and / or bottlenecks (i.e., resource shortages which must be resolved if the desired level of operations is to be achieved). This operational exercise facilitates subsequent financial analysis of the costs associated with spare capacity and the costs and benefits of alleviating a bottleneck.

Activity Based Budgeting is the process of planning and controlling the expected activities of the organistaion to derive a cost-effective budget, that meets forecast workload and agreed strategic goals. Activity-based budgeting is a quantitative expression of the expected activities of the organization reflecting management forecast of workload and financial and non-financial requirements to meet agreed strategic goals and planned changes to improve performance. The three key elements of 'Activity-based budgeting' are as follows :

(i) Type of work to be done

(ii) Quantity of work to be done, and

(iii) Cost of work to be done.

An example is given here to understand the sequence of steps in ABB and also reinforce the understanding of the contribution which ABB can make to resource management in an organisation.

Jane's Production Company Ltd. (JPCL) JPCL manufactures three standard products which it sells to several large wholesale chains. Production (which is highly automated) occurs in large batches, and goods are shipped to customers in slightly smaller batches. Details of a typical month's output are as follows:

Product:	**A**	**B**	**C**	**Total**
Units of output	1,00,000	2,00,000	4,50,000	7,50,000
Production machine hours (PMH), per unit of output	0.3 PMH	0.2 PMH	0.4 PMH	
Production batch size (units)	2,500	4,000	7,500	
Shipment batch size (units)	2,000	2,000	5,000	

Two types of indirect labour are employed, namely, 4 quality control inspectors (at a cost of ₹4,000 each per month) and 9 administrators (at a monthly cost of ₹ 3,500 each). Each employee works a standard 180 hours per month. The role of the quality control staff is to inspect a sample from each batch of output produced; this takes a standard 3 hours inspection time per batch produced. The administrators perform two tasks, namely, shipment processing work (which takes 2 hours per batch shipped) and monitoring of production (at the rate of one hour of administrator time for every 600 units of output).

In addition to the production machinery (which has a capacity of 225,000 production machine hours [PMH] per month) there are two additional types of specialized machinery which perform automated production setup and automated shipment loading procedures. Details of these two machines are:

	Production setup machinery	**Shipment loading machinery**
Monthly capacity	650 hours	400 hours
Usage rates	4 hours per batch produced	1.5 hours per batch shipped

Activity-based budget for JPCL: Step 1

The first step is to calculate the amount of activities which are necessary if operations are to occur at the level indicated in the previous section:

	Product A	**Product B**	**Product C**	**Total**
Number of PMH	1,00,000 * 0.3 = 30,000 PMH	2,00,000 * 0.2 = 40,000 PMH	4,50,000 * 0.4 = 1,80,000 PMH	2,50,000 PMH
Number of batches produced	1,00,000 / 2,500 = 40	2,00,000 / 4,000 = 50	4,50,000 / 7,500 = 60	150
Number of batches shipped	1,00,000 / 2,000 = 50	2,00,000 / 2,000 = 100	4,50,000 / 5,000 = 90	240

Activity-based budget for JPCL: Step 2

The second step involves calculate the amounts of the various resources (i.e., the different types of indirect labour and machinery) which are necessary in order to perform the amounts of activities identified at Step 1:

Indirect labour:

Quality control	(150 batches produced * 3 inspection hours) = **450 inspection hours**
Administration	(240 batches shipped * 2 administration hours) = 480 administration hours + (750,000 units of output / 600) = 1,250 administration hours = **1,730 administration hours**

Machinery:

Production machinery	2,50,000 PMH (already calculated above)
Setup machinery	(150 batches produced * 4 hours) = 600 hours
Shipment loading machinery	(240 batches shipped * 1.5 hours) = 360 hours

Activity-based budget for JPCL: Step 3

We can now assess whether the resources currently owned or employed by the company are sufficient to meet the requirements identified in the previous steps:

Indirect labour: staff numbers:

	Quality control inspectors	**Administrators**
Number employed at present	4 inspectors	9 administrators
Number required	450 hours / 180 hours each = 2. 5 inspectors	1,730 hours / 180 hours each = 9.61 administrators
Surplus (shortfall)	1.5 inspectors	(0.61 administrators)

Machine capacity:

	Production machinery	**Setup machinery**	**Shipment loading machinery**
Capacity of existing equipment	225,000 PMH	650 hours	400 hours
Capacity required	250,000 PMH	600 hours	360 hours
Surplus (shortfall)	(25,000 PMH)	50 hours	40 hours

Activity-based budget for JPCL: Analysis

We have now completed the operational phase of the ABB. Two resource shortages have been identified at Step 3 above: the company has two few administrators and too little production machine capacity, and unless these bottlenecks are "elevated" (i.e., removed) the budgeted levels of output of some or all of the three products will not be achieved. Sometimes, operational improvements – such as redeployment of surplus administrative staff from elsewhere in an organisation, or servicing of production equipment to improve its efficiency – can allow bottlenecks to be eliminated at little or no incremental cost to the organisation. However, if such operational improvements are not sufficient to solve the problem, then the company needs to analyse whether costly solutions (such as employing an extra administrator and acquiring extra production machinery capacity) are justified in cost-benefit terms.

Notice that, for at least one resource, the problem is that the company has far too much capacity. Specifically, the JPCL employs 4 quality control inspectors, which is 1.5 more inspectors than it needs. Since the cost of employing an inspector is ₹4,000 per month, the cost of this spare inspection capacity is (1.5 × ₹4,000 = ₹6,000). An important question which arises is whether and how this idle time cost can be avoided. Redundancy may be one option, but only after JPCL has considered the full long–term consequences (including redundancy payments). A more constructive option may be to redeploy the surplus staff elsewhere in the organisation, permanently or temporarily. For example, suppose that some of the tasks performed by administrators require skills that the quality control inspectors also have. If that is the case, then it may be feasible to ask each quality control inspector to take on some of the administrative tasks. This would avoid the need to employ an extra administrator while simultaneously reducing quality control inspector idle time, at no net cost to the company.

Advantages

The advantages of ABB are similar to those provided by activity-based costing (ABC).

- It draws attention to the costs of 'overhead activities' which can be a large proportion of total operating costs.
- It recognises that it is activities which drive costs. If we can control the causes (drivers) of costs, then costs should be better managed and understood.
- ABB can provide useful information in a total quality management (TQM) environment, by relating the cost of an activity to the level of service provided.

Disadvantages of ABB

- A considerable amount of time and effort might be needed to establish the key activities and their cost drivers.
- It may be difficult to identify clear individual responsibilities for activities.
- It could be argued that in the short-term many overhead costs are not controllable and do not vary directly with changes in the volume of activity for the cost driver. The only cost variances to report would be fixed overhead expenditure variances for each activity.

According to the specialists' opinion, the stages of the activity-based budgeting are the following:

1. Estimation of key-factors of the budget (estimations regarding the total value of the quantities of products obtained and the sales to customers);
2. Establishment of the organizational activities (elaboration and execution of the activity-based budget);
3. Determination of the necessary resources (quantity and type) in order to perform the organizational activities;
4. Identification of the total of necessary resources in order to satisfy the demands;
5. Determination of the capacities at the level of activities and at the level of resources.

Activity-Based Budgeting vs. Traditional Budgeting

Activity-Based Budgeting	Traditional Budgeting
Focus on the work volume and of the costs of processes.	Focus on workers and on departmental costs.
Measure the effects and determine and identify the unused capacities.	Measure the effects, but do not determine and identify the unused capacities.
Identify the necessary resources for the planned production and not in order to set out limits.	Do not fulfill the purpose of a global budget, representing only analytical and control expenditure.
Ensure the management, with the possibility of transformation of the organizational thinking regarding the fixed costs.	They are based on a iterative negotiation process between the managers of responsibility centers and the senior management.
Focus on the used capacity versus the unused capacity.	Focus on the fixed costs versus variable costs.
Represent a possible solution for the budget process by increasing the real participation of the employees.	
Represent a tangible solution for short term planning of strategic objectives, as they focus on the basic processes of the work place for customer's satisfaction.	
Unify the efforts made by various functions, such as: processes re-engineering or processes reevaluation in a single effort directed towards the strategic objectives planned by the entity for a short or long term.	

9.4 JUST-IN-TIME

Just in time (JIT) is a 'pull' system of production, so actual orders provide a signal for when a product should be manufactured. Demand-pull enables a firm to produce only what is required, in the correct quantity and at the correct time.

This means that stock levels of raw materials, components, work in progress and finished goods can be kept to a minimum. This requires a carefully planned scheduling and flow of resources through the production process. Modern manufacturing firms use sophisticated production scheduling software to plan production for each period of time, which includes ordering the correct stock. Information is exchanged with suppliers and customers through **EDI** (**Electronic Data Interchange**) to help ensure that every detail is correct.

Supplies are delivered right to the production line only when they are needed. For example, a car manufacturing plant might receive exactly the right number and type of tyres for one day's production, and the supplier would be expected to deliver them to the correct loading bay on the production line within a very narrow time slot.

The JIT Strategy

By taking a JIT approach to inventory and product handling, companies can often cut costs significantly. Inventory costs contribute heavily to the company expenses, especially in manufacturing organizations. By minimizing the amount of inventory you hold, you save space, free up cash resources, and reduce the waste that comes from obsolescence.

JIT Systems

To facilitate a JIT approach, you need a variety of systems in place. The most notable is a kanban. This is a Japanese approach to ensuring a continuous supply of inventory or product. Kanbans were designed to support the JIT philosophy.

A kanban is a visual signal that indicates it is time to replenish stock and possibly reorder. For instance, as the supply of bolts in a bin on the assembly line falls below a certain number, it may uncover a yellow line painted around the inside of the storage bin. This yellow line indicates to the foreman that he needs to prepare a requisition for more bolts. That requisition is given to the purchasing department, which processes the order. This prevents the supply of bolts from dropping below a critical amount and allows production continues to flow smoothly.

JIT also exists in concert with continuous improvement systems. Total Quality Management and Six Sigma are overarching programs that help you take a detailed look at every point of the production process and identify ways to make improvements. By applying JIT, you are continuously monitoring the production process. This gives you opportunities for making the production process smoother and more efficient.

Because JIT is intended to spread throughout the organization, it can have an impact on many areas through improvements in processes. When the emphasis is on lean production, systems tend to be made simpler and more predictable. From how a product moves through the building to ways to increase worker involvement in system design, JIT improves efficiency.

Advantages of Just-In-Time System

Following are the advantages of adopting Just-In-Time Manufacturing System:

- Just-in-time manufacturing keeps stock holding costs to a bare minimum. The release of storage space results in better utilization of space and thereby bears a favorable impact on the rent paid and on any insurance premiums that would otherwise need to be made.
- Just-in-time manufacturing eliminates waste, as out-of-date or expired product; do not enter into this equation at all.

- As under this technique, only essential stocks are obtained, less working capital is required to finance procurement. Here, a minimum re-order level is set, and only once that mark is reached fresh stocks are ordered, making this a boon to inventory management too.
- Due to the afore-mentioned low level of stocks held, the organization's return on investment (referred to as ROI, in management parlance) would generally be high.
- As just-in-time production works on a demand-pull basis, all goods made would be sold, and thus it incorporates changes in demand with surprising ease. This makes it especially appealing today, where the market demand is volatile and somewhat unpredictable.
- Just-in-time manufacturing encourages the right first time concept, so that inspection costs and cost of rework is minimized.
- High quality products and greater efficiency can be derived from following a just-in-time production system.
- Close relationships are fostered along the production chain under a just-in-time manufacturing system.
- Constant communication with the customer results in high customer satisfaction.
- Over production is eliminated, when just-in-time manufacturing is adopted.

Disadvantages:

Following are the disadvantages of adopting Just-In-Time Manufacturing Systems:

- Just-in-time manufacturing provides zero tolerance for mistakes, as it makes re-working very difficult in practice, as inventory is kept to a bare minimum.
- There is a high reliance on suppliers, whose performance is generally outside the purview of the manufacturer.
- As there will be no buffers for delays, production downtime and line idling can occur, which would bear a detrimental effect on finances and on the equilibrium of the production process.
- The organization would not be able to meet an unexpected increase in orders, due to the fact that there are no excess finish goods.
- Transaction costs would be relatively high, as frequent transactions would be made.
- Just-in-time manufacturing may have certain detrimental effects on the environment, due to the frequent deliveries that would result in increased use of transportation which in turn would consume more fossil fuels.

Precautions:

Following are the things to Remember When Implementing a Just-In-Time Manufacturing System:

- Management buy-in and support at all levels of the organization are required; if a just-in-time manufacturing system is to be successfully adopted.
- Adequate resources should be allocated, so as to obtain technologically advanced software, that is generally required if a just-in-time system is to be a success.
- Building a close, trusting relationship with reputed and time-tested suppliers will minimize unexpected delays in the receipt of inventory.
- Just-in-time manufacturing cannot be adopted overnight. It requires commitment in terms of time and adjustments to corporate culture would be required, as it is starkly different to traditional production processes.
- The design flow process needs to be redesigned and layouts need to be re-formatted, so as to incorporate just-in-time manufacturing.

- Lot sizes need to be minimized.
- Work station capacity should be balanced whenever possible.
- Preventive maintenance should be carried out, so as to minimize machine breakdowns.
- Set up times should be reduced wherever possible.
- Quality enhancement programs should be adopted, so that total quality control practices can be adopted.
- Reduction in lead times and frequent deliveries should be incorporated.
- Motion waste should be minimized, so the incorporation of conveyor belts might prove to be a good idea when implementing a just-in-time manufacturing system.

Just-in-time manufacturing is a philosophy that has been successfully implemented in many manufacturing organizations.

It is an optimal system that reduces inventory whilst being increasingly responsive to customer needs, This is not to say that it is not without its pitfalls.

However, these disadvantages can be overcome, with a little forethought and a lot of commitment at all levels of the organization.

9.5 TRADITIONAL PERFORMANCE MEASURES

Traditional performance measures have been developed to meet the needs of manufacturing characterized by the production of standard products with high direct labour contest. Set ups are minimized to assure uninterrupted production runs. In this way, labour and machine capacities can be fully utilized and the greatest possible output produced with a consequent reduction in the overhead cost per unit of output. The competitive strategy is cost minimization, so variance reporting, overhead absorption and capacity utilization measures appropriately reflect this strategy.

Variance Reporting: The use of variance accounting for managerial performance evaluation has been criticized as counter-effective in the modern global environment (Howell & Soucy, 1987). This is because traditional variance analysis encourages dysfunctional behaviours such as allowing inventory to build up so as to show a favourable volume variance, and delaying machine maintenance, padding the budget or shifting expenses between accounts so as to show a favourable expenses variance.

Purchasing managers, for example, may act dysfunctionally by purchasing materials based on lowest price considerations at the expense of quality so as to show a favourable materials price variance. The consequences of inferior quality materials purchased are manifested in increased reworks, scraps, inspections and storage of defective parts leading to higher production costs and loss of competitiveness.

The volume variance as a manufacturing indicator has been criticized since traditional absorption costing encourages excessive production in order to absorb the fixed overheads into inventory costs. Maximizing capacity utilization is necessary to achieve cost minimization. However, such a policy is short-sighted because any production in excess of market demand must be consigned to inventory and this runs counter to the just-in-time philosophy of maintaining a zero inventory with all its attendant benefits (Sadhwani, et al, 1985).

Variance reports at the manager's level are also too aggregated for meaningful interpretation. Moreover, the standard cost itself may be perceived the norm eliminating any incentive for product innovation. In this case an unintended signal has been put out which impede efforts to infuse a culture of continuous improvement.

Capacity utilization measures productivity improvement. Automation and robotics have shrank direct labour cost to only a small fraction of the total manufacturing cost, whereas overheads have increased

significantly. Despite these developments and the consequent impact on cost structures, reports from surveys in various countries indicated that companies have not responded in tandem with the technological changes (Schoch, et al., 1994; Teoh, 1991). This has serious implications for production costing and performance evaluation as the continued focus on direct labour means labour is still considered a major driver of costs when it is no longer relevant. The result is the development of burden rates that are volume-driven, based on a diminished direct labour element. Such a computed burden rate is artificially inflated due to the small direct labour base. Hen applied to an increasing pool of overheads, the incurrence of which may not be totally volume-driven, the labour generated burden rate can lead to serious distortions of the overheads absorbed into production cost. This is because of the unrealistic burden rate used which does not reflect the actual consumption of overheads by different products or processes (Kaplan, 1986).

The overhead absorption measure gives rise to a distorted product cost analysis, so "good' performance is associated with products apparently showing profitable margins but are actually incurring loses (Beckett & Dang, 1992). Thus an incorrect signal about profitability is received

Earned hours, as a measure of labour efficiency, is also deficient since it provides an erroneous signal to supervisors to maximize earned hours by keeping employees "gainfully" occupied regardless of market conditions. It would have been more beneficial in the long term to use the time for training or cross training of operators so as to upgrade their skills.

The machine utilization rate, as a measure of supervisory performance, also suffers from a number of deficiencies. It encourages the excessive use of machines for large-scale production, resulting in an unwidely accumulation of inventory. Worse still, maximizing the utilization rate encourages continuous machine usage at the expense of regular maintenance. Moreover, the focus on utilization may lead to inadequate emphasis on quality.

Short-term Financial Measures: Although achieving profit and an acceptable return on investment are the raison d'etre for a company to stay in business, the traditional focus on these performance measures however encourages managers to take a myopic view that emphasizes short-term results to the detriment of long-term profitability (Banks & Wheelwright, 1979). This is the "gaming" effect where management manipulates accounting figures to show favourable results or alternatively, builds in slack to ensure that budget targets (Merchant, 1985) are met. Reliance on short-term financial measures can lead to dysfunctional decisions since these indications fail to signal the erosion of a firm's value if discretionary expenditures have to be reduced for short-term gains. Such spending is fact essential for new products development production process improvement, worker skills training and upgrading distribution networks and promoting customer awareness (Kaplan, 1986). Furthermore, profit measures represent outcomes that may not fully reflect management's effort (Drucker, 1964). Stated differently, total performance cannot be completely captured by Naira profits.

New Performance Measurement Objectives

In the new technological environment, a flexible manufacturing strategy must be implemented that focuses on customer responsiveness, quality, time, innovation and human resources practices. A performance measurement system designed to achieve the traditional objective of cost efficiency will be incongruent with this new strategy. It is necessary to redesign the system so as to reflect this change in strategic objectives.

Customer Responsiveness: increasingly, customers demand not only a better service but also a wider variety of products with improved quality and shorter delivery times (Northey, 1991). Customer responsiveness examines a firm's relative ability to satisfy customers. Therefore, high customer responsiveness translates into greater customer retention, leading to longer-term.

Profitability as the costs of acquiring and serving customers come down. Customers' responsiveness measures therefore must be designed into the performance measure system. These include reporting on the number of customer complaints, warranty claims, and on-time deliveries, among others. As

Eccles (1991) put it bluntly "what you measure is what you get and what you measure gets attention", indicating that performance measures must be relevant to send the right signals for employees to achieve desired company objectives. For example, a system that evaluates how well customer demands have been satisfied can better support efforts in achieving sustainable competitive advantage than one that emphasizes labour or machinery efficiency in internal operations (Beckette & Dang, 19910, Goldhar & Lei 1991).

Quality: Quality measures, which are the most process-oriented evaluations are designed to determine the effectiveness of a series of activities rather than the individual activity. Quality refers to the degree to which a product's specific features in terms of workmanship; durability and so on satisfy the requirements of a particular customer. Poor quality can contribute to a significant increase in the manufacturing costs in various ways. As Howell and Soucy (1997) stated:

"The absence of good materials, highly-trained labour, and well-maintained equipment will dramatically increase the costs of non quality such as scrap, rework, excess inventories, process and equipment: breakdowns, field serves, and warranty claims.

However, quality is usually difficult to measure because of the broad scope. A contemporary measurement concept that is increasing in interest is "the perfect order". Delivery of the perfect order is the ultimate measure of quality operations. The perfect order represents ideal performance from an operational perspective, a multi-industry consortium defines the perfect order as one that meets the complete delivery of all items requested, delivery customer's request date with one-day tolerance, complete and accurate documentation supporting the order and perfect condition, that is, faultlessly installed, correct configuration, customer-ready with no damage.

Operational and financial measurers to monitor quality include the manufacturing quality index (i.e. defect rates), inventory levels, warranty claims, vendor quality, cost of quality and scrap cost. All these provide valuable feedback for identifying existing problems and assessing whether the quality objective is adequately meet.

Time: Reducing level times is also of the new manufacturing strategy through out, (manufacturing cycle) time measures the amount of time required to convert raw materials into completed products. Cycle time is the total value from the issue of materials into production to the delivery of the final products to customers. The theory is that the cost of a product is related to the time required to produce it. Cycle time variance therefore provides useful information about non-value-adding activities such as moving, inspecting, reworking, storing and waiting, that added to production costs as overhead charges but no value to customers (Alexander et al, 1991). Using throughput and cycle times as performance measures help managers to eliminate these non-value adding activities, considered as waste time, and achieve substantial cost savings. Thus, according to Lippa (1990);

Shorter cycle times can result in less finished goods inventory, less forecast reliance, strategic capability when a firm reacts to customer demands faster than the competition and the ability to exploit opportunities).

Innovation in today's competitive environment companies must continuously engage in product improvement be designing new and improved products with unique characteristics valued by customers. Only in this way are companies able to enlarge their market share and maintain a competitive edge. Introducing technological innovation and advanced design features into new products is costly initially and requires operational flexibility; unlike cycle have unique characteristics (Ainikal & Teo, 1992) that will require performance measures tailored for this purpose such as turnover by products and product cost improvement.

Human Resources: The benefit of adopting a long-term employment policy is a loyal and committed workforce, resulting in productivity increases, reduced training costs, and improved customer services since this is provided by long-serving, presumably more experienced and better-informed employees.

A performance measure such as employee turnover is needed to help management assess an enterprise's human resource availability and capabilities.

It is against this background that the present study has been conducted. In Nigeria, the trend toward high technology manufacturing is a recent event, partly motivated by rising costs and partly encouraged by the Government as a strategy to maintain a sustainable competitive edge. As companies automate or adopt advanced manufacturing technology, complementary changes in performance measurement systems must be implemented to reflect the new manufacturing environment.

Performance Measurement in a JIT System

Many measurements used in traditional accounting system are not used in JIT environment. New measurements can be implemented, that take advantage of unique characteristics of this system. For example, machine utilization is a key measurement in a traditional system. This is used to ensure that every asset of the company is being thoroughly utilized. This is particularly important where there has been a large investment in automation or large, high speed machinery. In JIT, the approach is different. Under JIT system, producing only what is actually needed, is the underlying rule. Machine cells under JIT system are relatively smaller and less costly than the highly automated juggernauts used in more traditional systems. In other words, machine utilization measurement can be thrown to back door, when JIT system comes in the front door.

In traditional systems, employees are paid by piece rates. Under a JIT system, emphasis is on producing only what is needed. Thus an employee who is producing more than requirements is going against the rule of the system. Therefore, piece rate system does not work under JIT system. Here measurement to be used is one, that focuses on quality of output or invites productive suggestions from employees.

Labour efficiency tracking is most talked about performance measurement. In JIT system, it is highly inappropriate to track labour efficiency. JIT system foes not go on how fast an employee works. Major emphasis is on quality of product manufactured.

Labour variances in traditional system require considerable time tracking. All this labour tracking is non-value added activity, which a JIT system wants to avoid as unnecessary activity. JIT system also uses following performance measures :

(i) Inventory turnover

(ii) Set-up time reduction

(iii) Customer complaints

(iv) Scrap

(v) Cost of quality

(vi) Customer service

(vii) Ideas generated

The following performance measurement criteria are relevant to JIT -

1. **Inventory Turnover:** One of the primary objectives of JIT systems is the reduction of unnecessary inventory. Hence, Inventory Turnover is a suitable performance measure in JIT. This measure can be subdivided into separate ratios for Raw Materials, Work In Process, and Finished Goods.
2. **Setup Time Reduction:** The average setup time per machine can be measured periodically and plotted on a trend line. The shortest possible setup intervals are crucial for the success of short production runs, so this is a major JIT measurement. It is best to measure it machine-wise, rather than in the aggregate for all machines.
3. **Customer Complaints:** JIT presumes optimum product quality. Hence customer complaints on product problems should be investigated immediately. The accumulation of customer complaints and their dissemination to management should be considered a major JIT measure.
4. **Scrap:** JIT aims to bring down materials scrap rates. The cost of scrap (along with a detailed list of items that were scrapped) is of particular concern as a JIT system is being implemented, since it helps to identify problem areas requiring further management attention.

5. **Cost of Quality:** Under JIT, it is necessary to keep track of the full cost of quality (which comprises defect control costs, failure costs, and the cost of lost sales) on a trend line. Managers can analyse this information to know where the largest quality costs still reside in the Company and can then work to reduce them.
6. **Customer Service:** This measure has several components like - (a) delivering products on the dates required by Customers, (b) despatching full orders to Customers, and (c) reducing rejections and returns.
7. **Ideas generated:** JIT system works best when employees provide suggestions for improvements that, when taken in total, result in a vastly improved, efficient operation. The amount of idea generation can be measured by the number of ideas per worker, the number of ideas suggested in total, the number of ideas implemented, or the proportion of ideas suggested that are implemented.

9.6 ENTERPRISE RESOURCE PLANNING (ERP)

Enterprise Resource Planning (ERP) is the latest high-end solution which information technology has lent to business application. The ERP solution seek to streamline and integrate operation process and information flows in the company to synergies the resources of an organisation namely men, material, money and machine though information. Initially implementation of an ERP packages was possible only for large multinationals and infrastructure companies due to high cost. Today, many companies in India have gone in for implementation of ERP. It is expected that in the next future, 60 per cent of the companies will be implementing one or the other ERP packages since this will become a must for gaining competitive advantage.

Meaning of ERP : Enterprise resource planning software or ERP attempts to integrate all departments and functions across a company into a single computer system that can serve all those different departments particular needs. In fact ERP combines all computerised departments together with the help of a single integrate software program that runs off as single database so that various department can more easily share information and commission with each other.

The need for ERP: Most organisation across the world have realised that in a rapidly changing environment, it is impossible to creates and maintain customer designed software package which will cater to all their requirements and be up-to-date. Realising the requirement of user organisations, some of the leading software companies have designed Enterprise Resource Planning software, which offers an integrated software solution to all the function of an organisation.

Components of ERP: To enable the easy handling of the system, ERP has been divided the following core subsystems, sales and marketing, master scheduling, materials requirements planning, capacity requirement planning, bill of materials, purchasing, shop floor control, accounts payable/receivable , logistic, assets management and financial accounting.

Features of Enterprise Resource Planning

Some of the major features of ERP and What ERP can do for the business system are :

- ERP facilities company—wide Integrated Information System covering all functional areas like manufacturing, selling and distribution, payables, receivables, inventory, accounts, human resources, purchases etc.
- ERP perform core activities and increases customers service, thereby augmenting the corporate image.
- ERP bridge the information gap across organisations.
- ERP provides complete integration of system not only across departments but also across companies under the same management.
- ERP is the solution for better project management.

- ERP allows automatic introduction of the latest technologies like Electronic Fund Transfer (EFT). Electronic Data Interchange (EDI), Internet, Intranet, Video conferencing, E—commerce etc.
- ERP eliminates most business problems like materials shortages, productivity enhancements, customer service, cash management, inventory problems, quality problems, prompt delivery etc.
- ERP not only addresses the current requirement of the company but also provide the opportunity of continually improving and refining business Processes.
- ERP provides business intelligence tools like Decision Support Systems (DSS), Executive Information System (EIS), Reporting. Data Mining and Early warning systems (Robots) for enabling people to make better decisions and thus improve their business processes.

Benefits of Enterprise Resource Planning

In an industry this is sensitive to dynamic market forces, cost fluctuations and manufacturing responsiveness, there are many benefits to be gained from investing in ERP. ERP application have shifted from assisting after—the—fact monitoring to real –time analysis, control and forecasting and from facilitating standardization, economies to scale and cost reduction in product, to enabling fast, flexible and accurate response and customization.

The benefits accruing to any business enterprise by implementing an ERP package are unlimited.

1. **Product Costing** : Determination of cost of products correctly, is quite critical for every industry. ERP supports advance costing methods, including standard costing, actual costing and activity –based costing. Additionally, all costing methods and information can be fully integrated with finance. This provides the company with essential financial information for monitoring controlling costs.
2. **Inventory Management** : ERP can be used in multi-national, multi – company, and multi—site manufacturing and distribution environments. This system simplifies complicated logistics by allowing one to plan and manage companies in different countries as a single unit and its advanced functionality allows one to process product and financial information flows in several different ways.

   Enterprise and managing the basis data required to effectively run one's business is an important start for effective warehouse management. The basis data includes warehouse, locations, items containers, lot and serial number, units of measures (including conversion), alias numbers, replacement and substitute items and more.

   Inventory reporting supports all reporting of specific and general types of stock transaction such as various types of stock transfers, re-classification, ID changes and physical inventory results. Additionally, functions are available for managing different stock and purchase requisitions as well as supporting the selection of appropriate locations for receipts. Inventory valuation involves both warehouse management and cost accounting. ERP supports several valuation methods including standard cost, average cost, FIFO and batch—specific prices.
3. **Distribution & Delivery** : Delivery and distribution in ERP lets one to define logistics processes, flexibly and efficiently to deliver the right product from the right warehouse to the right customer at the right time –every time. To the customer, the most important element of quality is one-time delivery. It doesn't matter how well a product is made if arrives late. Processing distribution or acquisition orders involves several closely related activities.
4. **E – Commerce** : Internet enables ERP offers Internet, Intranet and extranet solutions for business, business to consumer, employee self-service and more.
5. **Automatic Control** : It ensure automatic quality control procedure.
6. **After Sales Service** : It ensures better after sales service.
7. **Improvement in Production Planning** : It improved production planning.
8. **Quick response** : It enables quick response to change in business operations & market conditions.
9. **Cumulative Edge's** : It helps to achieve competitive advantages by improving business process.

Reasons for the Implemention of ERP by Companies

1. **Improve a company's business performance** : ERP automates the tasks involved in performing a business process – such as order fulfillment which involves taking an order from a customer, shipping it and billing for it. With ERP, When a customer service representative takes an order from a customer, he or she has all the information necessary to complete the order (the customer's credit rating and order history, the company's inventory levels and the shipping dock's trucking schedule). Everyone else in the company sees the same computer screen and has access to the single database that holds the customer's new order. When one departments finishes with the order it automatically routed via the ERP system to the next department. To find out where the order is at any point, one need only to log into the ERP system and track it down. With luck, the order process moves like a bolt of lightning through the organisation, and customers get their orders faster and with fewer errors than before. ERP can apply that same magic to the other major business processes, such as employee benefits or financial reporting.
2. **Standardize manufacturing processes** : Manufacturing companies --- especially those with an appetite for mergers and acquisitions --- often find that multiple business units across the company make the same widget using different methods and computer systems, Standardizing those processes and using a single, integrated computer system can save time, increase productivity & reduce headcount.
3. **Integrate Financial data** : As the CEO tries to understand the company's overall performance, he or she may find many different versions of the truth. Finance has its own set of revenue numbers, sales has another version, and the different business units may each have their own versions of how much they contributed to revenues. ERP creates a single version of the truth that cannot be questioned because everyone is using the same system.
4. **To standardise HR information** : Especially in companies with multiple business units, HR may not have a unified, simple method for tracking employee time and communicating with them about benefits and services. ERP can fix that.
5. **Reduction in cycle time :** Cycle time is the time between receipt of the order and delivery of the product. ERP systems are helpful in both make-to -order and make-to-stock situations. In both cases, cycle time can be reduced by the ERP systems, but the reduction will be more in the case of make-to-order systems. ERP packages go a long way in reducing the cycle times due to automation achieved in material procurement, production planning and the efficiency achieved through the plant maintenance and production systems of the ERP packages.
6. **Improved Resource Utilization** : As manufacturing processes become more sophisticated and as the philosophies of elimination of waste and constraint management achieve broader acceptance, manufacturer place increased emphasis upon planning and controlling capacity. The capacity planning feature of ERP systems offer both rough-cut and detailed capacity planning. The system loads each resource with production requirements from Master Production Scheduling, Materials Requirements Planning and Shop-floor Control. The ERP systems have simulation capabilities that help the capacity and resource planners to simulate the various capacity and resource utilization scenarios and choose the best option. The ERP systems help the organisation in drastically improving the capacity and resource utilization.
7. **Better Customer Satisfaction** : Customer satisfaction means meeting or exceeding customer's requirements for a product or service. The customer could get technical support by either accessing the company's technical support knowledge base (help desk) or by calling the technical support. Since all the details of the product and the customer are available to the person at the technical support department, the company will be able to better support the customer. All this is possible because of use of latest developments in information technology by the ERP systems.
8. **Improved Supplier Performance** : The quality of the raw materials or components and the capability of the vendor to deliver them ontime are of critical importance for the success of any organisation. For this reason, an organisation chooses its suppliers or vendors very carefully and monitor their activities very closely. To realise these benefits, corporations rely heavily on supplier management and control systems to help, plan, manage and control the complex processes associated with global supplier partnerships.

Illustration No. 1.

The budgeted overheads and cost driver volumes of XYZ are as follows.

Cost Pool	Budgeted Overheads (₹)	Cost Driver	Budgeted Volume
Material procurement	5,80,000	No. of orders	1,100
Material handling	2,50,000	No. of movements	680
Set-up	4,15,000	No. of set ups	520
Maintenance	9,70,000	Maintenance hours	8,400
Quality control	1,76,000	No. of inspection	900
Machinery	7,20,000	No. of machine hours	24,000

The company has produced a batch of 2,600 components of AX-15, its material cost was ₹ 1,30,000 and labor cost ₹ 2,45,000. The usage activities of the said batch are as follows.

Material orders – 26, maintenance hours – 690, material movements – 18, inspection – 28, set ups – 25, machine hours – 1,800

Calculate – cost driver rates that are used for tracing appropriate amount of overheads to the said batch and ascertain the cost of batch of components using Activity Based Costing.

Solution:

Computation of Cost Driver Rates

	Particulars		Amount (₹)
1.	Material procurement	580000/1100	527
2.	Material handing	250000/680	368
3.	Set-up	415000/520	798
4.	Maintenance	970000/8400	115
5.	Quality control	176000/900	196
6.	Machinery	720000/24000	30

Computation of Batch Cost of 2600 units of AX-15

		₹
Material cost		1,30,000
Labour Cost		2,45,000
Prime Cost		3,75,000
Add: Overheads		
Material orders 26 x 527	13,702	
Material handling 18 x 368	6,624	
Set-up 25 x 798	19,950	
Maintenance 690 x 115	79,350	
Quality Control 28 x 196	5,488	
Machinery 1800 x 30	54,000	1,79,114
Total Cost		5,54,114

Illustration No. 2.

A company produces four products, viz. P, Q, R and S. The data relating to production activity are as under

Product	Quantity of production	Material cost/ unit ₹	Direct labour hours/unit	Machine hours/unit	Direct Labour cost/unit ₹
P	1,000	10	1	0.50	6
Q	10,000	10	1	0.50	6
R	1,200	32	4	2.00	24
S	14,000	34	3	3.00	18

Production overheads are as under: ₹

(i) Overheads applicable to machine oriented activity: 1,49,700

(ii) Overheads relating to ordering materials 7,680

(iii) Set up costs 17,400

(iv) Administration overheads for spare parts 34,380

(v) Material handling costs 30,294

The following further information have been compiled:

Product	No. of set up	No. of materials orders	No. of times materials handled	No. of spare parts
P	3	3	6	6
Q	18	12	30	15
R	5	3	9	3
S	24	12	36	12

Required:

(i) Select a suitable cost driver for each item of overhead expense and calculate the cost per unit of cost driver.

(ii) Using the concept of activity based costing, compute the factory cost per unit of each product.

Solution:

Computation of Cost Driver Rates

(1) Overheads relating to Machinery oriented activity

Cost Driver ÷ Machine Hour Rate

(1000 × 0.5) + (10000 × 0.5) + (1200 × 2) + (14000 × 3)

1,49,700/49,900 = ₹ 3 per hour

(2) Overheads relating to ordering materials

Cost driver ÷ No. of Material orders

7680/30 = ₹ 256 per order

(3) Set up costs

Cost driver ÷ No. of set ups

17400/50 = ₹348 per set up

(4) Administrative Overheads for spare parts

Cost driver ÷ No. of spare parts

34380/36 = ₹ 955 per spare part.

(5) Material Handling costs

Cost driver ÷ No. of times materials handled

30294/81 = ₹ 374 per material handling

Computation of factory cost for each product

	P		Q		R		S	
Materials		10.00		10.00		32.00		34.00
Labour		6.00		6.00		24.00		18.00
Overheads								
Machine oriented activity	1.500		1.50		6.00		9.00	
Ordering of Materials	0.768		0.31		0.64		0.22	
Set up costs	1.044		0.63		1.45		0.60	
Administrative Spare Parts	5.730		1.43		2.39		0.82	
Material handling	2.244	11.29	1.12	4.99	2.81	13.29	0.96	11.60
Factory Cost (Rs)		27.29		20.99		69.29		63.60

Illustration No. 3.

Precision Auto comp Ltd. Manufactures and sells two automobile components A and B. Both are identical with slight variation in design. Although the market for both the products is the same, the market share of the company for product A is very high and that of product B very low. The company's accountant has prepared the following profitability statement for the two products Cost of production: (same for both the products)

Direct Material	₹	125
Dirbect Labour	₹	24
Direct Expenses (sub-contract charges)	₹	36
Overheads (400% of direct labour)	₹	96
Total Cost	₹	281

		Product A	**Product B**	**Total**
Quantity sold	No.	1,24,000	23,150	1,47,150
Unit sale price	₹	300	290	
Total sales realisation	₹			4,39,13,500
Cost of sales as above	₹			4,13,49,150
Margin	₹			25,64,350

The company's marketing manager, after attending a workshop on activity-based costing challenges the accountant's figures. The nearest competitor's prices for the two products are ₹ 330 and ₹ 275 per unit respectively and, if the company can match the competitor's prices, it can sell 75,000 nos. each of the two products. The Production Manager confirms that he can produce this product mix with the existing facilities. The management engages you as consultant, and the following facts have been identified by you:

(a) product A undergoes 5 operations and product B undergoes two operations by sub-contractors, although the total subcontract charges are the same for both the products, and

(b) 75% of the overheads is accounted for by three major heads relating to sub-contracting operations, *viz.,* ordering, inspection and movement of components, to and from the sub-contractor's works.

Prepare a revised profitability statement to find out if the marketing manager's proposal is viable.

Solution:

Total overheads = 1,47,150 x 96 = ₹1,41,26,400

Operations overhead = 1,41,26,400 x 75/100 = ₹1,05,94,800

Balance 25% assumed to be fixed i.e. ₹ 35,31,600

Allocation of Variable Overheads under ABC

A = 1,05,94,800 x 5/7 = ₹75,67,714

B = 1,05,94,800 x 2/7 = ₹30,27,086

Statement showing computation profit under Activity Based Costing as per Manager's suggestion:

		A		B		Total
No. of units		Units	75000	Units	75000	
Materials	₹	125	93,75,000	125	93,75,000	1,87,50,000
Labour	₹	24	18,00,000	24	18,00,000	36,00,000
Direct expenses	₹	36	27,00,000	36	27,00,000	54,00,000
Prime Cost	₹	185	1,38,75,000	185	1,38,75,000	2,77,50,000
Variable Overheads	₹	101	75,67,714	41	30,27,086	1,05,94,800
Fixed Overheads	₹	24	17,65,800	24	17,65,800	35,31,600
Total Cost	₹	310	2,32,08,514	250	1,86,67,886	4,18,76,400
Profit	₹	30	15,41,486	25	19,57,114	34,98,600
Sales	₹	330	2,47,50,000	275	2,06,25,000	4,53,75,000

As the profit is more at the Marketing Manager's proposal by ₹ 9,34,250 and hence this proposal may be accepted.

Illustration No. 4.

Relevant data relating to a company are:

		Products			
		P	Q	R	Total
Production and sales (units)		60,000	40,000	16,000	
Raw material usage in units		10	10	22	
Raw material costs	₹	50	40	22	49,52,000
Direct labour hours		2.5	4	2	3,42,000
Machine hours		2.5	2	4	2,94,000
Direct labour costs	₹	16	24	12	
No. of production runs		6	14	40	60
No. of deliveries		18	6	40	64
No. of receipts		60	140	880	1,080
No. of production orders		30	20	50	100

Overheads: ₹

Setup	60,000
Machines	15,20,000
Receiving	8,70,000

Packing	5,00,000
Engineering	7,46,000

The company operates a JIT inventory policy and receives each component once per production run.

Required:

(i) Compute the product cost based on direct labour-hour recovery rate of overheads.

(ii) Compute the product cost using activity based costing.

Solution:

(i) Traditional Method of absorption of overhead i.e. on the basis of Direct Labour Hours

$$\text{Total overheads} = \frac{36,96,000}{\text{Hours } (60000 \times 2.5) + (40000 \times 4) + (16000 \times 2)}$$

$$= \frac{36,96,000}{3,42,000} = ₹\ 10.81 \text{ per labour hour}$$

Calculation of Factory cost of the products

	P	Q	R
	₹	₹	₹
Raw Material	50.00	40.00	22.00
Direct Labour	16.00	24.00	12.00
Overheads (2.5 x 10.81)	27.025	43.24	21.62
Factory cost	**93.025**	**107.24**	**55.62**

(ii) Under Activity Based Costing System

Computation of Cost Drivers Rates.

(1) Set up cost : Cost driver ÷ No. of Production run

60000/60 = ₹ 1000 per run

(2) Machines : Cost driver ÷ Machine hour rate

15,20,000/2,94,000 = ₹ 5.17 per Machine hour rate

(3) Receiving cost: Cost driver ÷ No. of Receipts

8,70,000/1080 = ₹ 805.56 per receipts

(4) Packing : Cost driver ÷ No. of deliveries

5,00,000/64 = ₹ 7812.5 per delivery

(5) Engineering: Cost driver ÷ No. of Production order

7,46,000/100 = ₹ 7,460 per order

Calculation of Factory Cost per unit of Production

	P		Q		R	
	₹	₹	₹	₹	₹	₹
Materials		50.00		40.00		22.00
Direct Labour		16.00		24.00		12.00
Overheads						

Setup cost	0.10		0.35		2.50	
Machines	12.93		10.34		20.68	
Receiving cost	0.81		2.82		44.31	
Packing	2.34		1.17		19.53	
Engineering	3.73	19.91	3.73	18.41	23.31	110.33
Factory Cost		85.91		82.41		144.33

Illustration No. 5.

Trimake Limited makes three main products, using broadly the same production methods and equipment for each. A conventional product costing system is used at present, although an Activity Based Costing (ABC) system is being considered. Details of the three products, for typical period are:

	Labour Hours per unit	Machine Hours per unit	Material Per unit	Volumes Units
Product X	½	1 ½	₹ 20	750
Product Y	1 ½	1	12	1,250
Product Z	1	3	25	7,000

Direct labour costs ₹ 6 per hour and production overheads are absorbed on a machine hour basis. The rate for the period is ₹ 28 per machine hour.

You are required:

(a) to calculate the cost per unit for each product using conventional methods.

Further analysis shows that the total of production overheads can be divided as follows

	%
Costs relating to set-ups	35
Costs relating to machinery	20
Costs relating to materials handling	15
Costs relating to inspection	30
Total production overhead	100%

The following activity volumes are associated with the product line for the period as a whole.

Total activities for the period

	Number of Set-ups	Number of movements of materials	Number of Inspections
Product X	75	12	150
Product Y	115	21	180
Product Z	480	87	670
	670	120	1,000

You are required:

(b) To calculate the cost per unit for each product using ABC principles; c) to comment on the reasons for any differences in the costs in your answers to (a) and (b)

Solution:

(a) Computation of cost per unit using Conventional Methods:

Total overheads		₹
X = 750 x 1.5 x 28	=	31,500
Y = 1250 x 1 x 28	=	35,000
Z = 7000 x 3 x 28	=	5,88,000
		6,54,500

Computation of Cost

	X	Y	Z
	₹	₹	₹
Materials	20	12	25
Labour	3	9	6
Overheads	42	28	84
Factory Cost	65	49	115

(b) Under ABC Costing

		Setup Cost	Machine Cost	Material Handling Cost	Inspection Expenses	Total
Costs	₹	2,29,075	1,30,900	98,175	1,96,350	6,54,500
Cost Driver		No. of setups	Machine hours	No. of Moment of Materials	No. of Inspections	
Cost driver rates	₹	341.90 (229075/670)	5.6 (130900/23375)	818.125 (98,175/120)	196.35 (196350/1000)	

Cost per unit under ABC costing

	X		Y		Z	
	₹	₹	₹	₹	₹	₹
Materials		20.00		12.00		25.00
Labour		3.00		9.00		6.00
Overheads						
Setup Cost	34.19		31.45		23.44	
Machine cost	8.40		5.60		16.80	
Machine Handling Cost	13.09		13.74		10.17	
Inspection Cost	39.27	94.95	28.27	79.06	18.79	69.20
Total Cost		117.95		100.06		100.20

Illustration No. 6.

Change with Times Ltd. has been manufacturing and selling 4 products A, B, C, and D — A & B in its production Department X and C & D in its production Department Y. Product A is a standard product, which is produced for one customer, according to the requirements of a long term contract. Products B & C are produced largely in response to orders received from a small number of customers, but limited numbers are produced for inventory. Product D is produced in a range of different colours and is usually produced for stock with orders being dispatched form warehouse, as required.

The company is thinking of going to a new product line. In this process, it may even chop one of the existing products after ascertaining the individual product costs and its profitability.

The following data collected pertain to a six months period:

	Department X			Department Y		
Product	**A**	**B**	**Total**	**C**	**D**	**Total**
Units produced & sold	1,000	800		1,000	500	
Selling Price (₹)	27.50	30.00		30.00	35.00	
Sales Revenue (₹)	27,500	24,000	51,500	30,000	17,500	47,500
Cost incurred (₹):						
Direct material	10,000	6,400	16,400	9,000	7,500	16,500
Direct labour	3,000	1,600	4,600	3,000	1,000	4,000
			21,000			20,500

	₹		₹
Factory Overhead:		Service Department Cost:	
Set Up	1,370	Purchasing	4,440
Supervision	2,400	Warehouse & Dispatch	3,100
Machines	19,800	Power	3,300
	23,570		10,840
Selling Expenses	7,920		

Following the usual practice of allocating all the factory overheads and service department costs using a blanket rate of 400% of unit direct labour cost and the selling expenses as 8% of unit selling price, the unit profit is worked out as:

Product	A	B	C	D
Profit per unit (₹)	0.30	9.60	3.60	7.20

Disturbed by figures, the Accountant of the company realises that using a blanket rate for common cost allocation will always be misleading. As all the operations are predominantly machine operations, arriving at a machine hour rate for each department for allocating at common costs to the products, he finds that each product requires one half an hour of machine time. During the period the machines are used for 1650 hours – 900 in X and 750 in Y. Going into details the Accountant makes a fresh calculation and arrives at the unit profitability to the products as under:

Product	A	B	C	D
Profit per unit (₹)	2.20	7.50	4.78	4.38

His calculation is based on the following details:

Allocation of Common Costs (₹)

Factory Overheads	Total	X	Y
Set up	1,370	470	900
Supervision	2,400	1,200	1,200
Machines	19,800	10,800	9,000

Service Department Cost:

Purchasing	4,440 to be allocated on material costs
Warehouse and dispatch	3,100 on units produced
Power plant	3,300 on hours of usage of machines

The Management Accountant who has joined the company recently is not at all satisfied with the Accountant's calculations. He feels that an important decision to drop a product cannot be taken based on those figures. He is of the view that a more refined technique is required and when details are available, he wants to use activity based costing.

With this end in view, he collects the following details:

Activity cost-pools:	₹
Set-up	1,370
Supervision	2,400
Machines	19,800
Order processing	440
Material handling	4,000
Finished goods storage	1,600
Dispatch	1,500
Power	3,300
Selling expenses	7,920

Cost Drivers:

	A	B	C	D
Production batch size (units)	100	50	100	25
Set up time (hrs)	1.5	4	1	2.4
Supervisor's time per period (hrs.)	75	40	75	50
Machine time per unit (hrs.)	0.5	0.5	0.5	0.5
Orders processed per period	10	20	20	60
Raw materials inputs per unit	2	5	2	4
Average holding of finished goods (unit)	0	100	100	200
No. of deliveries per period	10	40	50	200
Sales staff time per period (hrs.)	30	160	200	400

With the help of these figures, he makes the allocations activity based and produces a profit statement for submission to management.

You are required to -

(i) Prepare the product profitability statement based on – (a) the blanket rate (b) the machine hour rate as the Accountant has done (c) activity based costing as suggested by the Management Accountant; and

(ii) Offer your comments on the profit figures arrived at, by the three methods.

Solution:

(i)

(a) Based on the blanket rate (₹)

Product	A	B	C	D
Direct material	10.00	8.00	9.00	15.00
Direct labour	3.00	2.00	3.00	2.00
Overhead & service cost (400% on direct labour)	12.00	8.00	12.00	8.00
Product cost	25.00	18.00	24.00	25.00
Selling expenses (8% of Selling price)	2.20	2.40	2.40	2.80
Total cost	27.20	20.40	26.40	27.80
Selling price	27.50	30.00	30.00	35.00
Profit	0.30	9.60	3.60	7.20

(b) Calculation of Machine Hour Rate.

Department overheads	Total	Dept. X	Dept. Y
Set up	1,370	470	900
Supervision	2,400	1,200	1,200
Machines	19,800	10,800	9,000
Purchase Department (material cost 16,400: 16,500)	4,440	2,213	2,227
Warehouse & dispatch (Units produced (1,800:1,500)	3,100	1,691	1,409
Powers (machine hours worked 900:750)	3,300	1,800	1,500
Total	34,410	18,174	16,236
Machine hour rate		20.19	21.65
		(18,174/900)	(16,236/750)

Accountant's Working	A	B	C	D
Direct materials	10.00	8.00	9.00	15.00
Direct labour	3.00	2.00	3.00	2.00
Overheads on machine hours (1/2 hr. per unit)	10.10	10.10	10.82	10.82
Total	23.10	20.10	22.82	27.82
Selling exp. 8% of price	2.20	2.40	2.40	2.80
Total	25.30	22.50	25.22	30.62
Selling price	27.50	30.00	30.00	35.00
Profit	2.20	7.50	4.78	4.38

(c) Management Accountant's working

Particulars	A	B	C	D
Direct Material	10.00	8.00	9.00	15.00
Direct Labour	3.00	2.00	3.00	2.00
Set up Cost	0.15	0.80	0.10	0.96
Supervision	0.75	0.50	0.75	1.00
Machines	6.00	6.00	6.00	6.00
Order Processing	0.04	0.10	0.08	0.48
Material Handling	0.80	2.00	0.80	1.60
Finished Goods storage	0.00	0.50	0.40	1.60
Dispatch	0.05	0.25	0.25	2.00
Power	1.00	1.00	1.00	1.00
Selling Expenses	0.30	2.00	2.00	8.00
Total Cost	22.09	23.15	23.38	39.64
Selling Price	27.50	30.00	30.00	35.00
Profit/ (Loss)	5.41	6.85	6.62	(4.64)

Illustration 7.

R Ltd. is a warehousing and distribution company which receives products from customers, stores the products and then repacks them for distribution as required. There three customers for whom the service is provided - J Ltd., G Ltd. and P Ltd. The products from all three customers are similar in nature but of varying degree of fragility. Basic Budget information has been gathered for the year to 30th June, 2013 and shown in following table:

	Product handled (cubic metres)
J Ltd.	30,000
G Ltd.	45,000
P Ltd.	25,000
Cost	(₹'000)
Packing material (see note)	1,950
Labour - Basic	350
-Overtime	30
Occupancy	500
Administration and management	60

Note: Packaging materials are used in re-packing each cubic metre of product for J Ltd., G Ltd. and P Ltd. in the ratio 1:2:3 respectively. This ratio is linked to the relative fragility of the goods for each customer.

Additional information has been obtained in order to enable unit costs to be prepared for each of the three customers using an activity-based costing approach. The additional information for the year to 30th June, 2013 has been estimated as follows:

(i) Labour and overhead costs have been identified as attributable to each of three work centres - Receipt and Inspection, Storage and Packing.

	Cost allocation proportions		
	Receipt and Inspection	Storage	Packing
Labour	%	%	%
-Basic	15	10	75
-Overtime	50	15	35
Occupancy	20	60	20
Administration and management	40	10	50

(ii) Studies have revealed that the fragility of different goods affects the receipt and inspection time needed for the products for each customer. Storage required is related to the average size of the basic incoming product unit from each customer. The repacking of goods for distributions related to the complexity of packing required by each customer. The relevant requirements per cubic metre of product for each customer have been evaluated as follows:

	J Ltd.	G Ltd.	P Ltd.
Receipt and inspection (minutes)	5	9	15
Storage (square metres)	0.3	0.3	0.2
Packing (minutes)	36	45	60

Required:

(a) Calculate the budgeted average cost per cubic metre of packaged products for each customer for each of the following two circumstances:

(i) Where only the basic budget information is to be used.

(ii) Where the additional information enables an activity-based costing approach to be applied.

(b) Comment on the activities and cost drivers which have been identified as relevant for the implementation of activity-based costing by R Ltd. Make reference to your answer to part (a) of the question, as appropriate.

Solution:

(a)

(i) Based on Basic Budget information. It is given that packing materials requirements which is used in the ratio of 1:2:3 respectively for J Ltd., G Ltd. and P Ltd. are as follows:

J Ltd.	30,000×1	30,000 units
G Ltd.	45,000×2	90,000 units
P Ltd.	25,000×3	75,000 units
		1,95,000 units

Cost per unit of packaging = ₹19,50,000÷1,95,000 = ₹10

Product cost per cubic metre:

	J Ltd.		G Ltd.		P Ltd.	
Packaging material	₹10×1	₹10.00	2×₹10	₹20.00	3×10	₹30.00
Labour and over-head (W. N. 1)		₹9.40		₹9.40		₹9.40
		₹19.40		₹29.40		₹39.40

(ii) Based on activity –based costing approach. The cost are assigned to following activities:

	Total (₹)	Receipt and in-spection		Storage		Packing	
		%	₹	%	₹	%	₹
Labour							
Basic	3,50,000	15	52,500	10	35,000	75	2,62,500
Overtime	30,000	50	15,000	15	4,500	35	10,500
Occupancy	5,00,000	20	1,00,000	60	3,00,000	20	1,00,000
Adv. & Mgmt.	60,000	40	24,000	10	6,000	50	30,000
			1,91,500		3,45,500		4,03,000

The resources usage for each of the cost driver is:

	Receipt and Inspection		Storage (m^2)		Packing hours	
J Ltd.	(30,000×5 min)÷60	2,500 hrs.	30,000×0.3	9,000	(30,000×36 min)÷60	18,000 hrs.
G Ltd.	(45,000×9 min)÷60	6,750 hrs.	45,000×0.3	13,500	(45,000×45 min)÷60	33,750 hrs.
P Ltd.	(25,000×15 min)÷60	6,250 hrs.	25,000×0.2	5,000	(25,000×60 min)÷60	25,000 hrs.
		15,500 hrs.		27,500 m^2		76,750 hrs.

The cost driver rates are:

Receipt and inspection per hour = ₹1,91,500 ÷ 15,500 hrs. = ₹12.355

Material stored per m^2 = ₹3,45,500 ÷ 27,500 m^2 = ₹12.564

Packing per hour = ₹4,03,000 ÷ 76,750 hrs. = ₹5.251

Product cost per cubic metre

	Relevant Note	J Ltd. (₹)	G Ltd. (₹)	P Ltd. (₹)
Packing Material	As calculated above	10.00	20.00	30.00
Receipt and Inspection	2	1.03	1.85	3.09
Storage cost	3	3.77	3.77	2.51
Packing cost	4	3.15	3.94	5.25
Total Product cost		17.95	29.56	40.85

(b) The company has established cost pools for three major activities (Receipt and Inspection, Storage and Packing). The cost driver that causes the receipt and inspection costs to be incurred the fragility of different goods (measured by receipt and inspection time). The Storage cost is influenced by the average size (measured in square metres) of the incoming product and packing costs are caused by the complexity of packaging and this is measured by the time required to pack the products. ABC results in the computation of more accurate costs by seeking to measure resources consumed by the products. ABC systems presume that activities cause costs and the products create the demand for activities. Costs are assigned to products based on individual product's understand the factors, that cause each major activity, the cost of activities and how activity relate calculating more accurate product costs but also a mechanism for managing and controlling overhead costs. By collecting and reporting on the significant activities in which

business engages, it is possible to understand and manage costs more effectively. The aim is to manage forces, that cause costs (i.e., cost drivers) and by reducing cost driver volume, costs can be managed and controlled in the long run.

Working Notes:

(1) Labour and overhead average cost per metre:

= (₹3,50,00 + 30,000 + 5,00,000 + 60,000) ÷ (30,000 + 45,000 + 25,000) = ₹9.40

(2) Receipt and Inspection

J Ltd.	(5/60) hrs. × ₹12.355	₹1.03
G Ltd.	(9/60) hrs. ×₹12.355	₹1.85
P Ltd.	(15/60) hrs. ×₹12.355	₹ 3.09

(3) Storage Cost

J Ltd.	₹12.564 × 0.3	₹3.77
G Ltd.	₹12.564 × 0.3	₹3.77
P Ltd.	₹12.564 × 0.2	₹2.51

(4) Packing cost

J ltd.	₹5.251× (36/60) hrs.	₹3.15
G Ltd.	₹5.251× (45/60) hrs.	₹3.94
P Ltd.	₹5.251× (60/60) hrs.	₹5.25

Illustration 8.

Hari Ltd. is concerned about the profitability of selling to its small customers. The following data are obtained from its records:

Customer group by Annual Sales Value	Total Annual Sales (₹ Lakh)	No. of Customers	Gross Margin %	No. of Salesmen's Call	No. of Orders P.a.
Over 10,000	10.00	40	20	320	500
5,000 to 9,999	7.00	60	23	410	700
1,500 to 4,999	5.00	100	24	570	800
500 to 1,499	4.00	340	25	1,750	2,100
under 500	3.00	400	25	3,750	4,500

Sales Department's Costs are as under:

	₹
Sale Management (Central and Regional)	60,000
Salesmen's Salaries	72,000
Salesmen's Commission (5% of Sales)	1,12,000
Salesmen's Expenses	33,000
Sales Office Cost (Excluding cost of handling Sales Order)	43,000
Total	3,20,000

Work-study carried out indicated that the cost of handling Sales Orders was ₹10 per order. During the year there were 2,200 prospective customers on whom the salesmen made 3,200 calls but obtain no orders. From the above, you are required to—

(i) Calculate cost per Salesman's call and profit per customer group.

(ii) Advice the company whether it should stop supplying directly to those customers who buy under ₹500 of goods per annum from the company.

Solution:

(i) Total number of calls made = 320+410+570+1,750+3,750+3,200(on prospective customers)

=10,000 calls per annum

Total Salesmen's Cost = ₹3,20,000

So, Cost per Call = ₹3,20,000 / 10,000 = ₹32.00

Statement Showing Customer Category wise Profitability

Category	Gross Contribution (₹)	Salesmen cost at 32.00 per call (₹)	Cost of handling sales order at ₹10 (₹)	Net Profit/ (Loss) (₹)
Over 10,000	2,00,000	10,240	5,000	1,84,760
5,000 to 9,999	1,61,000	13,120	7,000	1,40,880
1,500 to 4,999	1,20,000	18,240	8,000	93,760
500 to 1,499	1,00,000	56,000	21,000	23,000
under 500	75,000	1,20,000	45,000	(90,000)
Prospective customers	—	1,02,400	—	(1,02,400)
	6,56,000	3,20,000	86,000	2,50,000

(ii) Evaluation of Small Customers (i.e. under ₹500): The following assumptions are made in this regard—

(a) Sales Management Expenses of ₹60,000 and Sales Office Costs of ₹43,000 are fixed and irrelevant.

(b) Salesmen salaries, commission and expenses can be proportionately reduced, by reference to the number of calls (in the absence of other information).

Costs	₹	Benefits	₹
Loss of Gross Margin on Sales (as computed above)	75,000	Savings in Costs:	
Net Benefit (balancing figure)	24,375	Salesmen Salaries [72,000×3,750÷10,000]	27,000
		Salesmen Expenses [33,000×3,750÷10,000]	12,375
		Salesmen Commission [5% of ₹3 Lakh]	15,000
		Order Handling Costs ₹10	45,000
	99,375		99,375

Conclusion: Since Savings in Costs is greater than Gross Margin, the Company should stop selling directly to these customers.

Illustration 9.

Ruchi Bank is examining the profitability of its premier, a combined saving & cheque account. Depositors receive a 7% annual interest on their average deposit. Ruchi Bank earns an interest rate spread of 3% (the difference between the rate at which it lends money and rate it pays to depositors) by lending money for home loan purpose.

The Premier Account allows depositors unlimited use of services such as deposits, withdrawals, cheque facility, and foreign currency drafts. Depositors with Premier Account balances of ₹50,000 or more receive unlimited free use of services.

Depositors with minimum balance of less than ₹50,000 pay ₹1,000-a-month service fee for their Premier Account. Ruchi Bank recently conducted an activity-based costing study of its services. The use of these services in a year by three customers is as follows-

	Activity Based cost per transaction	Account usage		
		Mr. A	Mr. B	Mr. C
Deposits/ withdrawal with teller	₹100	40	50	5
Deposits/ Withdrawal with Automatic Teller Machine (ATM)	₹40	10	20	15
Deposits/ withdrawal on prearranged monthly basis	₹25	0	10	60
Bank Cheque written	₹400	9	3	2
Foreign currency Drafts	₹700	4	1	6
Inquiries about Account balance	₹75	10	18	20
Average premier Account balance for the year		₹65,000	₹35,000	₹10,50,000

Assume Mr. A and Mr. C always maintains a balance above ₹50,000, whereas Mr. B always has a balance below ₹50,000.

Required:

(i) Compute the profitability of Mr. A, Mr. B, Mr. C Premier Account at Ruchi Bank.

(ii) What evidence is there of cross-subsidization among the three Premier Accounts? Why might Ruchi Bank worry about this Cross-subsidization, if the Premier Account product offering is profitable as a whole?

(iii) What changes would you recommended for Ruchi Bank's Premier Account?

Solution:

(i) Customer profitability statement

Particulars	**Mr. A**		**Mr. B**		**Mr. C**		**Total**
(A) Income:		₹		₹		₹	₹
Interest at 3%	65,000×3%	1,950	35,000×3%	1,050	10,50,000×3%	31,500	34,500
Service charges		-		12,000		-	12,000
Total Income		**1,950**		**13,050**		**31,500**	**46,500**
(B) Expenditure							
Teller	40×100	4,000	50×100	5,000	5×100	500	9,500
ATM	10×40	400	20×40	800	15×40	600	1,800

Prearranged Monthly Basis	-	-	10×25	250	60×25	1,500	1,750
Bank cheques written	9×400	3,600	3×400	1,200	2×400	800	5,600
Foreign Currency Drafts	4×700	2,800	1×700	700	6×700	4,200	7,700
Inquiries about Account balance	10×75	750	18×75	1,350	20×75	1,500	3,600
Total Expenditure		**11,550**		**9,300**		**9,100**	**29,950**
(C) Profits (A-B)		**(9,600)**		**3,750**		**22,400**	**16,550**

(ii) Cross Subsidisation: Since the loss in Mr. A's Account is set off by profits. In the other two accounts, resulting in an overall profit for all the three Customers, there is an element of Cross-subsidisation. Even though there is an overall profit, the bank might worry about this Cross-Subsidisation due to the following-

(a) Had the loss in Mr. A's Account been avoided, the overall profit would have increase.

(b) There should be a positive contribution from each customer account, to meet General Overhead Costs.

(c) Cost of services rendered to Mr. A is not fully recovered from the customer.

(iii) Changes/Suggestion: The Bank may avoid Cross-Subsidisation, and recover the cost of services rendered to the customers, with the following measures-

(a) Increase in the average account balance to avail unlimited free usage of services,

(b) Restriction on the number of "free" transaction per annum,

(c) Differential service charges from different customer based on account usage,

(d) Differential between "free" services and "chargeable" services.

Illustration 10.

Jeet Ltd. provides you with following data:

Total overhead		₹29,82,000
Total machine hrs.		2,13,000 hrs.
Production:		
Product X		10,000 units
Product Y		3,000 units
Product Z		2,00,000 units
	Direct cost per unit	Selling price per unit
Product X	₹20	₹50
Product Y	₹20	₹45
Product Z	₹9	₹40

Mr. Paul is Chartered Accountant of this firm and he says that profit of this company is ₹35,93,000. The overhead has been distributed at the rate of ₹14.00 per machine hour and each unit produced in the company is presumed to have used one machine hour. Mr. Paul has reported that all the units are profit-making.

Mr. Banerjee is Director Finance of Jeet Ltd. He is Dynamic personality and is eager to find out ways to improve profit. He wants to implement Activity Based Costing. With this objective in mind he has given a project to Mr. Roy to introduce ABC system. Mr. Roy has held numerous interviews and surveys. He has gathered the following information:

(i) **The overhead is caused by following activities.**

(a) Set-up	1,37,600 set-ups to be charged at the rate of ₹10 per set-up.	₹13,76,000
(b) Machining	51,800 machine hours to be charged @ ₹15 per machine hours	₹7,77,000
(c) Engineering	24,750 engineering hours to be charged @₹20 per hour	₹4,95,000
(d) Organisation cost cannot be linked with products		₹3,34,000
		₹29,82,000

(ii) **Based on the basis of factory records Mr. Roy has established that activities have been assigned to different products as follows:**

	Set-up (hrs.)	Machining (hrs.)	Engineering (hrs.)
Product X	8,000	6,000	2,500
Product Y	3,600	3,800	2,250
Product Z	1,26,000	42,000	20,000
	1,37,600	51,800	24,750

Mr. Roy has recently left the organization and Mr. Banerjee, who was keeping an overall watch over the project is very hopeful of the validity of the data. He expects you to answer following question:

(i) What are the profits made by different products, when conventional costing method of overhead distribution is made and overall profit is ₹35,93,000 ?

(ii)

(a) What will be the profit of different products, if ABC costing is used presuming that work done by Mr. Roy is quite reliable.

(b) Can we discontinue any product, if discontinuing a loss-making product does not harm the organization otherwise? What will be increase in profit, if loss-making product is discontinued?

(c) Reasons for difference in results shown by conventional costing and Activity-based costing system.

Solution:

(i) Product-wise profit position using conventional costing

(i.e., overhead rate per machine hour)

	Product X (10,000 units)		Product Y (3,000 units)		Product Z (2,00,000 units)		Total
	Per unit	Total	Per unit	Total	Per unit	Total	
Product revenue	50.00	5,00,000	45.00	1,35,000	40.00	80,00,000	86,35,000
Product Costs:							
Direct Cost	20.00	2,00,000	20.00	60,000	9.00	18,00,000	
Overhead @ ₹14.00 per unit	14.00	1,40,000	14.00	42,000	14.00	28,00,000	
Total	34.00	3,40,000	34.00	1,02,000	23.00	46,00,000	50,42,000
Income		1,60,000		33,000		34,00,000	35,93,000

(ii)

(a) Product-wise profit position using Activity-based costing system

	Product X (10,000 units)		Product Y (3,000 units)		Product Z (2,00,000 units)		Total
	Per unit	Total	Per unit	Total	Per unit	Total	
Product revenue	50.00	5,00,000	45.00	1,35,000	40.00	80,00,000	86,35,000
Product Costs:							
Direct Cost	20.00	2,00,000	20.00	60,000	9.00	18,00,000	
Overhead charge for different activities							
Set-up (Refer to note 1)	8.00	80,000	12.00	36,000	6.30	12,60,000	
Machining (Refer to note 2)	9.00	90,000	19.00	57,000	3.15	6,30,000	
Engineering (refer to note 3)	5.00	50,000	15.00	45,000	2.00	4,00,000	
Total	42.00	4,20,000	66.00	1,98,000	20.45	40,90,000	47,08,000
Product line Income/ (loss)		80,000		(63,000)		39,10,000	39,27,000
Organisational costs							(3,34,000)
Income							35,93,000

(b) From the table given above it is apparent that product Y can be discontinued, because it is a loss-making product. The suggestion is based on the presumption that there will not be adverse consequences of this decision otherwise. The total profit will increase by ₹63,000, if product Y is discontinued.

(c) Reasons for difference

The overhead distribution was not based on activity consumption in conventional costing. Due to this reason product Z's position was poorly shown. Product Y was shown as making profit whereas it is making loss of ₹63,000. Even position of product X was not poorly shown. It is making a profit of ₹80,000, whereas in conventional costing, it was shown making a profit of ₹1,60,000. Illogical overhead distribution was the main reason for distributed results.

Working Notes

1.	Set-up:	Product X	8,000×₹10	₹80,000
		Product Y	3,600×₹10	₹36,000
		Product Z	1,26,000×₹10	₹12,60,000
				₹13,76,000
2.	Machining	Product X	6,000×₹15	₹90,000
		Product Y	3,800×₹15	₹57,000
		Product Z	42,000×₹15	₹6,30,000
				₹7,77,000
3.	Engineering:	Product X	2,500×₹20	₹50,000
		Product Y	2,250×₹20	₹45,000
		Product Z	20,000×₹20	₹4,00,000
				₹4,95,000

Illustration 11.

B Ltd. has decided to adopt JIT policy for materials. The following effects of JIT policy are identified-

(1) To implement JIT, the company has to modify its production and material receipt facilities at a capital cost of ₹10,00,000. The new machine will require a cash operating cost ₹1,08,000 p.a. The capital cost will be depreciated over 5 years.

(2) Raw material stockholding will be reduced from ₹40,00,000 to ₹10,00,000.

(3) The company can earn 15% on its long-term investments.

(4) The company can avoid rental expenditure on storage facilities amounting to ₹33,000 per annum. Property Taxes and insurance amounting to ₹22,000 will be saved due to JIT programme.

(5) Presently there are 7 workers in the store department at a salary of ₹5,000 each per month. After implementing JIT scheme, only 5 workers will be required in this department. Balance 2 workers' employment will be terminated.

(6) Due to receipt of smaller lots of Raw Materials, there will be some disruption of production. The costs of stock-outs are estimated at ₹77,000 per annum.

Determine the financial impact of the JIT policy. Is it advisable for the company to implement JIT system?

Solution:

Cost-Benefit Analysis of JIT policy

Costs	₹	**Benefits**	₹
Interest on capital for modifying production facilities (₹10,00,000×15%)	1,50,000	Interest on investment on released funds (₹40,00,000-₹10,00,000) ×15%	4,50,000
Operating Costs of new production facilities	1,08,000	Saving in salary of 2 workers terminated (₹5,000×12 months×2)	1,20,000
Depreciation of new production facilities	Nil	Saving in rental Expenditure	33,000
Stock-Outs Costs (given)	77,000	Saving in Property Tax & Insurance	22,000
Net Benefit due to JIT policy	2,90,000		
Total	6,25,000	Total	6,25,000

Conclusion: The JIT policy may be implemented, as there is a Net Benefit of ₹2,90,000 per annum.

Note: Depreciation, being apportionment of capital cost, is ignored in decision-making, Tax Saving on Depreciation is not considered in the above analysis.

Illustration 12.

Dandia Ltd. follows JIT system. It had following transactions in May, 2014:

(i) Raw materials were purchased for ₹2,00,000.

(ii) Direct labour cost incurred ₹36,000

(iii) Actual overhead costs ₹3,00,000

(iv) Conversion costs applied ₹3,16,000

All materials, that were purchased, were placed into production and the production was also completed and sold during the month. The difference between actual and applied costs is computed.

You are required to pass both Traditional journal entries and Backflush journal entries.

Solution:

In the books of Dandia Ltd.

Journal Entries (Traditional)

Particulars	**Debit (₹)**	**Credit (₹)**
Material A/c……..Dr.	2,00,000	
To, Accounts Payable		2,00,000
(being purchase of raw materials)		
WIP A/c……Dr.	2,00,000	
To, Materials A/c		2,00,000
(being materials issued to production)		
WIP A/c……..Dr.	36,000	
To, Direct wages A/c		36,000
(being direct labour cost incurred)		
Overhead Control A/c……..Dr.	3,00,000	
To, Accounts Payable		3,00,000
(being overhead cost incurred)		
WIP A/c……..Dr.	2,80,000	
To, Overhead Control A/c		2,80,000
(Being application of overhead)		
Finished Goods A/c……Dr.	5,16,000	
To, WIP A/c		5,16,000
(Being completion of goods)		
Cost of Goods Sold A/c……..Dr.	5,16,000	
To, Finished Goods		5,16,000
(being cost of finished goods sold transferred)		
Cost of Goods Sold A/c……..Dr.	20,000	
To, Overhead Control A/c		20,000
(being variance is recognized)		

In the books of Dandia Ltd.

Journal Entries (Backflush)

Particulars	**Debit (₹)**	**Credit (₹)**
Raw Material in Process A/c……..Dr.	2,00,000	
To, Accounts Payable		2,00,000
(being purchase of raw materials)		

Conversion Cost Control A/c……..Dr.	3,36,000	
To, Direct wages A/c		36,000
To, Accounts Payable		3,00,000
(being overhead cost incurred)		
Finished Goods A/c……Dr.	5,16,000	
To, Raw Material in Process A/c		2,00,000
To, WIP A/c		3,16,000
(Being completion of goods)		
Cost of Goods Sold A/c……..Dr.	5,16,000	
To, Finished Goods		5,16,000
(being cost of finished goods sold transferred)		
Cost of Goods Sold A/c……..Dr.	20,000	
To, Overhead Control A/c		20,000
(being variance is recognized)		

Illustration 13.

Altra Video Company sells package of blank Video tapes to its customers. It purchases video tapes from Yash Tape Company at ₹150 per packet. Yash Tape Company pays all freight to Altra Video Company. No incoming inspection is necessary because Yash Tape Company has a superb reputation for delivery of quality merchandise. Annual demand of Altra Video Company is 15,600 packages. Altra Video Company requires 10% annual return on its investment. The purchase order Lead time is 2 weeks. The purchase order is passed through internet and it costs ₹20 per order. The relevant insurance, material handling etc. is ₹10 per package per year.

Altra Video has to decide whether or not to shift to JIT purchasing. Yash Tape Company agrees to deliver 100 packages of Video tapes 156 times per year (6 times every 2 weeks) instead of existing delivery system of 1,200 packages 13 times a year, with additional amount of Re.0.05 per package. Altra Video Company incurs no stock out under its current purchasing policy. It is estimated that Altra Video Company will incur stock out cost on 50 video tape packages under a JIT purchasing policy. In the event of stock out, Altra video company has to rush order tape packages, which costs ₹8 per package. Comment whether Altra Video Company should implement JIT purchasing system.

Ram Co. also supplies video tapes. It agrees to supply at ₹145 per package under JIT delivery system. If video tape is purchased from Ram Co. relevant carrying cost would be ₹9 per package against ₹10 in case of purchasing from Yash Tape Company. However Ram Co. does not enjoy a sterling reputation for quality, Altra Video Company anticipates the following negative aspects of purchasing tapes from Ram Co.

(1) Incurring additional inspection cost of ₹0.05 per package.

(2) Average stock out of 360 tape packages per year would occur, largely resulting from late deliveries. Ram Co. cannot rush order at short notice. Altra Video Company anticipates lost contribution margin per package of ₹10 from stock out.

(3) Customers would likely return 2% of all packages due to poor quality of the tape and to handle this return, an additional cost of ₹25 per package would be incurred.

Comment on whether Altra Video Company can place an order with Ram Co.

Solution:

(1) **Computation of Carrying Costs**

Carrying Cost= Interest+ Others (Insurance, Material Handling, etc.), which is calculated as under:-

Particulars	Current Policy	JIT with Yash Tape Co.	JIT with Ram Co.
(i) Interest cost	₹150×10% = ₹15.00	₹150.05×10% = ₹15.005	₹145×10% = ₹14.50
(ii) Others	₹10.00	₹10	₹9.00
(a) Total carrying cost p.u. p.a.	₹25.00	₹25.005	₹23.50
(b) Average Inventory	1/2 x 1200 = 600 units	1/2 x 100 = 50 units	1/2 x 100 = 50 units
(c) Carrying Costs p.a. (a× b)	₹15,000	₹1,250	₹1,175

(2) **Comparative Statement of Relevant Annual Costs of Purchasing Policies**

Particulars	Current policy	JIT with Yash Tape Co.	JIT with Ram Co.
(a) Cost of tapes purchased	15,600 tapes×₹150 =₹23,40,000	15,600 tapes×₹150.05 =23,40,780	15,600 tapes ×₹145 =₹22,62,000
(b) Ordering or buying costs	13 orders×₹20=₹260	156 orders×₹20=₹3,120	156 orders×₹20=₹3,120
(c) Carrying costs [As calculated in (1)]	₹15,000	₹1,250	₹1,175
(d) Stock out costs	Nil	50 units×₹8=₹400	360 units×₹10=₹3,600
(e) Inspection Costs	Nil	Nil	15,600 units×0.05=₹780
(f) Customer Return costs	Nil	Nil	15,600 units×2%×₹25 =₹7,800
Total Relevant costs	**₹23,55,260**	**₹23,45,550**	**₹22,78,475**

Conclusions:

(1) Compared to present system, JIT with Yash Tape Co. will result in cost saving of ₹23,55,260 - ₹23,45,550 = ₹9,710. Hence, JIT system may be implemented.

(2) Comparing present system, JIT with Yash Tape Co and Ram Co., JIT with Ram Co. results in the least total cost. Hence, the packages may be bought from Ram Co.

Study Note - 10

COST OF QUALITY AND TOTAL QUALITY MANAGMENT

This Study Note includes

10.1 COST OF QUALITY

Quality of product or service is decided by the customer and is built into the service on product through the design for it. A customer has certain needs or requirements for product or service. It is the design of product or service which builds these requirements as product or service specifications into the product or service–including the way the product or service would be delivered to the customer. The way the product is made or the service is delivered is according to a set of processes which are in sequence. This set of processes, their sequence and interdependence gets defined while the design activity is performed and the design of process has a direct impact on the outcome, that is, the extent to which the outcome meets the specifications developed during design. Process design also contributes to quality.

Concept of Quality

Quality as perception: You will not be wrong when you state that the term quality is a perception which is personal to an individual. In plain terms, quality is "features" or "worth" or "value". You will realise how this is true when you read the following phrases picked from literature on quality.

(i) "Quality is not an act. It is a habit"- Aristotle. This is true and applicable to any act of a human being.

(ii) "Quality is conformance to requirements": This in line with the concept that quality is decided by the customer.

(iii) "Quality is zero defects": No customer wants defects in the products or services he or she pays for. This is a totally different idea on quality and is true when you make quality a habit.

(iv) "Quality is free" - Phil Crosby. This is the utopian situation. When there are no defects then there is no wastage and thus quality becomes free.

(v) "Quality is the degree to which a set of inherent characteristics fulfils requirements"- ISO 9000. This is an attempt to give universality to the term quality.

Today, there is no single universal definition of quality. Some people view quality as "performance to standards."Others view it as "meeting the customer's needs" or "satisfying the customer." Let's look at some of the more common definitions of quality.

- **Conformance to specifications** measures how well the product or service meets the targets and tolerances determined by its designers. For example, the dimensions of a machine part may be specified by its design engineers as $3 \pm .05$ inches. This would mean that the target dimension is 3 inches but the dimensions can vary between 2.95 and 3.05 inches. Similarly, the wait for hotel room service may be specified as 20 minutes, but there may be an acceptable delay of an additional

10 minutes. Also, consider the amount of light delivered by a 60 watt light bulb. If the bulb delivers 50 watts it does not conform to specifications. As these examples illustrate, conformance to specification is directly measurable, though it may not be directly related to the consumer's idea of quality.

- **Fitness for use** focuses on how well the product performs its intended function or use. For example, a Mercedes Benz and a Jeep Cherokee both meet a fitness for use definition if one considers transportation as the intended function. However, if the definition becomes more specific and assumes that the intended use is for transportation on mountain roads and carrying fishing gear, the Jeep Cherokee has a greater fitness for use. You can also see that fitness for use is a user-based definition in that it is intended to meet the needs of a specific user group.
- **Value for price paid** is a definition of quality that consumers often use for product or service usefulness. This is the only definition that combines economics with consumer criteria; it assumes that the definition of quality is price sensitive. For example, suppose that you wish to sign up for a personal finance seminar and discover that the same class is being taught at two different colleges at significantly different tuition rates. If you take the less expensive seminar, you will feel that you have received greater value for the price.
- **Support services** provided are often how the quality of a product or service is judged. Quality does not apply only to the product or service itself; it also applies to the people, processes, and organizational environment associated with it. For example, the quality of a university is judged not only by the quality of staff and course offerings, but also by the efficiency and accuracy of processing paperwork.
- **Psychological criteria** is a subjective definition that focuses on the judgmental evaluation of what constitutes product or service quality. Different factors contribute to the evaluation, such as the atmosphere of the environment or the perceived prestige of the product. For example, a hospital patient may receive average health care, but a very friendly staff may leave the impression of high quality. Similarly, we commonly associate certain products with excellence because of their reputation; Rolex watches and Mercedes-Benz automobiles are examples.

Differences Between Manufacturing and Service Organizations

Defining quality in manufacturing organizations is often different from that of services. Manufacturing organizations produce a tangible product that can be seen, touched, and directly measured. Examples include cars, CD players, clothes, computers, and food items. Therefore, quality definitions in manufacturing usually focus on tangible product features.

The most common quality definition in manufacturing is *conformance,* which is the degree to which a product characteristic meets preset standards. Other common definitions of quality in manufacturing include *performance*—such as acceleration of a vehicle; *reliability*—that the product will function as expected without failure; *features*—the extras that are included beyond the basic characteristics; *durability*— expected operational life of the product; and *serviceability*—how readily a product can be repaired. The relative importance of these definitions is based on the preferences of each individual customer. It is easy to see how different customers can have different definitions in mind when they speak of high product quality.

In contrast to manufacturing, service organizations produce a product that is intangible. Usually, the complete product cannot be seen or touched. Rather, it is experienced. Examples include delivery of health care, experience of staying at a vacation resort, and learning at a university. The intangible nature of the product makes defining quality difficult. Also, since a service is experienced, perceptions can be highly subjective. In addition to tangible factors, quality of services is often defined by perceptual factors. These include responsiveness to customer needs, *courtesy* and *friendliness* of staff, *promptness* in resolving complaints, and *atmosphere*. Other definitions of quality in services include *time*—the amount of time a customer has to wait for the service; and *consistency*—the degree to which the service is the same each time. For these reasons, defining quality in services can be

especially challenging. Dimensions of quality for manufacturing versus service organizations are shown in the Table.

Dimensions of Quality for Manufacturing Versus Service Organizations

Manufacturing organizations	Service organizations
Conformance to specifications	Tangible factors
Performance	Consistency
Reliability	Responsiveness to customer needs
Features	Courtesy/friendliness
Durability	Timeliness/ promptness
Serviceability	Atmosphere

Concepts of Quality Management

Quality management is defined as "coordinated activities to direct and control an organization with regard to quality"(ISO 9000:2000). The activities are normally integrated into a system.

This is known as the systems approach to managing quality and the same approach needs to be adapted to business operations. Starting from early 60s and migrating to the 70s, the practices of quality management have shown an evolution. In the following paragraphs, you will get an overview of the way these evolution started from the activity or process of "Inspection".

Inspection: Inspection is defined as "Activities such as measuring, testing and gauging one or more characteristics of a product or service and comparing with specifications as in design to determine its conformity". This approach is the "after the event" approach, meaning the things which have happened and then which you verify by, measuring or testing and screen out those which do not meet specifications. Organisation is said to be working in a "detection" mode, having things or events which have happened! The result is that the nonconforming products are cost as they are a waste of material and as well as that of efforts or needing some rework or being sold as "seconds" at a lower price all resulting into a dent in profits. This also creates the culture of "somebody else will check my outcome and it is that somebody's responsibility to give the conforming product". This approach had several limitations and had to be replaced by another effective way of attaining quality and the concept of Quality Control was the result.

Quality Control: Defined as "Operational techniques and activities that are used to fulfill requirements for quality". Organisations realized that "Inspection" alone was a costly affair as all that was segregated was a waste and a cost to the organisation, thus reducing profitability. The result was the idea of "control on operations," as Quality control. This was not necessarily very different from Inspection but had a new look at inspection. Under a system of quality control, there was a need to find controls for an activity, in the form of procedures, intermediate stage inspections and recording of performance of a process for giving feedback. The methods of inspection got sophisticated with addition of tools like sample checks, lot size, etc for inspections at identified stages. However, the intention and activity of preventing a non-conforming product reaching a customer depended solely on the screening inspection at the final stage of production or service delivery. Application of this concept of course resulted into lesser defects but remained in nature as "detection mode", which we have discussed earlier.

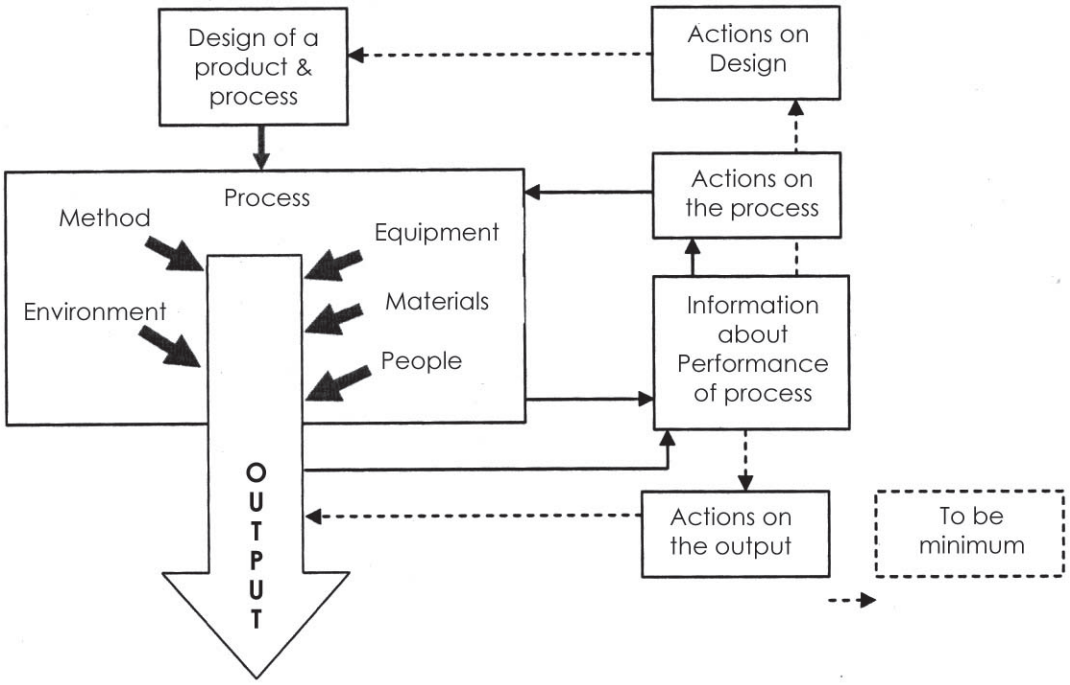
Quality Assurance: From the business point of view, eliminating non-conformance was the key to a better level of quality and assurance of quality. And then the concept of Quality Assurance (QA) was developed. The central idea is to identify the root cause of non- conformity, take steps to eliminate the cause and thus remove recurrence of the nonconformity in future deliveries to the customer. QA is defined as "All those planned and systematic actions necessary to provide an adequate confidence that a product or service will satisfy the given requirements for quality".

Quality assurance is a prevention based system. The system improves product and service quality and increases productivity by placing emphasis on the design of product or service and relevant processes. The basis is that the process that makes the product or a service needs to be designed in such a manner that the variation in the process outcome is minimal in reference to design specifications, thus eliminating non-conformance. This is a proactive approach as compared to the reactive one in the "detection mode" discussed above.

In this system of operations, quality is created in the design stage and not in the control stage. The premise is that the design of the products and the processes makes the quality happen and not any verification or inspection as in the detection mode. Changing from "detection mode" to "prevention based system" requires the use of a set of quality management tools and techniques along with a new operating philosophy and approach –even of thinking, by the top management.

The new philosophy demands a change in the management style to integrate various functions or departments to work together to discover the root cause of non-conformance or variation and to pursue elimination. Quality planning and improvements begin when the top management includes prevention, as opposed to detection, in organisational policies because this philosophy directs the business towards the future.

Integrating various processes of the business into "a whole" was at the basis and thus a true system approach to business. Such thinking resulted into a new practice which came to be known as the "Total Quality Management" (TQM). To get an insight into this concept, you need to understand that no-business process can work in isolation. Interdependence and an interaction between each of the business processes exist, and must be addressed while operating a business. This is the systems approach.



Schematic for a Prevention Based System

COST OF QUALITY

The reason quality has gained such prominence is that organizations have gained an understanding of the high cost of poor quality. Quality affects all aspects of the organization and has dramatic cost

implications. The most obvious consequence occurs when poor quality creates dissatisfied customers and eventually leads to loss of business. However, quality has many other costs, which can be divided into two categories. The first category consists of costs necessary for achieving high quality, which are called *quality control costs*. These are of two types: *prevention costs* and *appraisal costs.* The second category consists of the cost consequences of poor quality, which are called *quality failure costs.* These include *external failure costs* and *internal failure costs*. The first two costs are incurred in the hope of preventing the second two.

Prevention costs are all costs incurred in the process of preventing poor quality from occurring. They include quality planning costs, such as the costs of developing and implementing a quality plan. Also included are the costs of product and process design, from collecting customer information to designing processes that achieve conformance to specifications. Employee training in quality measurement is included as part of this cost, as well as the costs of maintaining records of information and data related to quality.

Appraisal costs are incurred in the process of uncovering defects. They include the cost of quality inspections, product testing, and performing audits to make sure that quality standards are being met. Also included in this category are the costs of worker time spent measuring quality and the cost of equipment used for quality appraisal.

Internal failure costs are associated with discovering poor product quality before the product reaches the customer site. One type of internal failure cost is *rework*, which is the cost of correcting the defective item. Sometimes the item is so defective that it cannot be corrected and must be thrown away. This is called *scrap,* and its costs include all the material, labor, and machine cost spent in producing the defective product.

Cost of Quality

External failure Costs are incurred when inferior products are delivered to customers. They include cost of handling customer complaints, warranty replacements, repairs of returned products and cost arising from a damaged company reputation.

Hence we can tabulate the above details with suitable examples as below:

Prevention costs	Ensuring the failures do not happen Example: • Quality training • Quality circles • Statistical process control activities • System Development for prevention • Quality improvement
Appraisal costs	Checking for failures Example: • Testing and inspecting materials • Final product testing and inspecting • WIP testing and inspecting • Package inspection • Depreciation of testing equipment

Internal failure costs	Keeping defective products from falling into the hands of customers Example: • Cost of Scrap (net of realization) • Cost of Spoilage • Cost of Rework • Down time due to defect in quality • Retesting
External failure cost	Costs of defects discovered by the customers Example: • Cost of field servicing • Cost of handling complaints • Warranty repairs • Lost sales • Warranty replacements

10.2 TOTAL QUALITY MANAGEMENT (TQM)

Total Quality Management is a philosophy of continuously improving the quality of all the products and processes in response to continuous feedback for meeting the customers' requirements. It aims to do things right the first time, rather than need to fix problems after they emerge (A company should avoid defects rather than correct them). Its basic objective is customer satisfaction.

The elements of TQM are:

Total	Quality involves everyone and all activities in the company (Mobilizing the whole organization to achieve quality continuously and economically)
Quality	Understanding and meeting the customers' requirements. (Satisfying the customers first time every time)
Management	Quality can and must be managed (Avoid defects rather than correct them)

TQM is a vision based, customer focused, prevention oriented, continuously improvement strategy based on scientific approach adopted by cost conscious people committed to satisfy the customers first time every time. It aims at Managing an organization so that it excels in areas important to the customer.

The underlying principles of TQM:

The philosophy of TQM rest on the following principles which are enlisted below:

1. Clear exposition of the benefits of a project.
2. Total Employee involvement (TEI).
3. Process measurement.
4. Involvement of all customers and contributors.
5. Elimination of irrelevant data.
6. Understanding the needs of the whole process.

7. Use of graphical and pictorial techniques to achieve understanding.
8. Establishment of performance specifications and targets.
9. Use of errors to prompt continuous improvement.
10. Use of statistics to tell people how well they are doing

Steps in Total Quality Management:

Step 1: **Identification of customers/customer groups:**

Through a team approach (a technique called Multi-Voting), the Firm should identify major customer groups. This helps in generating priorities in the identification of customers and critical issues in the provision of decision-support information.

Step 2: **Identifying customer expectations:**

Once the major customer groups are identified, their expectations are listed. The question to be answered is - What does the customer expect from the Firm?

Step 3: **Identifying customer decision-making requirements and product utilities:**

By identifying the need to stay close to the customers and follow their suggestions, a decision-support system can be developed, incorporating both financial and non-financial and non-financial information, which seeks to satisfy user requirements. Hence, the Firm finds out the answer to - What are the customer's decision-making requirements and product utilities? The answer is sought by listing out managerial perceptions and not by actual interaction with the customers.

Step 4: **Identifying perceived problems in decision-making process and product utilities:**

Using participative processes such as brainstorming and multi-voting, the Firm seeks to list out its perception of problem areas and shortcomings in meeting customer requirements. This will list out areas of weakness where the greatest impact could be achieved through the implementation of improvements. The Firm identifies the answer to the question - What problem areas do we perceive in the decision-making process?

Step 5: **Comparison with other Firms and benchmarking:**

Detailed and systematic internal deliberations allow the Firm to develop a clear idea of their own strengths and weaknesses and of the areas of most significant deficiency. Benchmarking exercise allows the Firm to see how other Companies are coping with similar problems and opportunities.

Step 6: **Customer Feedback:**

Steps 1 to 5 provide a information base developed without reference to the customer. This is rectified at Steps 6 with a survey of representative customers, which embraces their views on perceived problem areas. Interaction with the customers and obtaining their views helps the Firm in correcting its own perceptions and refining its processes.

Steps 7 & 8: **Identification of improvement opportunities and implementation of Quality Improvement Process:**

The outcomes of the customer survey, benchmarking and internal analysis, provides the inputs for Steps 7 and 8, i.e. the identification of improvement opportunities and the implementation of a formal improvement process. This is done through a six-step process called **PRAISE**, for short.

6C's and 4P's

The essential requirements for successful implementation are described as the six C's of TQM. These are:

The 6C's	
Commitment	If a TQM culture is to be developed, total commitment must come from top management. It is not sufficient to delegate 'quality' issues to a single person. Quality expectations must be made clear by the top management, together with the support and training required for its achievement.
Culture	Training lies at the centre of effecting a change in culture and attitudes. Negative perceptions must be changed to encourage individual contributions and to make 'quality' a normal part of everyone's job.
Continuous improvement	TQM should be recognised as a 'continuous process'. It is not a 'one-time programme'. There will always be room for improvement, however small it may be.
Co-operation	TQM visualises Total Employee Involvement (TEI). Employee involvement and co-operation should be sought in the development of improvement strategies and associated performance measures.
Customer focus	The needs of external customers (in receipt of the final product or service) and also the internal customers (colleagues who receive and supply goods, services or information), should be the prime focus.
Control	Documentation, procedures and awareness of current best practice are essential if TQM implementations are to function appropriately. Unless control procedures are in place, improvements cannot be monitored and measured nor deficiencies corrected.

It is possible that the organisation is led to Total Quality Paralysis, instead of improvement, by improper implementation of TQM. To avoid such disruption and paralysis the following principles (called the four P's) of TQM should be followed:

The 4P's	
People	To avoid misdirection, TQM teams should consist of team spirited individuals who have a flair for accepting and meeting challenges. Individuals who are not ideally suited to the participatory process of TQM, should not be involved at all, e.g. lack of enthusiasm, non-attendance at TQM meetings, failure to complete delegated work, remaining a "Mute Spectator" at TQM meetings, etc.
Process	It is essential to approach problem-solving practically and to regard the formal process as a system designed to prevent participants from jumping to conclusions. As such, it will provide a means to facilitate the generation of alternatives while ensuring that important discussion stages are not omitted.
Problem	Problems need to be approached in a systematic manner, with teams tackling solvable problems with a direct economic impact, allowing for immediate feedback together with recognition of the contribution made by individual participants.
Preparation	Additional training on creative thinking and statistical processes are needed in order to give participants a greater appreciation of the diversity of the process. This training must quickly be extended beyond the immediate accounting circle to include employees at supervisory levels and also who are involved at the data input stagey

10.3 PRAISE ANALYSIS

Identification of improvement opportunities and implementation of quality improvement process, of the TQM Process is through a six-step activity sequence, identified by the acronym 'PRAISE'.

Step	Activity	Elements
1	Problem Identification	• Areas of customer dissatisfaction. • Absence of competitive advantage.
2	Ranking	• Prioritise problems and opportunities by – 1. Perceived importance, and 2. Ease of measurement and solution.
3	Analysis	• Ask "Why?" to identify possible causes. Keep asking 'Why?' beyond to the move symptoms and to avoid jumping to premature conclusion;,. • Ask 'What?' to consider potential implications. • Ask 'How much?' to quantify cause and effect.
4	Innovation	• Use creative thinking to generate potential solutions. • Operationalise these solutions by identifying – 1 . Barriers to implementation, 2. Available enablers, and 3. People whose co-operation must be sought.
5	Solution	• Implement the preferred solution. • Take appropriate action to bring about the required changes. • Reinforce with training and documentation back-up.
6	Evaluation	• Monitor the effectiveness of actions. • Establish and interpret performance indicators to track progress towards objectives • Identify the potential for further improvements and return to Step 1 .

Difficulties in PRAISE Analysis

Step	Activity	Difficulties	Remedies
1	Problem Identification	• Effects of a problem are apparent, but the problems themselves are difficult to identify. • Problem may be identifiable, but it is difficult to identify a measurable improvement opportunity. • Some problems are too vague to define e.g. morale, communication, productivity etc.	• Participative approaches like brainstorming, multi-voting, panel discussion. • Quantification and precise definition of problems.

2	Ranking	• Difference in perception of individuals in ranking • Difference in preferences based on functions, e.g. production, finance, marketing etc. • Lack of consensus between individuals.	• Participative Approach. • Subordination of individual to group interest.
3	Analysis	• Adoption of adhoc approaches and quick-fix solutions.	• Lateral Thinking. • Brainstorming.
4	Innovation	• Lack of creativity or expertise. • Inability to operationalise ideas, i.e. convert thoughts into action points.	• Systematic evaluation of all aspects of each strategy.
5	Solution	• Resistance from middle managers.	• Effective internal communication. • Training of personnel and managers. • Participative approach.
6	Evaluation	• Problems in implementation. • Lack of measurable data for comparison of expectations with actuals.	• Effective Control System to track actuals. • Feedback system.

Central to the PRAISE system are - (a) Quality Control - the search for continuous improvements in quality -and (b) Total Employee Involvement - the co-operation and commitment of employees. This dual approach provides a single focus - the customer - whose increased satisfaction remains the primary goal of the procedure.

Implementation of PRAISE Process

A three-point action plan for implementation of the process is -

1. Small to Big Issues: Big improvement opportunities are generally complex and require extensive interdepartmental co-operation. The choice of a relatively small problem in the first instance provides a greater chance of success. Therefore, the TQM team has to proceed from small to big issues gradually.
2. Solvable problem: The problem selected should not be trivial, but it should be one with a potential impact and a clear improvement opportunity. Measurable progress towards implementation should be accomplished within a reasonable time in order to maintain the motivation of participants and advertise the success of the improvement itself.
3. Recognition of participants: The successful projects and team members should receive appropriate recognition. Prominent individuals should be rewarded for their efforts through monetary / non-monetary prices as a measure of personal recognition and as encouragement to others.

10.4 QUALITY COST REPORT

A company's total quality cost is likely to be very high unless management gives this area special attention. Experts say that these costs should be more in 2% to 4% range. **How does a company reduces its total quality cost?** The answer lies in how the quality costs are distributed. Total quality cost is a function of **quality of conformance**. A high quality of conformance means that a product is free of defects and a low quality of conformance means that a product has defects. In this sense an economy car may have a quality of conformance same as a very expensive car if it has no defects. Like wise an expensive car may have less quality of conformance if it has defects that effect its use. When the quality of conformance is low, total quality cost is high and most of this cost consists of cost of internal and external failure. A low quality of conformance means that a high percentage of units is defective and hence the company must incur high failure costs. However, as a company spends more and more on prevention and appraisal activities, the percentage of defective units drops. This results in lower costs of internal and external failure costs. Ordinarily total quality cost drops rapidly as the quality of conformance increases.

Thus, a company can reduce its total quality cost by focusing its efforts on prevention and appraisal. The cost savings from reduced defects usually swamp the costs of the additional prevention and appraisal efforts.

As a company's quality program becomes more refined and as its failure costs begin to fall, prevention activities usually become more effective than appraisal activities. Appraisal can only find defects, whereas prevention can eliminate them. The best way to prevent defects from happening is to design processes that reduce the likelihood of defects and to continually monitor processes using statistical process control methods.

Quality Cost Report:

A **quality cost report** details the prevention costs, appraisal costs, and internal failure cost and external failure cost that arise from company's current level of defective products or services. Companies often construct a quality cost report that provides an estimate of the financial consequences of the company's current level of defects. A simple *quality cost report* is shown in the following example:

Example of Quality Cost Report
Ventura Company
Quality Cost Report
For the Year1 & 2

	Year 2		Year 1	
	Amount	**Percent**	**Amount**	**Percent**
Prevention Cost	1,000,000	2.00%	650,000	1.30%
Appraisal Costs	1,500,000	3.00%	1,200,000	2.40%
Internal Failure Costs	3,000,000	6.00%	2,000,000	4.00%
External Failure Costs	2,000,000	4.00%	5,150,000	10.30%
Total Quality Cost	7,500,000	15.00%	9,000,000	18.00%

Prevention cost increased by (1,000,000 – 650,000) = 350,000
Appraisal cost increased by (1,500,000 – 1,200,000) = 300,000
Internal Failure cost (3,000,000 – 2,000,000) = 1,000,000
Total Increase = 1,650,000
External failure cost decreased by = 3,150,000
Net Quality Cost Benefit = 3,150,000 – 1,650,000 = 1,500,000

Several things should be noted from the data in the quality cost report. First, note that the quality costs are poorly distributed in both years, with most of costs being traceable to either internal or external failure. The external failure costs are particularly high in year 1 in comparison to other costs. Second note that the company increased its spending on prevention and appraisal activities in year 2. As a result, internal failure costs went up in that year (from $2 million in first year to $3 million in year 2), but external failure costs dropped sharply (from $5.15 million in year 1 to $3 million in year 2). Because of the increase in appraisal activates in year 2, more defects were caught inside the company before they were shipped to the customers. This resulted in more cost for scrap, rework, and so forth, but saved huge amounts in warranty repairs, warranty replacements, and external failure costs. Third, note that as a result of greater emphasis on prevention and appraisal, total quality cost decreased in year 2. As continued emphasis is placed on prevention and appraisal in future years, total quality cost should continue to decrease. That is, future increases in prevention and appraisal costs should be more than offset by decreases in failure costs. Moreover, appraisal costs should also decrease as more effort is placed into prevention.

10.5 CONTINUOUS PROCESS IMPROVEMENT

Quality is a never ending quest and Continuous Process Improvement (CPI) is a never ending effort to discover and eliminate the main causes of problems. It accomplishes this by using small-steps improvements, rather than implementing one huge improvement. The Japanese have a term for this called kaizen which involves everyone, from the hourly workers to top-management.

CPI means making things better. It is NOT fighting fires. Its goal is NOT to blame people for problems or failures. . . it is simply a way of looking at how we can do our work better. When we take a problem solving approach, we often never get to the root causes because our main goal is to put out the fire. But when we engage in process improvement, we seek to learn what causes things to happen and then use this knowledge to:

- Reduce variation.
- Remove activities that have no value to the organization.
- Improve customer satisfaction.

Process improvement is important as Rummler & Brache's research (1995) showed that process account for about 80% of all problems while people account for the remaining 20%.

Steering Committee and CPI Teams

One way to get CPI started is to set up a Steering Committee (SC). Although everyone in the organization is responsible for CPI, the SC follows all ideas from conception to completion. Some organizations might have several SCs working on different processes, departments, or systems; while smaller organizations might set up one SC to oversee all CPI projects. Normally, there is one SC that oversees all CPI projects within a physical area. It in turn, passes each CPI suggestion on to a CPI team that carries that project out to completion. At the very least, the SC must contain members who can approve a project (spending authority).

CPI Procedure

CPI has been described using a number of models. Here we will discuss the system approach or ADDIE (Analysis, Design, Development, Implement, Evaluate) model. There are five phases in this model:

Analysis Phase:

The first step in the ADDIE process is "Analyze." The one that would be most appropriate for this step is "Seek First to Understand, Then to be understood." This is the stage when asking questions of stakeholders is the primary task so that we can completely understand the current situation (reality), the desired

situation (goals), and then to determine what the gaps are in employee knowledge, skills and attitude. The outcome of this stage is a report that summarizes these issues known as a training needs analysis. Below are a few key questions that can be asked during this phase of the process:

- What are the organizational goals?
- What are the training program objectives?
- Who are the stakeholders?
- Who is the audience and what are their characteristics?
- What does the audience need to learn?
- What is the extent of participant knowledge/skills prior to training?
- What resources are available for the planning and implementation of the project?
- What are the constraints?
- What are the delivery options?
- What approach will be used for transferring learned skills to the workplace?
- What will participants do to determine their competency?
- When should the project be completed?
- What are the project risks?
- What will be the project costs?
- What are the anticipated benefits of the project?

Design Phase:

The second step of the ADDIE process is "Design." The primary tasks in this stage are to take the information gathered during the Analysis stage and do some further questioning of stakeholders in order to establish a framework for the training program in question. The end product of this stage is a program design outline. This document would contain all the strategies for the training program, but not the content of the topic(s). Below are a few significant factors to take into consideration when designing a program design outline:

- How do the organizational and program objectives translate into specific learning objectives?
- Based on the learning objectives, what content must be developed?
- What will be the program structure?
- What will be the program sequence?
- What will be the program duration?
- What will be the pace of the program?
- What will be the mode(s) of delivery?
- What type(s) of skill assessment process and instruments will be utilized?
- How will the training program itself be evaluated?
- What are the specific expectations for transfer of learning?
- What support will be in place in the workplace to reinforce transfer of learning?

Development Phase:

The third step of the ADDIE process is "Develop." During this stage, the training topics identified during the first two steps are researched and the training program content is determined. This content is then

translated into a variety of products. It is important to remember that it is not only important to come up with the content that addresses the true learning needs, but it is also important to put thoughtful consideration into how the information will be presented. Below are the products that should come out of this step:

- Communication packets for program stakeholders
- Training lesson plans
- Trainer guides
- Participant workbooks & handouts
- Trainer and participant resources
- Training and job aids
- Coaching/mentoring guides and resources
- Technology infrastructure and software (if needed)
- Participant Knowledge/Skills/Attitude assessment tools
- Program evaluation instruments
- A pilot to test if the program meets the organization's expectations/requirements
- A review of implementation and evaluation costs, effort required and schedule

Implementation Phase:

The fourth step of the ADDIE process is "Implement." It is during this stage that all the work up to this point is put into action. If the planning in the first three steps has been done well, then the implementation stage should also go well. The actual hard-copy products of this stage are the completed knowledge/skills/attitude assessments, attendance records, and completed participant feedback forms. Below are the tasks to be completed in this phase of the process:

- Rollout program communications to stakeholders.
- Produce program materials and aids.
- Prepare coaches/mentors/trainers.
- Install technology infrastructure and services (if needed).
- Set up administrative databases and systems.
- Install job aids.
- Set up venue(s) for the program.
- Schedule participants.
- Conduct training sessions.
- Implement training transfer strategies.
- Conduct participant KSA assessments.
- Collect participant feedback.

Evaluation Phase:

The fifth and final step of the ADDIE process is "Evaluate." Many people misunderstand this stage. They think that if you evaluate the learning experiences by collecting participant feedback forms, then you are done. This is far from accurate. Remember that this is a proactive process. People who do this stage

will collect participant feedback and take the information to learn how to improve the program – and then they make the changes necessary for that improvement. They also continually assess the impact that the training is having on the employees, the department, and the organization as a whole. They do this to ensure that the training is achieving the desired results. If it stops doing this, the training must be changed or replaced with something more appropriate. The products of this stage are completed evaluations and reports that summarize the implications of the evaluations. Sometimes the evaluation results indicate that the ADDIE process must be started over because a different direction is needed. Proactive project leaders will be open to starting over from scratch if they believe it is necessary. Below are the primary tasks found in this ADDIE step:

- Collect training program evaluation data.
- Collect project evaluation data.
- Review training program performance.
  - ❖ number of employees trained
  - ❖ percent participants passed (if applicable)
  - ❖ participant satisfaction
- Review project performance.
  - ❖ cost
  - ❖ schedule
  - ❖ scope
  - ❖ stakeholder satisfaction
  - ❖ project team satisfaction
- Report program and project performance results.

Illustration 1.

A company manufactures a component on batches of 2,000 each. Each component is tested before being sent to the agents for sales. Each component can be tested at the factory at a cost of ₹25. If any component is found to be defective, it can be rectified by spending ₹200. In view of the large demand for the components and the sophisticated system of manufacture, a proposal came up that the practice of pre-testing of the components to be dispensed with to save costs. In that event, any defective component is received back from the customer under warranty, the cost of rectification and re-dispatch will be ₹400 per component.

State at what percentage of manufacture of components, the company will find it cheaper to pre-test each component.

Solution:

Let the defectives be d

To set (2,000 × 25) + 200d

If defectives are rectified after return from customers, the cost = 400d

At Cost indifference point:

(2,000 × 25) + 200d = 400d

or, 200d = 50,000

or, d = 250

Percentage of defectives to total components = 250 ÷ 2,000 × 100 = 12.5%

If defectives are more than 12.5%, pre-testing is advised.

Illustration 2.

Snacks Ltd. initiated a quality improvement program at the beginning of the year. Efforts were made to reduce the number of defective units produced. By the end of the year, reports from the production manager revealed that scrap and rework had both decreased. Though pleased with success, the CEO of the company wanted some assessment of the financial impact of the improvements. To make this assessment, the following financial data were collected for the current and preceding year:

Particulars	**2011-12 (₹)**	**2012-13 (₹)**
Sales	1,00,00,000	1,00,00,000
Scrap	4,00,000	3,00,000
Rework	6,00,000	4,00,000
Product inspection	1,00,000	1,25,000
Product warranty	8,00,000	6,00,000
Quality training	40,000	80,000
Material inspection	60,000	40,000

You are required to —

(i) Classify the cost as prevention, appraisal, internal failure, or external failure.

(ii) Compute the profit that has increased because of quality improvements.

Solution:

(i) **Costs Classification:**

Prevention Costs	Quality training
Appraisal Cost	Product inspection and materials inspection
Internal Failure	Scrap and rework
External Failure	Product warranty

(ii) **Computation of the profit that has increased because of quality improvements:**

	₹
Total quality cost for the year 2011-12	20,00,000
Total quality cost for the year 2012-13	15,45,000
Cost savings/ profit increased	4,55,000

Illustration 3.

A Company manufactures a single product, the estimated costs of which are as follows:

Direct material ₹ 20 each

Direct Wages 10 hours at ₹ 1.00 per hour

Overhead absorption rate ₹ 2.00 per hour. (50% fixed overhead included)

During this period, 1,000 units will be produced and sold as follows:-

900 units of first at	₹60 each
50 units of second at	₹50 each
50 units of third at	₹30 each

By reprocessing the inferior units, taking the full re-processing time of a further 5 hours and adding further materials, costing ₹10 per unit, these 'seconds' and 'thirds' can be converted into 'firsts.'

Present information to management showing the loss due to the production of inferior units.

Solution:

Present Position (Based on 1,000 units production)

Cost per unit:

		(₹)
Direct material		20
Direct wages	(10 hrs. @ ₹1.00)	10
Overheads	(10 hrs. @ ₹2.00)	20
Total		50

	Per Unit		Units	Total	
Particulars	**Sales price (₹)**	**Profit/Loss (₹)**		**Profit (₹)**	**Loss (₹)**
First	60	10	900	9,000	-
Seconds	50	-	50	-	-
Thirds	30	(20)	50	-	1,000
				9,000	1,000
			Net Profit		8,000

Reprocessing of Inferior Units

(a) Additional expenditure for reprocessing per unit.

	(₹)
Direct material	10
Direct wages 5 hrs. @ ₹1 per hr.	5
Variable overhead @ ₹1.00	5
Total	20

Total expenditure for 100 units = 100×₹20 = ₹2,000

(b) Additional revenue

		(₹)
Seconds	(₹60-₹50)×50 units	500
Thirds	(₹60-₹30)×50	1,500
		2,000

Note: No change in the profit position hence this need not be considered.

Study Note - 11

APPLICATION OF OPERATIONS RESEARCH AND STATISTICAL TOOLS IN STRATEGIC DECISION MAKING

This Study Note includes

11.1 OPERATIONS RESEARCH

Operations research applies sophisticated statistical analysis and mathematical modeling to solve an array of business and organizational problems, as well as improve decision-making. As the business environment grows more complex, companies and government agencies rely on analysis to inform decisions that were once based largely on management intuition. Originally developed by the U.S. Department of Defense during World War II, Operations Research has helped many large companies and government agencies make better decisions, boost performance and reduce risk.

Operations Research (OR) is one of the popular managerial decision science tools used by profit and nonprofit organizations. As the global environment becomes fiercely competitive, Operations Research has gained significance in applications like World-Class Manufacturing systems(WCM), Lean production, Six-sigma quality management, Benchmarking, Just-in-time (JIT) inventory techniques. The growth of global markets and the resulting increase in competition have highlighted the need for Operation Research. In order to be competitive, businesses must meet the challenges present in a global market by offering products and services that offer good value to their customers. Good value is a combination of low cost, high quality, rapid availability and real time information on these. In order to enhance the role of operational research and speed up the process and methodologies of different stakeholders, they should work closely and complement each other's effort. In this process, the academicians should take the lead in the design, development and demonstration of sustainable operational research models. Industry should support this initiative and accelerate the transmission of this methodology. This would ensure wealth creation in the short term, and sustainable development in the long term. The government should encourage this initiative by adopting optimized responses. Consequently, optimized policy responses and its implementation would bring about positive changes in the socio political and economic environment. As a result, sustained use of operational research would be a regular feature in the decision making process of the government, industry and the society. Such a wide usage of operational research models by the government, industry and academicians would not only contribute to the discipline but also would contribute to the enhanced quality of life in India.

Role of Computers in Solving Operation Research Problems

The Operation Research problems are time consuming and involve tedious computations. Even a simple problem with few variables take a long time to solve manually and even by a hand calculator. The

advent of computers accelerated the wide use of Operation Research techniques for solving complex business problems faced by managers and administrators in business and government. The automation of computational algorithm allows decision-makers to concentrate on problem's formulation and the interpretation of the solutions. Major computer manufacturers and vendor have developed software packages for the various computer systems providing computational support for problems to be solved by the application of Operation Research techniques. Some academic departments in different universities have also produced software packages for solving various Operation Research problems. Computer manufacturers like IBM, CDC, Honeywell, UNIVAC, ICL, etc. have invested substantial amount in developing software programs for solving the optimizing, scheduling, inventory, simulation and other Operation Research problems. Also large scale simulations are possible only through computers by using GPS software packages.

Application and Scope of Operations Research

Some of the areas of management where techniques of Operations Research are applied are listed below:

Area	Application
Finance	Dividend policy making investment and budgeting portfolio analysis, cash flow analysis, credit risks, etc.
Accounting	Cash flow planning Credit policy analysis Planning of delinquent account strategy.
Marketing	Advertising and media planning Product selection, timing, competitive action Recruitment of salesmen.
Personnel	Selection of personnel, mixes of age and skills Recruitment policies and assignment of jobs Manpower planning, wage (or salary) administration Scheduling of training programmes.
Construction	Allocation of resources to projects Determination of proper workforce Deployment of workforce Project scheduling, monitoring and control.
Facilities Planning	Factory size location decision Location and size of warehouse, distribution centres and retail outlets Transportation, loading and unloading Logistics system design, layout.
Manufacturing	Employment, training, layoffs, quality control Aggregate production planning, assembly line, blending, purchasing Production scheduling, production smoothing Inventory control.
Purchasing and procurement	Bidding policies, Vendor analysis, Replacement policies Optimal buying and reordering Materials transfer.

Maintenance and Project scheduling	Preventive maintenance and maintenance policies Project scheduling and allocation of resources Maintenance crew size and scheduling Project management & strategic planning.
Research and development	Control of R&D projects Product introduction planning Organizational design and control Decision supports system & MIS.
Government	Economic planning, natural resources Energy, Urban and rural housing problem Military, police and pollution control.

Challenges in Operations Research

Due to vast quantities of data and calculation, solving optimization problems is challenging and time consuming. Thus, such approach towards performance improvement may or may not be economically feasible for some organizations. Numerous studies are conducted on development of more effective and efficient heuristic and exact algorithms that can solve large scale optimization problems.

OR is quantitative problem solving technique; hence, data plays important, if not the most important, role in producing high quality and executable solutions. With an organization that has data readily available using information system such as MRP and ERP should be able to use the required data with certain level of integrity. However, for a system that is highly manual, data driven decision science techniques presented her may or may not be the appropriate approach. With companies moving towards managing business with some form of company-wide information system; Linear Programming, Discrete Event Simulation and Queuing Theory will be most suitable and appropriate decision tools. Integrity of data depends on many factors. Information system that requires manual input of data, unstable network systems, unstable programs and defective hardware are some of the factors. The most important factor that determines high data integrity is human error when inputting data. Human errors can be minimized through education combined with hands-on training such as on-the-job training. Unfortunately, many organizations tend to focus heavily on physical system implementation and give little or no attention on education and training. Regardless, employees are often reprimanded for not entering the data correctly and the quality of hardware and/or software is questioned for poor data integrity. Sustainment is as important implementation. An organization can implement the world's greatest database, but if the personnel responsible for operating and sustaining the system lacks knowledge of performing his or her job, attaining and implementing the world's greatest system is meaningless.

Managers are also decision makers. To survive and lead the today's highly competitive and demand driven market, pressure is on management to make economical decisions. One of the essential managerial skills is ability to allocate and utilize resources appropriately in the efforts of achieving the optimal performance efficiently. In some cases such as small-scale low complexity environment, decision based on intuition with minimal quantitative basis may be reasonably acceptable and practical in achieving the goal of the organization. However, for a large-scale system, both quantitative and qualitative (i.e. intuition, experience, common sense) analyses are required to make the most economical decisions. Using Operations Research techniques including Linear Programming, Discrete Event Simulation and Queuing Theory, organization leaders can make high quality decisions. Operations managers are not expected to be experts in any decision science tools; however, he or she must have fundamental knowledge of such tools to acquire right resources and to make the most economically sounding decisions for the company as a whole.

Advantages and Limitation of Operation Research

Advantages	Limitations
1. Optimum use of production factors. 2. Improved quality of Decision. 3. Preparation of future managers. 4. Modification of mathematical Solution. 5. Better decisions. 6. Better co-ordination 7. Better control.	1. Magnitude of computation. 2. Distance between managers and Operations research. 3. Reliability of the proposed solution. 4. Presence of multiple objects. 5. Non-availability of appropriate data. 6. Deals only with quantified data.

11.2 TECHNIQUES USED IN OPERATION RESEARCH

Assignment

An Assignment problem involves **assignment** or **matching** of two things, e. g. matching of workers and jobs or matching of salesmen and areas etc. The basic principle in Assignment problem is that the matching is on a **one to one** basis. i. e. One worker can do only one job or one salesman can operate in only one area.

An assignment problem is a particular case of transportation problem where the objective is to assign a number of resources to an equal number of activities so as to minimize total cost or maximize total profit of allocation. The problem of assignment arises because available resources such as men, machines, etc. have varying degrees of efficiency for performing different activities. Therefore, cost, profit or time of performing the different activities is different. Thus, the problem is how the assignments should be made so as to optimize the given objective.

Suppose that a taxi firm has three taxis (the agents) available, and three customers (the tasks) wishing to be picked up as soon as possible. The firm prides itself on speedy pickups, so for each taxi the "cost" of picking up a particular customer will depend on the time taken for the taxi to reach the pickup point. The solution to the assignment problem will be whichever combination of taxis and customers results in the least total cost. However, the assignment problem can be made rather more flexible than it first appears. In the above example, suppose that there are four taxis available, but still only three customers. Then a fourth dummy task can be invented, perhaps called "sitting still doing nothing", with a cost of 0 for the taxi assigned to it. The assignment problem can then be solved in the usual way and still give the best solution to the problem. Similar tricks can be played in order to allow more tasks than agents, tasks to which multiple agents must be assigned (for instance, a group of more customers than will fit in one taxi), or maximizing profit rather than minimizing cost.

Hungarian Method

There are various ways to solve assignment problems. Certainly it can be formulated as a linear program (as we saw above), and the simplex method can be used to solve it. In addition, since it can be formulated as a network problem, the network simplex method may solve it quickly.

However, sometimes the simplex method is inefficient for assignment problems (particularly problems with a high degree of degeneracy). The Hungarian Algorithm developed by Kuhn has been used with a good deal of success on these problems and is summarized as follows.

Step 1. Determine the cost table from the given problem

- If the no. of sources is equal to no. of destinations, go to step 3.
- If the no. of sources is not equal to the no. of destination, go to step2.

Step 2. Add a dummy source or dummy destination, so that the cost table becomes a square matrix. The cost entries of the dummy source/destinations are always zero.

Step 3. Locate the smallest element in each row of the given cost matrix and then subtract the same from each element of the row.

Step 4. In the reduced matrix obtained in the step 3, locate the smallest element of each column and then subtract the same from each element of that column. Each column and row now have at least one zero.

Step 5. In the modified matrix obtained in the step 4, search for the optimal assignment as follows:

(a) Examine the rows successively until a row with a single zero is found. Enrectangle this row (☐)and cross off (X) all other zeros in its column. Continue in this manner until all the rows have been taken care of.

(b) Repeat the procedure for each column of the reduced matrix.

(c) If a row and/or column has two or more zeros and one cannot be chosen by inspection then assign arbitrary any one of these zeros and cross off all other zeros of that row / column.

(d) Repeat (a) through (c) above successively until the chain of assigning (☐) or cross (X) ends.

Step 6. If the number of assignment (☐) is equal to n (the order of the cost matrix), an optimum solution is reached.

If the number of assignment is less than n(the order of the matrix), go to the next step.

Step 7. Draw the **minimum number** of horizontal and/or vertical lines to cover all the zeros of the reduced matrix.

Step 8. Develop the new revised cost matrix as follows:

(a)Find the smallest element of the reduced matrix not covered by any of the lines.

(b)Subtract this element from all uncovered elements and add the same to all the elements laying at the intersection of any two lines.

Step 9. Go to step 6 and repeat the procedure until an optimum solution is attained.

Special Cases in Assignment Problems

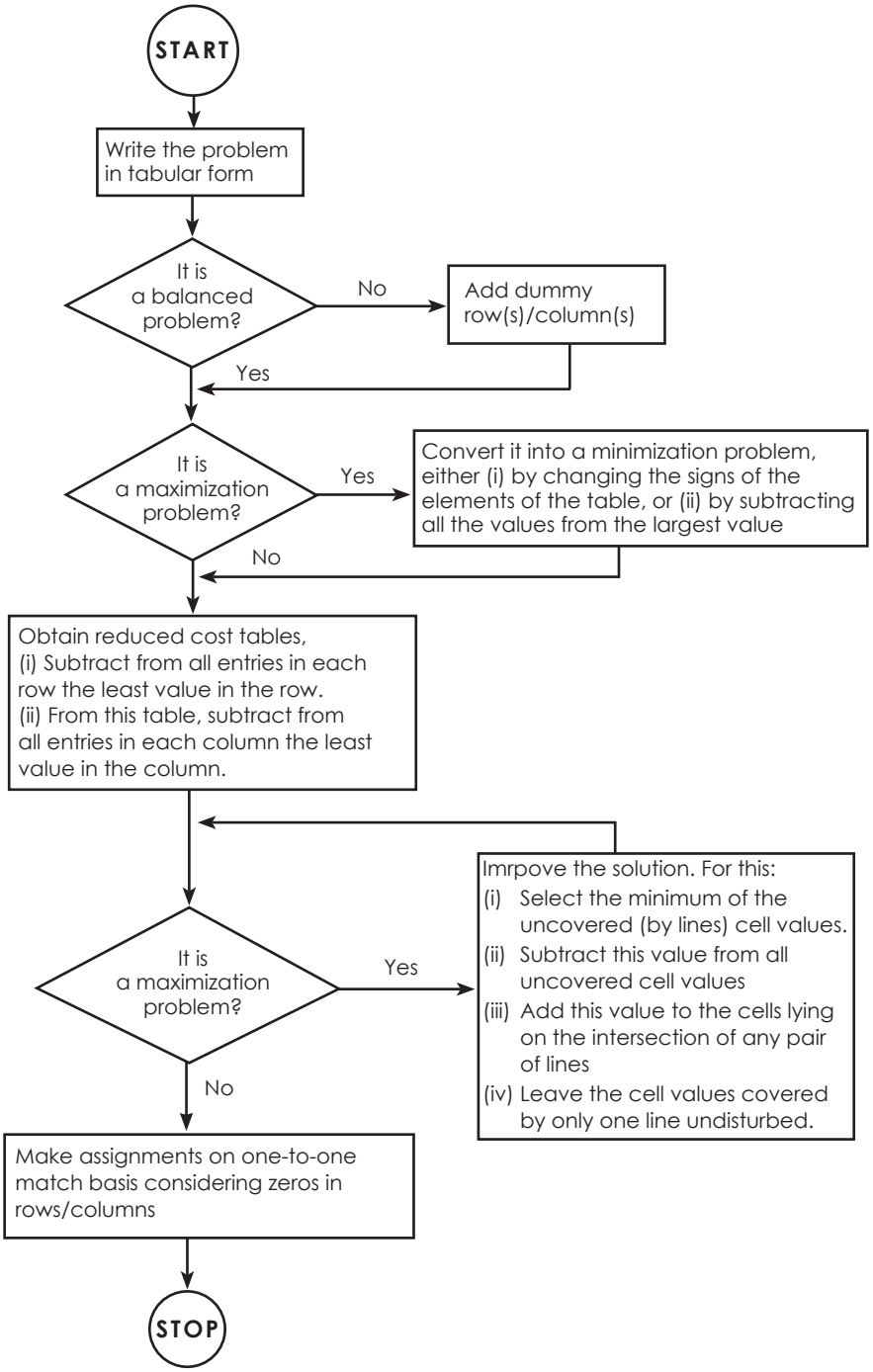
1. **Multiple Optimal Solutions:** Sometimes, it is possible to have two or more ways to cross out all zero elements in the final reduced matrix for a given problem. This implies that there are more than the required numbers of independent zero elements. In such cases, there will be multiple optimal solutions with the same total cost of assignment. In such type or situations, management may exercise their judgment or preference and select that set of optimal assignments which is more suited to their requirement.

2. **Unbalanced Assignment Problem:** Whenever, the payoff matrix of an assignment problem is not a square matrix (i.e., number of rows are not equal to the number of columns), the assignment problem is called unbalanced assignment problem, square matrix. Then, we can apply the Hungarian method to this resulting balanced (square matrix) assignment problem. For example, if four workers, are to be assigned to five machines, a dummy row is simply added to transform the assignment problem into a square (5 x 5) matrix. Creating dummy rows or columns will give us a matrix of equal dimensions and allow us to solve the problem as discussed earlier. The cost (or time) associated with this dummy or column is assigned zero elements in the matrix.

3. **Maximization Case in Assignment Problem:** In some cases, the pay off elements of the assignment problem may represent revenues or profits instead of costs so that the objective will be to maximize the total revenue or profit. The Hungarian method explained earlier can also be used for maximization case by selecting the largest element among all elements of the profit matrix and

then subtracting if form all other elements in the matrix. We can then proceed as usual and obtain the optimal solution by adding the original values of these cells to which the assignments have been made.

4. **Prohibited Assignments:** Sometimes due to certain reason, an assignment cannot be made in a particular cell. For example, a particular machine cannot be installed at a particular place or a worker cannot be given a particular job to perform. To resolve this, we put a very large cost, say M or dash (-) to avoid assignments in those cells where there is a restriction of assignment.



Transportation Technique

Transportation plays an important role in our economy and in managerial decision. Here we will focus on one particular type of transportation problem. Consider a firm that has three factories located at different sites for producing the same product. The outputs from the factories have to be transported to meet the demand at four-depot site at different location. The cost of transportation will depend upon the factory - depot combination.

Assume that the total production (supplies) from the factories equals the total of demands at all depots. Then it is possible to satisfy the demand at all the depots from available supplies. The problem is one of deciding which factory should send how much to which depot so that the total transportation cost is minimized. However, a transportation problem has a special mathematical structure, which permits it to be solved by an efficient method known as transportation method.

Transportation models deal with the transportation of a product manufactured at different plants or factories (supply origins) to a number of different warehouses (demand destinations). The objective is to satisfy the destination requirements within the plants capacity constraints at the minimum transportation cost. Transportation models typically arise in situation involving physical movement of goods from plants to warehouses, warehouse to wholesalers, wholesalers to retailers and retailers to customers. Solution of the transportation models requires the determination of how many units should be transported from each supply origin to each demands destination in order to satisfy all the destination demands while minimizing the total associated cost of transportation. The transportation problem can be formulated as a standard LP problem. However, the characteristics of a transportation model are such that it is usually solved by a specialized procedure (algorithm or method) rather than by simplex method.

For example, consider a situation that a manufacturer has three factories Fl, F2, and F3 producing the same product. From these factories, the product is transported to three warehouses W1, W2, and W3. Each factory has a limited supply (capacity), and each warehouse has specific demand. Each factory can transport to each warehouse but the transportation costs vary for different - combinations. The problem is to determine the quantity each factory should transport to each warehouse in order to minimize total transportation cost.

Mathematical Formulation of Transportation Problem

Let there be three units, producing scooter, say, A_1, A_2 and A_3 from where the scooters are to be supplied to four depots say B_1, B_2, B_3 and B_4.

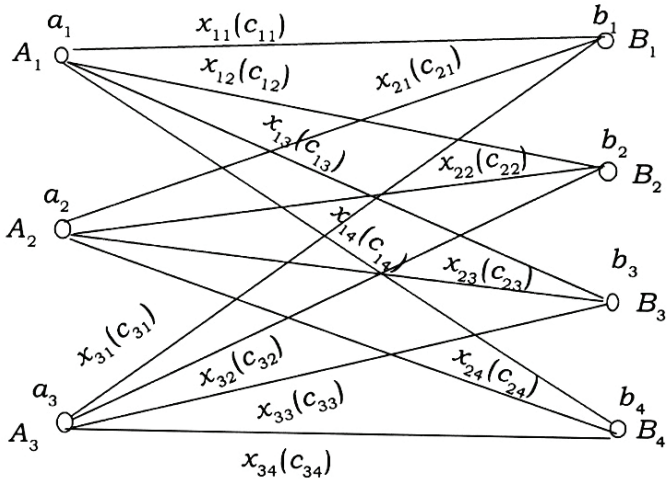
Let the number of scooters produced at A_1, A_2 and A_3 be a_1, a_2 and a_3 respectively and the demands at the depots be b_1, b_2, b_3 and b_4 respectively.

We assume the condition

$a_1+a_2+a_3 = b_1+b_2+b_3+b_4$

i.e., all scooters produced are supplied to the different depots. Let the cost of transportation of one scooter from A_1 to B_1 be c_{11}. Similarly, the cost of transportations in other combination are also shown in the figure and Table 1.

Let, out of a_1 scooters available at A_1, x_{11} be taken at B_1 depot, x_{12} be taken at B_2 depot and to other depots as well, as shown in the following figure and table 1.



Total number of scooters to be transported form A_1 to all destination, i.e., B_1, B_2, B_3, and B_4 must be equal to a_1.

$\therefore x_{11} + x_{12} + x_{13} + x_{14} = a_1$ .....(1)

Similarly, from A_2 and A_3 the scooters transported be equal to a_2 and a_3 respectively.

$\therefore \quad x_{21} + x_{22} + x_{23} + x_{24} = a_2$.....(2)

and $\quad x_{31} + x_{32} + x_{33} + x_{34} = a_3$.....(3)

On the other hand it should be kept in mind that the total number of scooters delivered to B_1 from all units must be equal to b_1, i.e.,

$x_{11} + x_{21} + x_{31} = b_1$ .....(4)

Similarly, $x_{12} + x_{22} + x_{32} = b_2$ .....(5)

$x_{13} + x_{23} + x_{33} = b_3$ .....(6)

$x_{14} + x_{24} + x_{34} = b_4$.....(7)

With the help of the above information we can construct the following table

Table 1

Depot / Unit	To B_1	To B_2	To B_3	To B_4	Stock
From A_1	$x_{11}(c_{11})$	$x_{12}(c_{12})$	$x_{13}(c_{13})$	$x_{14}(c_{14})$	a_1
From A_2	$x_{21}(c_{21})$	$x_{22}(c_{22})$	$x_{23}(c_{23})$	$x_{24}(c_{24})$	a_2
From A_3	$x_{31}(c_{31})$	$x_{32}(c_{32})$	$x_{33}(c_{33})$	$x_{34}(c_{34})$	a_3
Requirement	b_1	b_2	b_3	b_4	

The cost of transportation from A_i (i = 1,2,3) to B_j (j = 1,2,3,4) will be equal to $C_{ij} = X_{ij}$

where the symbol put before $c_{ij} x_{ij}$ signifies that the quantities $c_{ij} x_{ij}$ must be summed over all i = 1,2,3 and all j = 1,2,3,4.

Thus we come across a linear programming problem given by equations (1) to (7) and a linear function (8).

We have to find the non-negative solutions of the system such that it minimizes the function (8).

Note : We can think about a transportation problem in a general way if there are m sources (say A_1, A_2, ..., A_m) and n destinations (say B_1, B_2,....,B_n). We can use a_i to denote the quantity of goods concentrated at points A_i(i=1,2,...., m) and b_j denote the quantity of goods expected at points B_j(j =1,2,...,n). We assume the condition

$$a_1+a_2+....+a_m=b_1+b_2+....+b_n$$

implying that the total stock of goods is equal to the summed demand for it.

Some Definitions

The following terms are to be defined with reference to the transportation problems:

Feasible Solution (F.S.)

A set of non-negative allocations $x_{ij} \geq 0$ which satisfies the row and column restrictions is known as feasible solution.

Basic Feasible Solution (B.F.S.)

A feasible solution to a m-origin and n-destination problem is said to be basic feasible solution if the number of positive allocations are (m+n–1).

If the number of allocations in a basic feasible solutions are less than (m+n–1), it is called degenerate basic feasible solution (DBFS) (otherwise non-degenerate).

Optimal Solution

A feasible solution (not necessarily basic) is said to be optimal if it minimizes the total transportation cost.

Solution of the Transportation Problem

Let us consider the numerical version of the problem stated before and the mathematical formulation of the same thereafter, as below in Table 2.

Table 2 (All terms are in hundreds)

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	c_{11} =2	c_{12}=3	c_{13}=5	c_{14}=1	a_1=8
A_2	c_{21} =7	c_{22}=3	c_{23}=4	c_{24}=6	a_2=10
A_3	c_{31} =4	c_{32}=1	c_{33}=7	c_{34}=2	a_3=20
Requirement	b_1 =6	b_2=8	b_3=9	b_4=15	=38

In order to find the solution of this transportation problem we have to follow the steps given below.

(A) Initial basic feasible solution

(B) Test for optimization.

Let us consider these steps one by one.

(A) Initial Basic Feasible Solution :

There are three different methods to obtain the initial basic feasible solution viz.

(i) North-West Corner Method

(ii) Least Cost Method

(iii) Vogel's Approximation Method

In the light of above problem let us discuss one by one.

(I) North-West Corner Method

In this method we distribute the available units in rows and column in such a way that the sum will remain the same. We have to follow the steps given below.

(a) Start allocations from north-west corner, i.e., from (1,1) position. Here min (a_1, b_1), i.e., min (8,6)=6 units. Therefore, the maximum possible units that can be allocated to this position is 6, and write it as 2(6) in the (1,1) position of the table. This completes the allocation in the first column and cross the other positions, i.e., (2,1) and (3,1) in the column. (see Table 3)

Table 3

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	2(6)	3	5	1	8-6 = 2
A_2	X	3	4	6	10
A_3	X	1	7	2	20
Requirement	6-6=0	8	9	15	32

(b) After completion of step (a), come across the position (1,2). Here min (8-6 = 2, 8) units can be allocated to this position and write it as 3(2). This completes the allocations in the first row and cross the other positions, i.e., (1,3) and (1,4) in this row (see Table 4).

Table 4

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	2(6)	3(2)	X	X	2-2 = 0
A_2	X	3	4	6	10
A_3	X	1	7	2	20
Requirement	0	8-2 = 6	9	15	30

(c) Now come to second row, here the position (2,1) is already been struck off, so consider the position (2,2). Here min (10, 8-2 =6) units can be allocated to this position and write it as 3(6). This completes the allocations in second column so strike off the position (3,2) (see Table 5)

Table 5

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	2(6)	3(2)	X	X	0
A_2	X	3(6)	4	6	10-6=4
A_3	X	X	7	2	20
Requirement	0	0	9	15	24

(d) Again consider the position (2,3). Here, min (10–6 = 4, 9) units can be allocated to this position and write it as 4(4). This completes the allocations in second row so struck off the position (2,4) (see Table 6).

Table 6

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	2(6)	3(2)	X	X	0
A_2	X	3(6)	4(4)	X	0
A_3	X	X	7	2	20
Requirement	0	0	9-4=5	15	20

(e) In the third row, positions (3,1) and (3,2) are already been struck off so consider the position (3,3) and allocate it the maximum possible units, i.e., min (20,9–4 = 5) units and write it as 5(7). Finally, allocate the remaining units to the position (3,4), i.e., 15 units to this position and write it as 15(2).

Keeping in mind all the allocations done in the above method complete the table as follows:

Table 7

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	2(6)	3(2)	X	X	8
A_2	X	3(6)	4(4)	X	10
A_3	X	X	7(5)	2(15)	20
Requirement	6	8	9	15	38

From the above table calculate the cost of transportation as

$6\times2 + 2\times3 + 6\times3 + 4\times4 + 5\times7 + 15\times2$

$= 12 + 6 + 18 + 16 + 35 + 30$

$= 117$

i.e., ₹ 11,700.

(II) Least Cost Method

Considering the previous example, the least cost method as follows:

(a) In this method we start with the lowest cost position. Here it is (1,4) and (3,2) positions, allocate the maximum possible units to these positions, i.e., 8 units to the position (1,4) and 8 units to position (3,2), write them as 1(8) and 1(8) respectively, then strike off the other positions in row 1 and also in column 2, since all the available units are distributed to these positions.

Table 8

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	X	X	X	1(8)	0
A_2	7	X	4	6	10
A_3	4	1(8)	7	2	12
Requirement	6	0	9	7	22

(b) Consider the next higher cost positions, i.e., (1,1) and (3,4) positions, but the position (1,1) is already been struck off so we can't allocate any units to this position. Now allocate the maximum possible units to position (3,4), i.e., 7 units as required by the place and write it as 2(7). Hence the allocations in the column 4 is complete, so strike off the (2,4) position.

Table 9

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	X	X	X	1(8)	0
A_2	7	X	4	X	10
A_3	4	1(8)	7	2(7)	5
Requirement	6	0	9	0	15

(c) Again consider the next higher cost position, i.e., (1,2) and (2,2) positions, but these positions are already been struck off so we cannot allocate any units to these positions.

(d) Consider the next higher positions, i.e., (2,3) and (3,1) positions, allocate the maximum possible units to these positions, i.e., 9 units to position (2,3) and 5 units to position (3,1), write them as 4(9) and 4(5) respectively. In this way allocation in column 3 is complete so strike off the (3,3) position.

Table 10

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	X	X	X	1(8)	0
A_2	7	X	4(9)	X	1
A_3	4(5)	1(8)	X	2(7)	0
Requirement	1	0	0	0	1

(e) Now only the position (2,1) remains and it automatically takes the alloation 1 to complete the total in this row, therefore, write it as 7(1).

With the help of the above facts complete the allocation table as given below.

Table 11

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	X	X	X	1(8)	8
A_2	7(1)	X	4(9)	X	10
A_3	4(5)	1(8)	X	2(7)	20
Requirement	6	8	9	15	38

From the above facts, calculate the cost of transportation as

$8\times1 + 1\times7 + 9\times4 + 5\times4 + 8\times1 + 7\times2$

$= 8 + 7 + 36 + 20 + 8 + 14$

$= 93$

i.e., ₹ 9,300.

(III) Vogel's Approximation Method (VAM)

This method is preferred over the other two methods because the initial basic feasible solution is either optimum or very close to the optimum solution. Therefore, the amount of time required to arrive at the optimum solution is greatly reduced. It involves the following steps:

(a_1) Write the difference of minimum cost and next to minimum cost against each row in the penalty column. (This difference is known as penalty).

(a_2) Write the difference of minimum cost and next to minimum cost against each column in the penalty row. (This difference is known as penalty)

We obtain the table as given below.

Table 12

Depot / Unit	B_1	B_2	B_3	B_4	Stocks	Penalties
A_1	(2) (6)	(3)	(5)	(1)	8	(1)
A_2	(7)	(3)	(4)	(6)	10	(1)
A_3	(4)	(1)	(7)	(2)	20	(1)
Requirement	6	8	9	15	38	
Penalties	(2)	(2)	(1)	(1)		

(b) Identify the maximum penalties. In this case it is at column one and at column two. Consider any of the two columns, (here take first column) and allocate the maximum units to the place where the cost is minimum (here the position (1,1) has minimum cost so allocate the maximum possible units, i.e., 6 units to this positon). Now write the remaining stock in row one. After removing the first column and then by repeating the step (a), we obtain as follows:

Table 13

Depot / Unit	B_2	B_3	B_4	Stocks	Penalties
A_1	(3)	(5)	(1) (2)	2	(2) ←
A_2	(3)	(4)	(6)	10	(1)
A_3	(1)	(7)	(2)	20	(1)
Requirement	8	9	15	32	
Penalties	(2) ↑	(1)	(1)		

(c) Identify the maximum penalties. In this case it is at row one and at column two. Consider any of the two (let it be first row) and allocate the maximum possible units to the place where the cost is minimum (here the position (1,4) has minimum cost so allocate the maximum possible units, i.e., 2 units to this position). Now write the remaining stock in column four. After removing the first row and by repeating the step(a), we obtain table 14 as given below.

Table 14

Depot / Unit	B_2	B_3	B_4	Stocks	Penalties
A_2	(3)	(4)	(6)	10	(1)
A_3	(1)	(7)	(2) (13)	20	(1)
Requirement	8	9	13	30	
Penalties	(2)	(3)	(4) ↑		

(d) Identify the maximum penalties. In this case it is at column four. Now allocate the maximum possible units to the minimum cost position (here it is at (3,4) position and allocate maximum possible units, i.e., 13 to this position). Now write the remaining stock in row three. After removing the fourth column and then by repeating the step (a) we obtain table 15 as given below.

Table 15

Depot / Unit	B_2	B_3	Stocks	Penalties
A_2	(3) (1)	(4) (9)	10	(1)
A_3	(1) (7)	(7)	7	(6) ←
Requirement	8	9		
Penalties	(2)	(3)		

(e) Identify the maximum penalties. In this case it is at row three. Now allocate the maximum possible units to the minimum cost position (here it is at (3,2) position and allocate maximum possible units, i.e., 7 to this position). Now in order to complete the sum, (2,2) position will take 1 unit and (2,3) position will be allocated 9 units.

This completes the allocation and with the help of the above informations draw table 16 as under.

Table 16

Depot / Unit	B_1	B_2	B_3	B_4	Stock
A_1	2(6)			1(2)	8
A_2		3(1)	4(9)		10
A_3		1(7)		2 (13)	20
Requirement	6	8	9	15	38

From the above facts calculate the cost of transportation as

$6\times2 + 2\times1 + 1\times3 + 9\times4 + 7\times1 + 13\times2$

$= 12 + 2 + 3 + 36 + 7 + 26$

$= 86$

i.e., ₹ 8,600.

Note: After calculating the cost of transportation by the above three methods, one thing is clear that Vogel's approximation method gives an initial basic feasible solution which is much closer to the optimal solution than the other two methods. It is always worth while to spend some time finding a "good" initial solution because it can considerably reduce the total number of iterations required to reach an optimal solution.

Test for Optimization :

Once an initial basic solution has been found, the next step is to test that solution for optimality. The following are the methods widely used for testing the solution:

1. Stepping Stone Method
2. Modified Distribution (MODI) Method.

The two methods differ in their computational approach but give exactly the same results and use the same testing procedure. The procedure being used is to test the each unoccupied cell one at a time, by computing the cost change. If the inclusion of any unoccupied cell can decrease, the transportation cost then this unoccupied cell will be considered for allocation in the improved solution. We select that unoccupied cell for allocation for which the cost change is most negative. This procedure is continued until we get the optimal solution.

Stepping Stone Method: In this method we calculate the net cost change that can be obtained by introducing any of the unoccupied cells into the solution. The important rule to keep in the mind is that every increase (or decrease) in the supply at one occupied cell must be associated by a decrease (or increase) in supply at another, the same rule holds true for the demand. Thus, there must be two changes in every row and column that is changed -one change increases the allocation (or quantity) and one change decreases it. It is obtain by evaluating re-allocation in a closed path sequence with only right angles turns permitted.

The criterion for making a re-allocation is simply to know the desired effect upon costs. The net cost change is determined by listing the unit cost associated with each cell and then summing over the path to find the net effect. Signs are alternative from (+) to negative (-) depending upon whether the shipment is being added or subtracted at a given point. A negative sign on the net cost change

indicates that a cost reduction can be made by making the change and the positive sign indicates a cost increase.

The steps involves in stepping stone method are as follows:

Step 1. Determine an initial basic feasible solution using any of the three methods explained earlier.

Step 2. Make sure that the number of occupied cells is exactly equal to (m + n - 1) where m is the number of rows and n is the number of columns.

Step 3. Evaluate the cost effectiveness of the shipping goods via transportation routes not currently in the solution. This testing of each unoccupied cell is conducted by the following five sub steps as follows:

(a) Select an unoccupied cell, where a shipment should be made.

(b) Beginning at this cell, trace a closed path using the most direct route through at least three occupied cells used in the solution and then back to the original occupied cell and moving with only horizontal and vertical moves. Further, since only the cell at the turning point are considered to be on the closed path, both unoccupied and occupied boxed may be skipped over, the cells at the turning point are called 'stepping stones' on the path.

(c) Assigning Plus (+) and (-) alternatively on each corner cell of the closed path just traced, starting with plus sign at unoccupied cell to be evaluated

(d) Compute the 'net change in the cost' along the closed path by adding together the unit cost figure found in each cell containing a plus sign and then subtracting the unit cost in each square containing the minus sign.

(e) Repeat sub step (a) through sub step (b) unit 'net change in cost' has been calculated for all unoccupied cells of the transportation table.

Step 4. Check the sign of each of the net changes, if all net changes computed are greater than or equal to zero, an optimum solution has been reached. If not, it is possible to improve the current solution and decrease total shipping costs.

Step 5. Select the unoccupied cells having the highest negative net cost change and determine the maximum number of units that can be assigned to a cell marked with a minus sign on the closed path corresponding to this cell. Add this number to the unoccupied cell and to all other cells on the path marked with a plus sign. Subtract this number from cells on the closed path marked with a minus sign.

Step 6. Go to step 2 and repeat the procedure until the optimum solution is obtained.

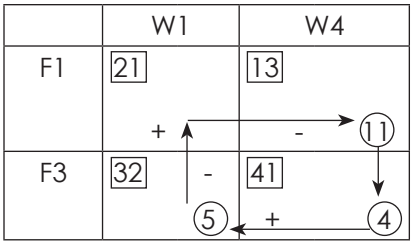
The initial solution is given Least Cost Method and application of this method is illustrated below:

Plant or factory	Warehouse				Capacity (Supply) S1
	W1	W2	W3	W4	
F1	[21]	[16]	[25]	[13] (11)	11
F2	[17] (1)	[18]	[14] (10)	[23]	13
F3	[32] (5)	[27] (10)	18	[41] (4)	19
Requirement (demand) D1	6	10	12	15	43

Solution:

Step 1. The initial solution has (4+3-1) = 6 occupied cell and involves transportation cost of ₹ 922.

Step 2. Let us evaluate the unoccupied cell (F1, W2). The shipment of one unit to this cell incurs an additional cost of ₹ 16. This required in turn that one unit to be decreased from the cell (F1W4), which decreases the cost by ₹ 13. But to keep the balance between the capacity and demand we have to add one unit to cell (F3W4) which increases cost by ₹ 41 and finally one unit is decreased from (F3 W1) which decreases the cost by ₹ 32. To determine the net cost change, let us list down the changes as given below:



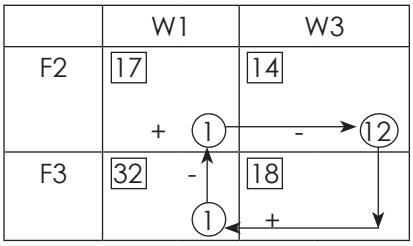
Cell	Change in allocation	Cost change (₹)
(F1, W1)	1	21
(F1, W4)	-1	-13
(F3, W4)	1	41
(F3, W1)	-1	-32
Net cost change		17

This indicates that if the occupied cell (F1, W1) is made occupied then the total transportation cost will be increased by ₹ 17 per unit supplied. Here the close path is (F1, W1) → (F1, W4) → (F3, W4) → (F3, W1). Similarly, other unoccupied cell can also be evaluated preceding the same manner.

Unoccupied cell	**Close path**	**Net cost change (₹)**	
(F1, W2)	(F1, W2) → (F1, W4) → (F3, W4) → (F3, W2)	16 – 13 + 41 – 27 = 17	Cost increase
(F1, W3)	(F1, W3) → (F1, W4) → (F3, W4) → (F3, W1) → (F2, W1) → (F2, W3)	25-13+41-32+17-14 = 24	Cost increase
(F2, W2)	(F2, W2) → (F3, W2) → (F3, W1) → (F2, W1)	18-27+32-17 = 6	Cost increase
(F2, W4)	(F2, W4) → (F2, W1) → (F3, W1) → (F2, W1)	**23-41+32-17 = -3**	**Cost decreases**
(F3, W3)	(F3, W3) → (F1, W2) → (F2, W1) → (F2, W3)	**18-32+17-14 = -11**	**Cost decreases**

From the above we observe that the only occupied cell (F3, W3) for which the largest reduction in cost change being – 11 will decrease the total transportation cost by ₹11 per unit. Therefore, the unoccupied cell (F3, W3) will be considered for further reduction in cost. The next question, which arises, is how much

quantity can be shipped to cell (F3, W3). The maximum quantity that can be shipped to cell (F3, W3) is exactly the minimum quantity of these cells with the minus sign in the closed path as shown below:-



In this case, cell (F3, W1) has 5 and cell (F2, W3) has 12 as the quantity to be shipped, therefore, the minimum of the 5, 12 is 5, which has to be the maximum quantity to be shipped to cell (F3, W3). It may be noted that if we ship more than 5 units to the cell (F3, W3) we have to assign some negative value to the cell (F3, W1) in order to meet supply and demand requirements, which is not possible. Thus, the new solution obtained shown below:-

Plant or factory	**Warehouse**				**Capacity (Supply)S1**
	W1	**W2**	**W3**	**W4**	
F1	21	16	25	13 (11)	11
F2	17 (6)	18	14 (7)	23	13
F3	32	27 (10)	18 (5)	41 (4)	19
Requirement (demand) D1	6	10	12	15	43

Therefore, the total transportation cost of the improved solution is:

Total cost = 11 x 13 + 6 x 17 + 7 x 14 + 10 x 27 + 5 x 18 + 4 x 41 = ₹ 867

Now again evaluate the unoccupied cell as explained above: -

Unoccupied cell	Close path	Net cost change (₹)	
(F1, W1)	(F1, W1) → (F1, W4) → (F3, W4) → (F3, W3) → (F2, W3) → (F2, W1)	21-13+41-18+14-17 = 28	Cost increase
(F1, W2)	(F1, W2) → (F1, W4) → (F3, W4) → (F3, W2)	16-13+41-27 = 17	Cost increase
(F1, W3)	(F1, W2) → (F1, W4) → (F3, W4) → (F3, W3)	25-13+41-18 = 35	Cost increase
(F2, W2)	(F2, W2) → (F2, W3) → (F3, W3) → (F3, W2)	**18-14+18-27 = -5**	**Cost decreases**
(F2, W4)	(F2, W4) → (F3, W4) → (F3, W3) → (F2, W3)	**23-41+18-14 = -14**	**Cost decreases**
(F3, W1)	(F3, W1) → (F3, W3) → (F2, W3) → (F2, W1)	32-18+14-17 = 11	Cost increases

Thus, every unit shipped from the factory F2 to warehouse W4 results in a saving of ₹ 14 per unit. We now make the amount of the shift as large as possible without violating any supply and demand conditions. This is obtained by shipping the minimum quantity of those cells with the minus sign in the closed path as shown below:-

Plant or factory	Warehouse				Capacity (Supply)S1
	W1	W2	W3	W4	
F1	[21]	[16]	[25]	[13] (11)	11
F2	[17] (6)	[18]	[14] - (7)	[23] +	13
F3	[32]	[27] (10)	[18] + (5)	[41] - (4)	19
Requirement (demand) D1	6	10	12	15	43

In this case, cell (F3, W4) has 4 and cell (F2, W3) has 7 as the quantity to be shipped, therefore, the maximum quantity to be shipped to cell (F2, W4) is 4. The second shipment plan is given in table below:-

Plant or factory	Warehouse				Capacity (Supply)S1
	W1	W2	W3	W4	
F1	[21]	[16]	[25]	[13] (11)	11
F2	[17] (6)	[18]	[14] (3)	[23] (4)	13
F3	[32]	[27] 10	[18] (9)	[41]	19
Requirement (demand) D1	6	10	12	15	43

The total transportation cost associated with the improved solution is:-

Total cost = 11 x 13 + 6 x 17 + 3 x 14 + 4 x 23 + 10 x 27 + 9 x 18 = ₹ 811

Now again we return to the step 2 and examine that the transportation cost can be reduced further by replacing any of the unoccupied cells with the one actually used in second solution.

Unoccupied cell	Close path	Net cost (₹)	
(F1, W1)	(F1, W1) → (F1, W4) → (F2, W4) → (F3, W3)	21-13+23-17 = 14	Cost increase
(F1, W2)	(F1, W2) → (F1, W4) → (F1, W4) → (F2, W3) → (F3, W3) → (F3, W2)	16-13+23-14+18-27 = 3	Cost increase
(F1, W3)	(F1, W3) → (F1, W4) → (F2, W4) → (F3, W3)	25-13+23-14 = 21	Cost increase

(F2, W2)	(F2, W2) → (F2, W3) → (F3, W3) → (F3, W2)	**18-14+18-27 = -5**	**Cost decreases**
(F3, W1)	(F3, W1) → (F3, W3) → (F2, W3) → (F2, W1)	32-18+14-17 = 11	Cost decreases
(F3, W4)	(F3, W4) → (F2, W4) → (F2, W3) → (F3, W3)	41-23+14-18 = 14	Cost increases

Thus, the cell (F2, W2) with the negative value will be included in the new solution because shipping one unit from factory F2 to warehouse W2 reduces the transportation cost by 5 per unit. Further since minimum of (3, 10) = 3 units can be shipped in cell (F2, W2) and the third feasible solution is given in the following table:-

Plant or factory	**Warehouse**				**Capacity (Supply)S1**
	W1	**W2**	**W3**	**W4**	
F1	21	16	25	13 (11)	11
F2	17 (6)	18 (3)	14	23 (4)	13
F3	32	27 (7)	18 (12)	41	19
Requirement (demand) D1	6	10	12	15	43

The corresponding shipping cost is:-

Total cost = 11 × 13 + 6 × 17 + 3 × 18 + 4 × 23 + 7 × 27 + 12 × 18 = ₹ 796

The next step is to evaluate again all unoccupied cells for the improved solution if any.

Unoccupied cell	**Close path**	**Net cost (₹)**	
(F1, W1)	(F1, W1) → (F1, W4) → (F2, W4) → (F2, W1)	21-13+23-17 = 14	Cost increase
(F1, W2)	(F1, W2) → (F1, W4) → (F2, W4) → (F2, W2) → (F3, W3) → (F3, W2)	16-13+23-18 = 8	Cost increase
(F1, W3)	(F1, W3) → (F1, W4) → (F2, W4) → (F2, W2)	25-13+23-18 = 17	Cost increase
(F2, W3)	(F2, W3) → (F3, W3) → (F3, W2) → (F2, W2)	14-18+27-18 = 5	Cost increase
(F3, W1)	(F3, W1) → (F3, W2) → (F2, W2) → (F2, W1)	32-27+18-17 = 6	Cost increase
(F3, W4)	(F3, W4) → (F2, W4) → (F2, W2) → (F3, W2)	41-23+18-27 = 9	Cost increases

Since all the unoccupied cells have positive values for the net change, and there is no way to improve the solution anymore. Hence, we have reached the optimum solution. The transportation schedule with the total cost of optimal solution is given below:

From Factory Factory	To warehouse	Quantity (Unit)	Transportation cost/unit (₹)	Total transportation cost (₹)
F1	W4	11	13	143
F2	W1	6	17	102
F2	W2	3	18	54
F2	W4	4	23	92
F3	W2	7	27	189
F3	W3	12	18	216
	Total	43		796

The Modified Distribution (MODI) Method

The modified distribution method has a pattern similar to that of the stepping stone method except that it evaluates each of the unoccupied cells in the process more efficiently. In the stepping-stone method, a closed path is traced for each of the unoccupied cells before the savings in respective costs, if any can be calculated. The unoccupied cell with the largest savings (identified as the one with the most negative value) enters in the next solution. In the modified distribution method, however, the improvement (opportunity) costs of all the unoccupied cells are calculated without having to trace their respective closed paths. In fact, we need to trace only one closed path in the modified distribution method after that the unoccupied cell with the most negative value has been identified. Thus, it can often provide considerable time saving over the stepping stone method.

The steps involves in modified distribution method are as given below:

Step1. Determine an initial basic feasible solution consisting of m+n-1 allocations in independent positions using any of the three methods discussed earlier.

Step 2. Determine a set of numbers for each row and each column: To compute U_i (i= 1,2,.. m) for each row and V_j (j= 1,2,.. n) for each column $C_{ij} = U_i + V_j$ for each of the m + n - 1 occupied cells used in the initial solution. Since there are m + n- 1 occupied cell used in initial solution. Consequently, there are m + n - 1 equations involving C_{ij} U_i and V_j because the number of unknowns, U_i and V_j are m +n, we can assign an arbitrary value (conveniently zero) to one of the variables without violating the equations.

Step 3. Compute the opportunity cost (improvement index) by using the relationship:

$\Delta_{ij} = C_{ij} - (U_j + V_j)$ (i = 1,2,.. m) and (j = 1,2,.. n)

For each of the unoccupied (empty) cells, in other words for every unoccupied cell we determine its implied cost by adding the corresponding row number and column number and then opportunity cost is obtained by subtracting the actual cost of this cell from its implied cost.

Step 4. Check the sign of each opportunity cost, if opportunity costs of all the empty cells are either positive or zero, then the given solution is optimum and if the one or more unoccupied cell have negative opportunity cost, then the given solution is not optimum and further savings in transportation cost is possible.

Step 5. Select the unoccupied cell with the largest negative opportunity cost as the cell to be included in the next solution.

Step 6. Draw a closed path or loop for the unoccupied cell in step 5. It may be noted that right angle turns in this path are permitted only at occupied cells and at the original unoccupied cell. It is to be further noted every closed loop must have been even number of turns and is formed with horizontal and vertical lines only.

Step 7. Assign alternative plus and minus signs at the unoccupied cells on the corner points of the loop with a plus sign at the cell being evaluated.

Step 8. Determine the maximum number of units that should be shipped to the unoccupied cell. The smallest stone with a negative position on the loop indicates the number of units can be shipped to the entering cell. This quantity is added to all the cells on the path marked with plus sign and subtracted from all the cell marked as minus signs. In this way, the unoccupied cell under consideration becomes an occupied cell as an unoccupied cell.

Step9. Repeat the whole procedure until the optimum solution is obtained i.e. the opportunity cost of all the unoccupied cells are either positive or zero. Finally, obtain the total transportation cost for the new solution.

Note:

Conditions to be satisfied by initial solution:

(a) Every row and every column must have at least one assignment.

(b) All the assignments must be made in independent cells (the cells which makes a closed loop are called dependent cells and other cells are independent cells) and must be m +n -1 in number.

(c) Case of similar maximum opportunity cost: While revising a given transportation problem,

if two or more cells have the same largest negative opportunity cost the unoccupied cell by including which the decrease in the transportation cost is maximum is chosen.

Alternative Optimum Solution:

If the optimum solution to a given transportation problem has zero opportunity cost for one or more unoccupied cells, and then there are alternative solutions to this problem. This means that though there may be different shipping schedule but all these schedules will have identical minimum transportation costs associated with them.

The initial solution is given by VAM and application of this method is illustrated below:

Plant or factory	Warehouse				Capacity
	W1	W2	W3	W4	
F1	[21]	[16]	[25]	[13] (11)	11
F2	[17] (6)	[18] (3)	[14]	[23] (4)	13
F3	[32]	[27] (7)	[18] (12)	[41]	19
Requirement (demand) D1	6	10	12	15	43

Solution:

In the MODI method, we have to alter the transportation table by inserting an additional row and column as shown below:

Plant or factory	Warehouse				Capacity	Row Number U_i
	W1	W2	W3	W4		
F1	[21]	[16]	[25]	[13] (11)	11	U_1 =
F2	[17] (6)	[18] (3)	[14]	[23] (4)	13	U_2 =
F3	[32]	[27] (7)	[18] (12)	[41]	19	U_3 =
Requirement (demand) D1	6	10	12	15	43	
Column Number V_j	V_1 =	V_2 =	V_3 =	V_4 =		

Step1. We have added column U_i to indicate row values and Row V_j to indicate column values. Now let us define these variables before we proceed further.

U_i = Value for the ith row (factory)

V_j = Value for the jth column (warehouse)

For example, the unit transportation cost for the six occupied cells can be described as:

$C_{14} = U_1+V_4 = 13$, $C_{21} = U_2 + V_1 = 17$, $C_{22} = U_2 + V_2 = 18$,

$C_{24} = U_2 + V_4 = 23$, $C_{32} = U_3 + V_2 = 27$, $C_{33} = U_3 + V_3 = 18$,

In the above equations, we have seven known variables (row and column numbers) and six equations, in order to obtain a solution to determine the row and column numbers, one of variable must be chose and given an arbitrary value zero. We select U_2 and assign a zero value to it. With $U_2 = 0$, we can identify the values of the remaining variables in the next relationship as given below:

$U_2+V_1=17 \rightarrow 0+V_1=17 \rightarrow V_1 = 17$

$U_2+V_2=18 \rightarrow 0+V_2=18 \rightarrow V_2 = 18$

$U_2+V_4=23 \rightarrow 0+V_4=23 \rightarrow V_4 = 23$

$U_1+V_4=13 \rightarrow U_1+23=13 \rightarrow U_1 = -10$

$U_3+V_2=27 \rightarrow U_3+18=27 \rightarrow U_3 = 9$

$U_3+V_3=18 \rightarrow 9+V_3=18 \rightarrow V_3 = 9$

Step 2. We now proceed to revaluate cost change for all the unoccupied cells by using the following formula:

Cost change = $C_{ij} – (U_i – V_j)$

As in the stepping stone method, if an unoccupied cell has a negative cost change, it indicates that an improvement in the solution is possible. When all the cost changes have zero or positive values, the optimum solution reached.

The net cost change or opportunity cost for each of the unoccupied cell is evaluated as follows:

Unoccupied cell	**$C_{ij} - (U_i - V_j)$**	**Net cost change**
(F1, W1)	21-(-10 + 17)	+14
(F1, W2)	16-(-10+18)	+8
(F1, W3)	25-(-10+9)	+26
(F2, W3)	14-(-0+9)	+5
(F3, W1)	32-(9+17)	+6
(F3, W3)	41-(9+23)	+9

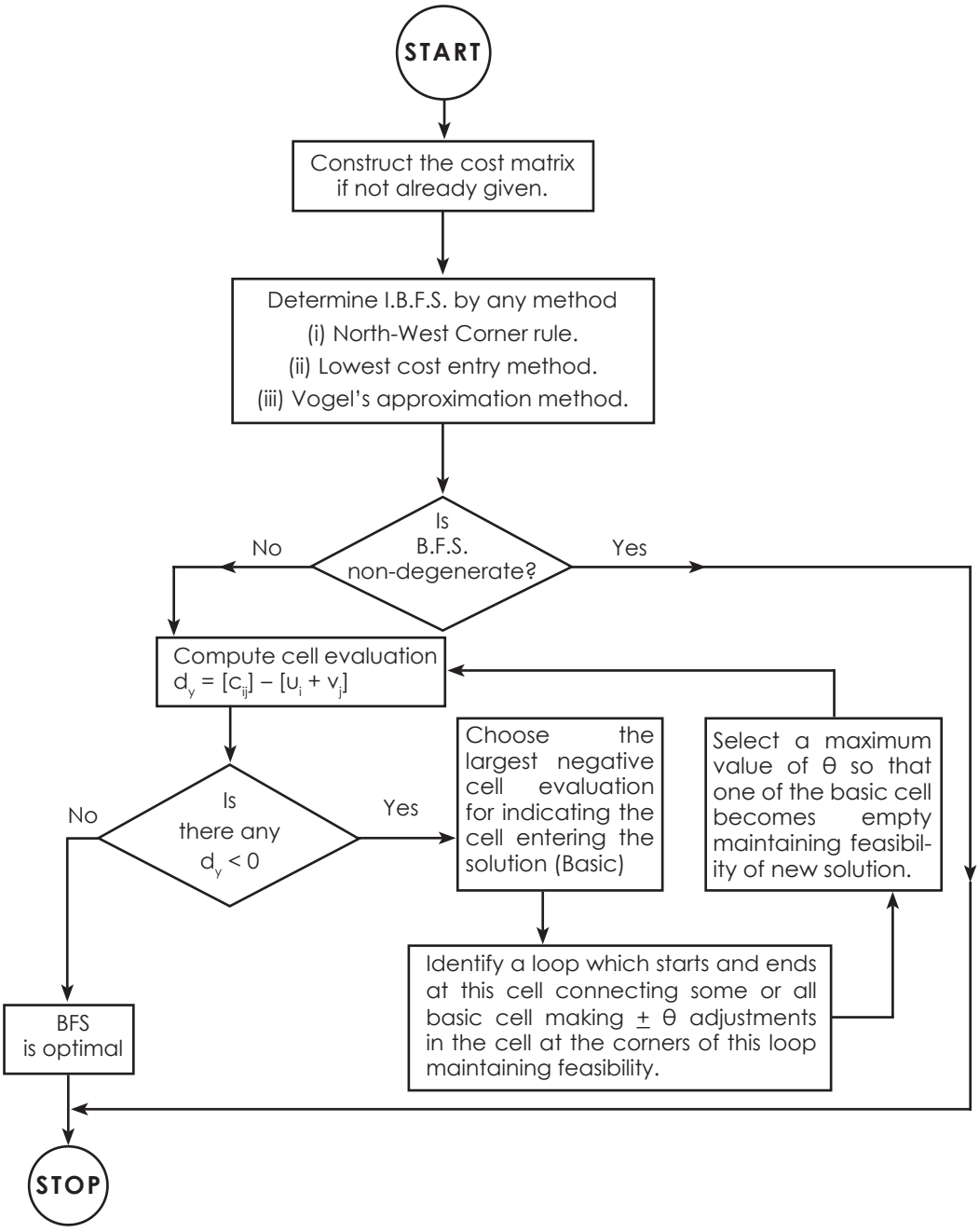
The following table represents the solution of the problem with the corresponding row and columns.

Plant or factory	**Warehouse**				**Capacity**	**Row Number U_i**
	W1	**W2**	**W3**	**W4**		
F1	[21] 14	[16] [8]	[25] [26]	[13] (11)	11	$U_1 = -10$
F2	[17] (6)	[18] (3)	[14] [5]	[23] (4)	13	$U_2 = 0$
F3	[32] [6]	[27] (7)	[18] (12)	[41] [9]	19	$U_3 = 9$
Requirement (demand) D1	6	10	12	15	43	
Column Number V_i	$V_1 = 17$	$V_2 = 18$	$V_3 = 19$	$V_4 = 23$		

The cost change calculated for all unoccupied cells are also shown in the right hand bottom side of the unoccupied cells and these values of cost change have no negative value, therefore, we have derived the optimum solution.

The solution is exactly equal to as calculated in the stepping stone method and the transportation cost calculated by the MODI method is ₹ 796.

What We Have Learnt



Linear Programming

Linear programming arose as a mathematical model developed during Second World War to plan expenditures and returns in order to reduce costs to the army and increase losses to the enemy. In Operation Research optimization means to find out the maximum profit and minimum loss in any deal which we can done in Quantitative Techniques, in this we can narrowing our choices to the very best when there are virtually immeasurable feasible options. This is a constrained optimization technique, which optimize some criterion within some constraints. In Linear programming the objective function (profit, loss or return on investment) and constraints are linear.

Linear programming (**LP, or linear optimization**) is a mathematical method for determining a way to achieve the best outcome (such as maximum profit or lowest cost) in a given mathematical model for some list of requirements represented as linear relationships. Linear programming is a specific case of mathematical programming (mathematical optimization).

More formally, linear programming is a technique for the optimization of a linear objective function, subject to linear equality and linear inequality constraints. Its feasible region is a convex polyhedron, which is a set defined as the intersection of finitely many half spaces, each of which is defined by a linear inequality. Its objective function is a real-valued affine function defined on this polyhedron. A linear programming algorithm finds a point in the polyhedron where this function has the smallest (or largest) value if such a point exists.

Thus Linear Programming is a mathematical way of planning, which involves three steps:

1. Identify the objective function as a linear function of its variables and state all the limitations on resources as linear equations and/or in equations (constraints).
2. Use mathematical techniques to find all possible sets of values of the variables (unknowns), satisfying the constraints.
3. Select the particular set of values of the variables obtained in (2) that lead to our objective—maximum profit, least cost, etc.

   The result at step (1) above is called a Linear Programming Problem. The set of solutions obtained in (2) is called the set of feasible solutions and the solution finally selected in step (3) is known as the optimum (best or optimal) solution of the Linear Programming Problems.

Linear programming can be applied to various fields of study. It is used in business and economics, but can also be utilized for some engineering problems. Industries that use linear programming models include transportation, energy, telecommunications, and manufacturing. It has proved useful in modeling diverse types of problems in planning, routing, scheduling, assignment, and design.

LP Assumptions

Linear programming is based on four mathematical assumptions. An **assumption** is a simplifying condition taken to hold true in the system being analyzed in order to render the model mathematically tractable (solvable). The first three assumptions follow from a fundamental principle of LP: the linearity of all model equations. (This applies to constraint inequalities as well, since the addition of slack and surplus variables convert all inequalities into equations.) Linearity means that all equations are of the form: $ax + by + ... + cz = d$, where a, b, c, d are constants.

The four mathematical assumptions are the following:

1. **Proportionality** — the effect of a decision variable in any one equation is proportional to a constant quantity.
2. **Additivity** — the combined effect of the decision variables in any one equation is the algebraic sum of their individual weighted effects. (The weighting, of course, is due to the proportionality constants.)
3. **Divisibility** — the decision variables can take on fractional (non-integer) values.
4. **Certainty** — all model parameters are known constants.

Advantages and Limitations of Linear Programming

Main advantages of L.P. are as follows :

- Linear Programming helps in attaining the optimum use of productive factors. It also indicates how a decision maker can employ his productive factors effectively by selecting and distributing these elements.

- Linear programming techniques improve the quality of decisions. Users of this technique become more objective and less subjective.
- Highlighting of bottlenecks in the production processes is one of the most significant advantages of this technique. For example, when bottlenecks occur, some production factors (say machines) cannot meet demand while other remains idle for some of the time.
- Linear programming provides possible and practical solutions since there might be other constraints operating outside of the problem which must be taken into account.

Linear programming suffers from certain limitations which are given below:

- In reality, objectives, functions and constraints cannot be expressed in linear form.
- In Linear Programming problem, fractional values are permitted for the decision variables. However, many decision problems require that the decision variables should be obtained in non-fractional values.
- The co-efficient of basic variables cannot be determined with certainty; however, they can be stated only with probability.
- Where a problem consists of inflicting multiple objectives, this technique cannot provide a solution.
- The linear programming does not take into consideration the effect of time and uncertainty.
- Parameters appearing in the LP model are assumed to be constant but in real life situations they are frequently neither known nor constant.
- In case of large, complex and constrained problems, computational problems are enormous.

Terminology and Concept of Linear Programming:

- **Terminology:**

  The word 'linear' is used here to describe the relationship among two or more variables, which are directly proportional. For example, if doubling or tripling the production of a product, will exactly double or triple the profit and required resource, then it is linear relationship. The word programming means planning of activities in a manner that achieve some optimal result with restricted resources.

  A programme is 'optimal' if it maximizes or minimizes some measures or criteria of effectiveness such as profit, cost, or sales.

- **Decision Variable and their Relationship:**

  The decision (activity) variables refer to candidates (products, services, projects etc.) that are competing with one another for sharing the given resources. These variable are usually are interrelated in terms of utilization of resources and need simultaneous solutions. The relationship among these variables should be linear.

- **Objective functions:**

  The LP problem must have a well-defined (explicit) objective function to optimize. For example maximization of profit or minimization of cost, it should be expressed as linear function of decision variables.

- **Constraints:**

  There must be limitation on resources, which are to be allocated among various competing activities. These resources may be production capacity, work force, time, space, or machinery. These must be capable of expressing as linear inequalities/equalities in terms of decision variable.

- **Alternative Course of Action:**

  There must be alternative course of action. For example, there may be many processes open to a firm for producing a commodity and one process can be substituted for others.

- **Non-Negativity Restrictions:**

  All variables must assume non-negative values that are all variable must take on values equal or greater than zero. Therefore, the problem should not result in negative values for the variables.

- **Linearity and Divisibility:**

  All the relationships (objective function and constraints) must exhibit linearity, that is, relationship among decision variables must be directly proportional. For example, if our resource increases by some percentage, then it should increase the outcome by the same percentage. Divisibility means that the variables are not limited to integers. It is assumed that decision variables are continuous, i.e. fractional values of these variables must be permissible in obtaining an optimum solution.

- **Deterministic:**

  In LP model (objective function and constraints), it is assumed that the entire model coefficients are completely known (deterministic) for example profit per unit of each product, and the amount of resource available is assumed to be fixed during the planning period.

Step Involved in the Formulation of LP Problem

The steps involved in the formation of linear programming problem are as follows:

Step 1→	Identify the Decision Variables of interest to the decision maker and express them as x_1, x_2, x_3……
Step 2→	Ascertain the Objective of the decision maker whether he wants to minimize or to maximize.
Step 3→	Ascertain the cost (in case of minimization problem) or the profit (in case of maximization problem) per unit of each of the decision variables.
Step 4→	Ascertain the constraints representing the maximum availability or minimum commitment or equality and represent them as less than or equal to (≤) type inequality or greater than or equal to (≥) type inequality or 'equal to' (=) type equality respectively.
Step 5→	Put non-negativity restriction as under: $x_j \geq 0$; j = 1, 2 ….n (non-negativity restriction)
Step 6→	Now formulate the LP problem as under:
	Maximize (or Minimize) $Z = c_1x_1 + c_2x_2 \ldots..c_nx_n$
	Subject to constraints:
	$a_{11}x_1 + a_{12}x_2, \ldots.a_{1n}x_n \leq b_1$ (Maximum availability)
	$a_{21}x_1 + a_{22}x_2, \ldots.a_{2n}x_n \geq b_2$ (Minimum commitment)
	$a_{31}x_1 + a_{32}x_2, \ldots.a_{3n}x_n = b_3$ (Equality)
	$x_1; x_2 \ldots. x_n \geq 0$ (Non-negativity restriction)

where,

x_j =	Decision Variables i.e. quantity of j^{th} variable of interest to the decision maker.
c_j =	Constant representing per unit contribution (in case of Maximization Problem) or Cost (in case of Minimization Problem) of the j^{th} decision variable.
a_{ij} =	Constant representing exchange coefficients of the j^{th} decision variable in the i^{th} constant.
b_i =	Constant representing i^{th} constraint requirement or availability.

Methods of Linear Programming

A linear programming problem can be solved by any of the following methods :

(i) Graphical Method, and

(ii) Simplex Method.

When the problem has been expressed in standard format, it can be solved by either of the two methods. If there are only two unknowns on decision variable, then the problem can be solved by graphical methods. If there are three or more unknown variables, then the usual solution technique is the simplex method.

Using the Graphical Method to Solve Linear Programs

A key problem faced by managers is how to allocate scarce resources among activities or projects. Linear programming, or LP, is a method of allocating resources in an optimal way. It is one of the most widely used Operations Research (OR) tools. It has been used successfully as a decision making aid in almost all industries, and in financial and service organizations.

Programming refers to mathematical programming. In this context, it refers to a planning process that allocates resources—labour, materials, machines, and capital—in the best possible (optimal) way so that costs are minimized or profits are maximized. In LP, these resources are known as decision variables. The criterion for selecting the best values of the decision variables (e.g., to maximize profits or minimize costs) is known as the objective function. The limitations on resource availability form what is known as a constraint set.

For example, let's say a furniture manufacturer produces wooden tables and chairs. Unit profit for tables is ₹6, and unit profit for chairs is ₹8. To simplify our discussion, let's assume the only two resources the company uses to produce tables and chairs are wood (board feet) and labour (hours). It takes 30 bf and 5 hours to make a table, and 20 bf and 10 hours to make a chair. There are 300 bf of wood available and 110 hours of labor available. The company wishes to maximize profit, so profit maximization becomes the objective function. The resources (wood and labour) are the decision variables. The limitations on resource availability (300 bf of wood and 110 hours of labour) form the constraint set, or operating rules that govern the process. Using LP, management can decide how to allocate the limited resources to maximize profits.

The "linear" part of the name refers to the following:

- **The objective function** (i.e., maximization or minimization) can be described by a linear function of the decision variables, that is, a mathematical function involving only the first powers of the variables with no cross products. In the given example, objective function Max z (Profit) = $6x_1+8x_2$.
- The constraint set can be expressed as a set of linear equations.

  $30x_1 + 20x_2 \leq 300$ (Wood Constraint)

  $5x_1 + 10x_2 \leq 110$ (Labour-hour Constraint)

In addition to the linear requirements, nonnegativity conditions state that the variables cannot assume negative values. It is not possible to have negative resources. Without these conditions, it would be mathematically possible to use more resources than are available.

Steps in solving an LP problem graphically

The steps in solving an LP problem graphically are introduced briefly below. In the remainder of this publication, we'll apply these steps to a simple LP problem.

Step 1. Formulate the LP problem

Formulation refers to translating the real-world problem into a format of mathematical equations that represent the objective function and the constraint set. Often, data gathering, problem definition, and problem formulation are the most important (and the most difficult, time-consuming, and expensive) steps when using any OR tool.

A thorough understanding of the problem is necessary in order to formulate it correctly. During the formulation stage, an OR specialist may discover new insights into the problem that may change the scope of the original problem. For this reason, it's very important to obtain the help of those who work most closely with the system being studied. They can help the OR specialist collect the necessary data and correctly define the problem so that he or she can create a valid model. In formulating an LP problem, it often helps to put all of the relevant information into a table.

Step 2. Construct a graph and plot the constraint lines

Constraint lines represent the limitations on available resources. Usually, constraint lines are drawn by connecting the horizontal and vertical intercepts found from each constraint equation.

Step 3. Determine the valid side of each constraint line

The simplest way to start is to plug in the coordinates of the origin (0,0) and see whether this point satisfies the constraint. If it does, then all points on the origin side of the line are feasible (valid), and all points on the other side of the line are infeasible (invalid). If (0,0) does not satisfy the constraint, then all points on the other side and away from the origin are feasible (valid), and all points on the origin side of the constraint line are infeasible (invalid).

Step 4. Identify the feasible solution region

The feasible solution region represents the area on the graph that is valid for all constraints. Choosing any point in this area will result in a valid solution.

Step 5. Plot two objective function lines to determine the direction of improvement

Improvement is in the direction of greater value when the objective is to maximize the objective function, and is in the direction of lesser value when **the objective is to** minimize the objective function. The objective function lines do not have to include any of the feasible region to determine the desirable direction to move.

Step 6. Find the most attractive corner

Optimal solutions always occur at corners. The most attractive corner is the last point in the feasible solution region touched by a line that is parallel to the two objective function lines drawn in step 5 above. When more than one corner corresponds to an optimal solution, each corner and all points along the line connecting the corners correspond to optimal solutions.

Step 7. Determine the optimal solution by algebraically calculating coordinates of the most attractive corner

Step 8. Determine the value of the objective function for the optimal solution

Example (Case of Maximization)

A furniture firm manufactures tables and chairs, a unit of table requires 30 sq. ft. wood and 5 labour hours, and a chair requires 20 sq. ft. wood and 10 labour hours. The total 300 sq. ft. wood and 110 labour hours available, unit profit from table and chair is ₹ 6 and ₹ 8 respectively.

You are required to formulate the problem as a linear programming problem, and solve it by using the graphical method.

Solution:

Resources	Unit requirements		Available
	Table	Chair	
Wood (sq. ft.)	30	20	300
Labour (hours)	5	10	110
Unit profit (₹)	6	8	

Let X_1 and X_2 be the number of tables and chairs to be manufactured respectively, then the LP model is given by:

Maximize:

$Z = 6X_1 + 8X_2$

Subject to:

$30X_1 + 20X_2 \leq 300$ - (wood constraint)

$5X_1 + 10\ X_2 \leq 110$ - (labour hour constraint)

$x_1 \geq 0, \quad x_2 \geq 0$

Next, we construct the graph by drawing a horizontal and vertical axis, which are represented, by the x-axis and y-axis, after that, we plot a line for each of the two constraints and the two non-negativity restrictions. This plotting suggests that the graphical method always starts with the first quadrant of the graph.

Now the inequalities are graphed taking them as equalities i.e.

$30X_1 + 20X_2 = 300$

$5X_1 + 10X_2 = 110$

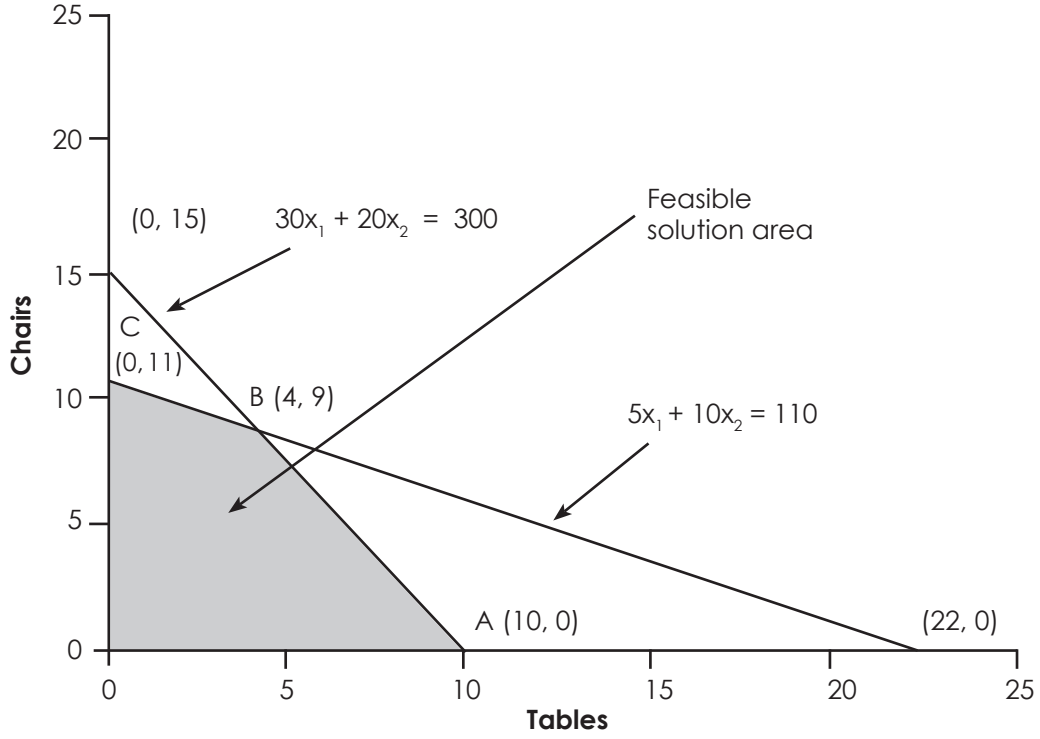
Calculate values for equation $30X_1 + 20X_2 = 300$

If	X_1	0	10
Then	X_2	15	0

Calculate values for equation $5X_1 + 10\ X_2 = 110$

If	X_1	0	22
Then	X_2	11	0

Thereafter, calculated values are plotted on the graph for both the equations



Graphical solution for maximization problem.

Any combination of values of X_1 and X_2 which satisfies the given constraints, is called a 'feasible solution'. The area OABC figure satisfied by the constraints is shown as feasible solution region or space. The coordinates of the points on the corners of the region OABC can be obtained by solving equations intersecting on these points.

The OABC region (shaded) may contain an infinite number of points, which satisfy the constraints of the given LP problem. However, it can be proved that the optimal solution of any LP problem corresponds to the one of the corner points (also called the extreme points) of the feasible solution region to get an optimal value of the objective function of the given LP problem

In our example, value of the objective function on the corner points can be evaluated as follows :-

Coordinates of the corner points	Objective function Z = 6X1 + 8×2	Value of Z
O (0,0)	6 (0) + 8 (0)	0
A (10,0)	6 (10)+ 8(0)	60
B (4,9)	6 (4)+ 8 (9)	96
C(0,11)	6(0)+ 8 (11)	88

The maximum profit of ₹ 96 is obtained at the corner point B (4,9) i.e. $X_1 = 4$ and $X_2 = 9$ which also satisfy the given constraints. Hence, to maximize profit the company has to produce 4 tables and 9 chairs.

Example (Case of Minimization)

In this problem, the objective is to minimize the costs

Minimize : $Z = 3X_1 + 2.25X_2$

Subject to:

$2X_1 + 4X_2 \geq 40$

$5X_1 + 2X_2 \geq 50$

$x_1 \geq 0, \quad x_2 \geq 0$

You are required to solve it by using the graphical method.

Solution :

The solution of minimization problems follows the same procedure as that of maximization problem. The basic difference is that we now want the smallest possible value of the objective function.

Because there are only two variables x_1 and x_2 we can construct the graph of the set of feasible solution.

Now the inequalities are graphed taking them as equalities i.e.

$2X_1 + 4X_2 = 40$

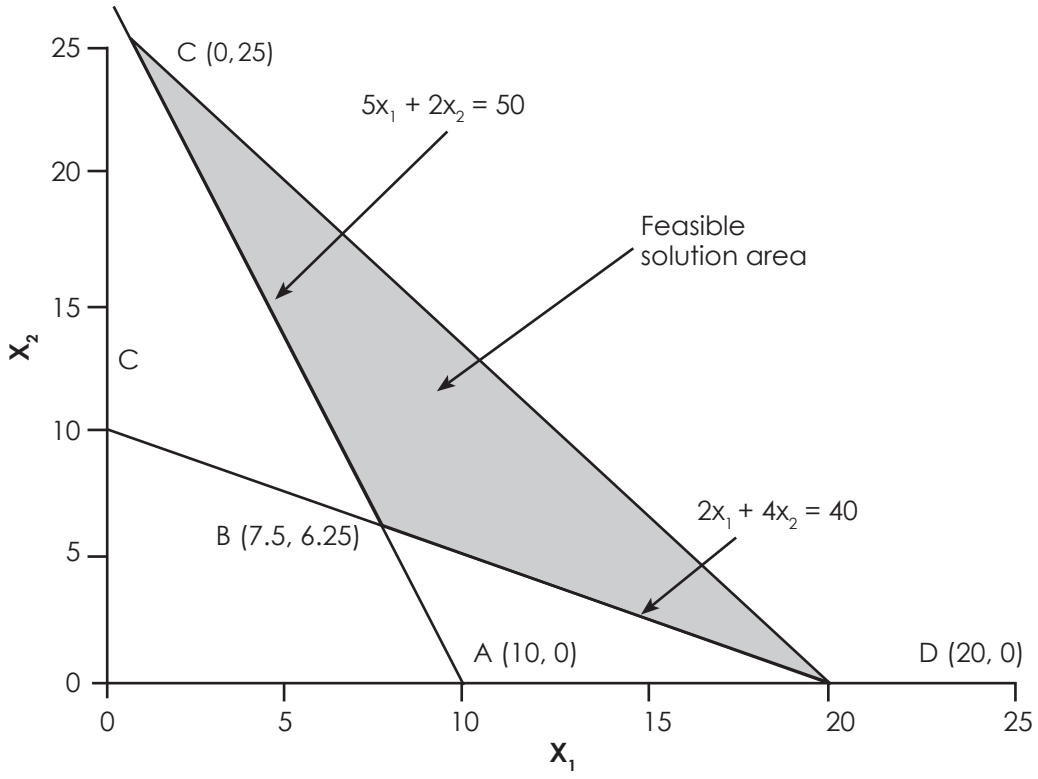
$5X_1 + 2X_2 = 50$

Calculate values for equation $2X_1 + 4X_2 = 40$

If	X_1	0	20
Then	X_2	10	0

Calculate values for equation $5X_1 + 2X_2 = 50$

If	X_1	0	10
Then	X_2	25	0



Graphical solution for minimization problem.

The area above, CBD is satisfied by the two constraints and is shown by shaded area, which is termed as feasible solution region. There is a significant difference between the feasible region for this minimization problem and the one for the maximization problem. The feasible region for this minimization problem is unbounded and unlimited because any combination of X_1 and X_2 will satisfy the constraints.

Since the optimal solution corresponds to one of the corner (extreme) points, we will calculate the values for the objective function for each corner point's viz., D (20, 0); B (7.5, 6.25); and C (0, 25). The calculations are shown as:

Coordinates of The corner points	Objective function Z = 3 × 1 + 2.25 × 2	Value of Z
D (20,0)	3 (20) + 2.25 (0)	60
B (7.5,6.25)	3 (7.5) + 2.25 (6.25)	36.565
C (0,25)	3 (0) + 2.25 (25)	56.25

The min. cost can be obtained at the corner point B (7.5, 6.25) i.e. $X_1 = 7.5$ and $X_2 = 6.25$.

Example (Case of mixed constraints)

A firm makes two products X and Y and has a total production capacity of 9 tonnes per day, X and Y requiring the same production facility. The firm has a permanent contract to supply at least 2 tonnes of X and at least 3 tonnes to Y per day to another company. Each tonne of X required 20 machine hours production time and each tonne of Y requires 50 machine hours production time; the daily maximum possible number of machine hours is 360. The entire firm's output can be sold and the profit made is ₹ 80 per tonne of X and ₹ 120 per tonne of Y. It is required to determine the production schedule for maximum profit and calculate this profit.

Solution:

The given information can be presented in appropriate mathematical form as follows:

Maximize: (Profit) $Z = 80X_1 + 120X_2$

Subject to:

$X_1 + X_2 < 9$, $x_1 > 2, x_2 > 3$ .... (Supply constraint)

$20X_1 + 50 X_2 < 360$ .... (Machine hour constraint)

$X_1 > 0, X_2 > 0$

Where,

X_1 = number of units (in tonnes) of product X

X_2 = number of units (in tonnes) of product Y

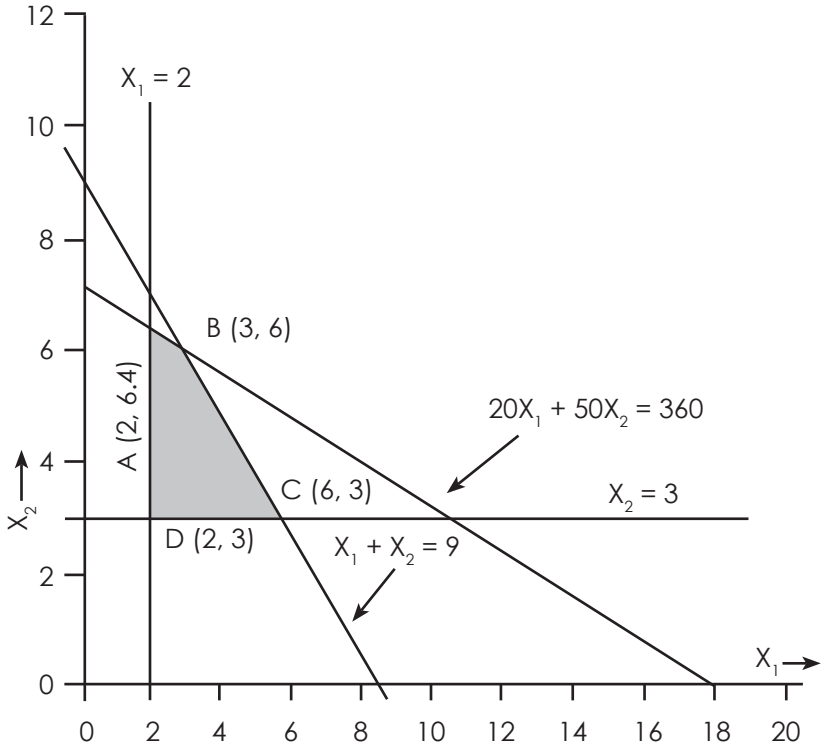
Now the region of feasible solution shown in the following figure is bounded by the graphs of the linear equalities:

$X_1 + X_2 = 9$,

$X_1 = 2$,

$X_2 = 3$,

$20 X_1 + 50 X_2 = 360$



Graphical solution for mixed problem

The corner points of the solution space are: A (2,6.4), B (3,6), C (6,3), and D (2,3)

Coordinates of The corner points	Objective function Z = $80X_1 + 120X_2$	Value of Z
A (2,6.4)	80(2)+ 120(6.4)	928
B (3,6)	80(3)+ 120(6)	960
C (6,3)	80 (6) + 120 (3)	840
D (2,3)	80 (2) + 120 (3)	520

The maximum profit (value Z) of ₹ 960 is found at the corner point B i.e. X1 = 3 and X2 = 6.

Hence, the company should produce 3 tonnes of product X and 6 tonnes of product in order to achieve the maximum profit.

Overview of the simplex method

The simplex method is the most common way to solve large LP problems. Simplex is a mathematical term. In one dimension, a simplex is a line segment connecting two points. In two dimensions, a simplex is a triangle formed by joining the points. A three-dimensional simplex is a four-sided pyramid having four corners. The underlying concepts are geometrical, but the solution algorithm, developed by George Dantzig in 1947, is an algebraic procedure.

As with the graphical method, the simplex method finds the most attractive corner of the feasible region to solve the LP problem. Remember, any LP problem having a solution must have an optimal solution that corresponds to a corner, although there may be multiple or alternative optimal solutions.

Simplex usually starts at the corner that represents doing nothing. It moves to the neighboring corner that best improves the solution. It does this over and over again, making the greatest possible improvement each time. When no more improvements can be made, the most attractive corner corresponding to the optimal solution has been found.

A moderately sized LP with 10 products and 10 resource constraints would involve nearly 200,000 coiners. An LP problem 10 times this size would have more than a trillion corners. Fortunately, the search procedure for the simplex method is efficient enough that only about 20 of the 2,00,000 corners are searched to find the optimal solution.

In the real world, computer software is used to solve LP problems using the simplex method, but you will better understand the results if you understand how the simplex method works. The example in this publication will help you do so.

Using the simplex method

By introducing the idea of slack variables (unused resources) to the tables and chairs problem, we can add two more variables to the problem. With four variables, we can't solve the LP problem graphically. We'll need to use the simplex method to solve this more complex problem.

We'll briefly present the steps involved in using the simplex method before working through an example. Table 2 shows an example of a simplex tableau. Although these steps will give you a general overview of the procedure, you'll probably find that they become much more understandable as you work through the example.

Step 1. Formulate the LP and construct a simplex tableau.

Add slack variables to represent unused resources, thus eliminating inequality constraints. Construct the simplex tableau—a table that allows you to evaluate various combinations of resources to determine which mix will most improve your solution. Use the slack variables in the starting basic variable mix.

Step 2. Find the sacrifice and improvement rows.

Values in the sacrifice row indicate what will be lost in per-unit profit by making a change in the resource allocation mix. Values in the improvement row indicate what will be gained in per-unit profit by making a change.

Table 2. Example of a simples tableau

Unit Profit		**6**	**8**	**0**	**0**		
	Basic mix	X_1	X_2	S_W	S_L	**Solution**	
0	S_W	30	20	1	0	300	
0	S_L	5	10	0	1	110	
	Sacrifice	0	0	0	0	0 ←	Current profit
	Improvement	6	8	0	0	—	

Step 3. Apply the entry criteria.

Find the entering variable and mark the top of its column with an arrow pointing down. The entering variable is defined as the current non-basic variable that will most improve the objective if its value is increased from 0. If ties occur, arbitrarily choose one as the entering variable. When no improvement can be found, the optimal solution is represented by the current tableau.

If no positive number appears in the entering variable's column, this indicates that one or more constraints are unbounded. Since it is impossible to have an unlimited supply of a resource, an unbounded solution indicates that the LP problem was formulated incorrectly.

Step 4. Apply the exit Criteria.

Using the current tableau's exchange coefficient from the entering variable column, calculate the following exchange ratio for each row as: Solution value/Exchange coefficient

The exchange ratio tells you which variable is the limiting resource, i.e., the resource that would run out first.

Find the lowest nonzero and nonnegative value. This variable is the limiting resource. The basic variable in this row becomes the exiting variable. In case of identical alternatives, arbitrarily choose one. Mark the exiting variable row with an arrow pointing left.

Step 5. Construct a new Simplex tableau.

Constructing a new tableau is a way to evaluate a new corner. One variable will enter the basic mix (entering variable), and one variable will leave the basic mix and become a non-basic variable (exiting variable). The operation of an entering variable and an exiting variable is called a pivot operation. The simplex method is made up of a sequence of such pivots. The pivot identifies the next corner to be evaluated. The new basic mix always differs from the previous basic mix by one variable (exiting variable being replaced by the entering variable).

To construct the new tableau, replace the exiting variable in the basic mix column with the new entering variable. Other basic mix variables remain unchanged. Change the unit profit or unit loss column with the value for the new entering variable. Compute the new row values to obtain a new set of exchange coefficients applicable to each basic variable.

Step 6. Repeat steps 2 through 5 until you no longer can improve the solution.

A simplex method example: Production of wooden tables and chairs

Step 1. Formulate the LP and construct a simplex tableau.

From the information in Table 3, we can formulate the LP problem as before.

Table 3. Information for the wooden tables and chairs linear programming problem.

Resource	Table (X_1)	Chair (X_2)	Available
Wood (bf) Labour (hr)	30 5	20 10	300 100
Unit profit	6	8	

Maximize $Z = 6X_1 + 8X_2$ (objective function)

Subject to: $30X_1 + 20X_2 \leq 300$ (wood constraint: 300 bf available)

$5X_1 + 10X_2 \leq 110$ (labor constraint: 110 hours available)

$X_1, X_2 \geq 0$ (nonnegativity conditions)

Slack variables

Using the simplex method, the first step is to recognize surplus resources, represented in the problem as slack variables. In most real-life problems, it's unlikely that all resources (usually a large mix of many different resources) will be used completely. While some might be used completely, others will have some unused capacity. Also, slack variables allow us to change the inequalities in the constraint equations to equalities, which are easier to solve algebraically. Slack variables represent the unused resources between the left-hand side and right-hand side of each inequality; in other words, they allow us to put the LP problem into the standard form so it can be solved using the simplex method.

The first step is to convert the inequalities into equalities by adding slack variables to the two constraint inequalities. With S_w representing surplus wood, and S_L representing surplus labour, the constraint equations can be written as:

$30X_1 + 20X_2 + S_W = 300$ (wood constraint: 300 bf)

$5X_1 + 10X_2 + S_L = 110$ (labor constraint: 110 hours)

All variables need to be represented in all equations. Add slack variables to the other equations and give them coefficients of 0 in those equations. Rewrite the objective function and constraint equations as:

Maximize: $Z = 6X_1 + 8X_2 + 0S_W + 0S_L$ (objective function)

Subject to: $30X_1 + 20X_2 + S_W + 0S_L = 300$ (wood constraint: 300 bf)

$5X_1 + 10X_2 + 0S_W + S_L = 110$ (labor constraint: 110 hours)

$X_1, X_2, S_w, S_L \geq 0$ (nonnegativity conditions)

We can think of slack or surplus as unused resources that don't add any value to the objective function. Thus, their coefficients are 0 in the objective function equation.

Basic variable mix and non-basic variables

Since there are more unknown variables (four) than equations (two), we can't solve for unique values for the X and S variables using algebraic methods. Whenever the number of variables is greater than the number of equations, the values of the extra variables must be set arbitrarily, and then the other variables can be solved for algebraically.

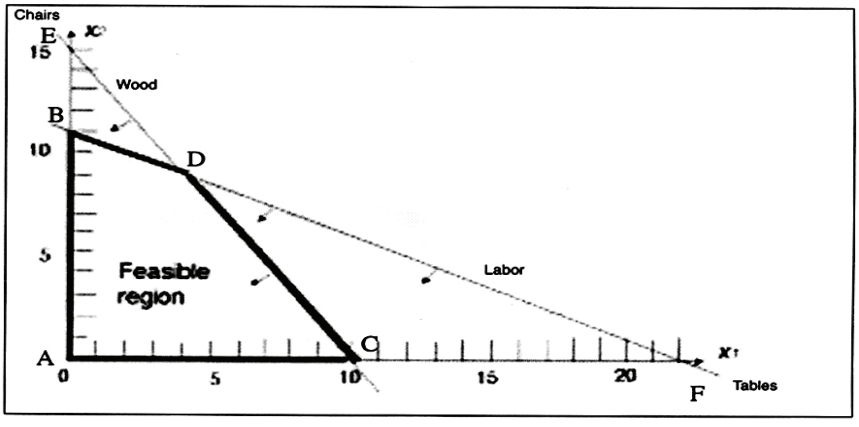
First we'll choose which variables to solve for algebraically. These variables are defined to be in the basic variable mix. We can solve for these variables after we fix the other variables at some arbitrary level.

The fixed-value variables are identified as not being in the basic mix and are called non-basic variables. We'll arbitrarily give the non-basic variables the value of 0. The algebraic solution of the constraint equations, with non-basic variables set to 0, represents a corner.

For any given set of variables, there are several possible combinations of basic variables and non-basic variables. For illustration, Table 4 contains the six basic mix pairs and the corresponding non-basic variables for the tables and chairs LP problem. Figure 2 illustrates where each corner (A through F in Table 4) lies on a graph.

Table 4. Basic variable mix combinations and algebraic solutions.

Basic variable mix	Non-basic variables	Algebraic solution					Corners (Figure 2)
		X_1	X_2	S_W	S_L	Z (₹)	
S_W S_L	X_1 X_2	0	0	300	110	0	A
S_W X_2	X_1 S_L	0	11	80	0	88	B
S_L X_1	X_2 S_W	10	0	0	60	60	C
X_1 X_2	S_W S_L	4	9	0	0	96	D
S_L X_2	S_W X_1	0	15	0	-40	infeasible	E
S_W X_1	S_L X_2	22	0	-360	0	infeasible	F



Corners corresponding to Table 4 data.

We can evaluate each corner to find the values of the basic variables and of Z:

Corner A:

Set $X_1 = 0$ and $X_2 = 0$

$30(0) + 20(0) + S_w + 0S_L = 300$

$5(0) + 10(0) + 0S_W + 5_L = 110$

Therefore, $S_w = 300$

and $S_L = 110$

Solution: $X_1 = 0$, $X_2 = 0$, $S_w = 300$, $S_L = 110$

Profit: Z = ₹6(0) + ₹8(0) + 0(300) + 0(110) = 0

Corner B:

Set $X_1 = 0$ and $S_L = 0$

$30(0) + 20X_2 + S_w + 0(0) = 300$

$5(0) + 10X_2 + 0S_w + 0 = 110$

Therefore, $20X_2 + S_W = 300$

and $10X_2 = 110$

Solution: $X_1 = 0$, $X_2 = 11$, $S_w = 80$, $S_L = 0$

Profit: Z = ₹6(0) + ₹8(11) + 0(80) + 0(0) = ₹88

Corner C:

Set $X_2 = 0$ and $S_w = 0$

$30X_1 + 20(0) + 0 + 0S_L = 300$

$5X_1 + 10(0) + 0(0) + S_L = 110$

Therefore, $30X_1 = 300$

and $5X_1 + S_L = 110$

Solution: $X_1 = 10$, $X_2 = 0$, $S_w = 0$, $S_L = 60$

Profit: Z = ₹6(10) + ₹8(0) + 0(0) + 0(60) = ₹60

Corner D:

Set $S_W = 0$ and $S_L = 0$

$30X_1 + 20X_2 + 0 + 0(0) = 300$

$5X_1 + 10X_2 + 0(0) + 0 = 110$

Therefore, $30X_1 + 20X_2 = 300$

and $5X_1 + 10X_2 = 110$

Solution: $X_1 = 4$, $X_2 = 9$, $S_W = 0$, $S_L = 0$

Profit: Z = ₹6(4) + ₹8(9) + 0(0) + 0(0) = ₹96

Point E is infeasible because it violates the labor constraint, and point F is infeasible because it violates the wood constraint. The simplex algorithm never evaluates infeasible corners.

Remember, with slack variables added, the tables and chairs LP is now four-dimensional and is not represented by above figure. Points on the constraint lines in Figure 2 represent 0 slack for both wood and labor resources. A feasible point off a constraint line represents positive slack and cannot be read off the two-dimensional graph.

In Table 4, all comers in the LP were identified, and all feasible comers were algebraically evaluated to find the optimum solution. You can see that a graph wasn't necessary to list all variable mixes and that each variable-mix pair corresponded to a comer solution.

One reason we can't use this procedure to solve most LP problems is that the number of comers for real-life LP problems usually is very large. Another reason is that each comer evaluation requires a lengthy algebraic solution. To obtain each comer solution for a 10-constraint linear program, 10 equations with 10 unknowns must be solved, which is not a simple arithmetic task. Many LP problems are formulated with many more than 10 constraints.

Simplex tableau

As you'll recall, we formulated the tables and chairs LP in standard form as:

Maximize:	$Z = 6X_1 + 8X_2 + 0S_W + 0S_L$	(objective function)
Subject to:	$30X_1 + 20X_2 + S_W + 0S_L = 300$	(wood constraint: 300 b0)
	$5X_1 + 10X_2 + 0S_W + S_L = 110$	(labor constraint: 110 hours)
	$X_1, X_2, S_w, S_L \geq 0$	(nonnegativity conditions)

The information for the tables and chairs example can be incorporated into a simplex tableau (Table 5). A tableau is a table that allows you to evaluate the values of variables at a given comer to determine which variable should be changed to most improve the solution.

Table 5. Tables and chairs simplex tableau.

Unit Profit		**6**	**8**	**0**	**0**	
	Basic mix	X_1	X_2	S_W	S_L	**Solution**
	S_W	30	20	1	0	300
	S_L	5	10	0	1	110

The top of the tableau lists the per-unit profit for the objective function. The rows in the body of the tableau indicate the basic variable mix for the corner point being evaluated. The first row in the body of the tableau lists the coefficients of the first constraint equation (the wood constraint) in their original order. The second row lists the coefficients of the second constraint equation (the labor constraint) in their original order.

The basic mix column lists the slack variables. All variables not listed in this column are designated as non-basic variables and will be arbitrarily fixed at a value of 0 when we plug them into the constraint equations.

The solution column lists the values of the basic variables, $S_w = 300$ and $S_L = 110$. Thus, the solution mix shows that all of the resources (wood and labor) remain unused. The solutions to the two constraint equations after zeroing out X_1 and X_2 are as follows:

$$30(0) + 20(0) + S_w + 0S_L = 300 \text{ or } S_w = 300$$

$$5(0) + 10(0) + 0S_W + S_L = 110 \text{ or } S_L = 110$$

The original constraint coefficients, highlighted in the simplex tableau, are called exchange coefficients. They indicate how many units of the variable listed on the left (basic mix column) must be given up to achieve a unit increase in the variable listed at the top of the tableau. The 30 indicates that 30 board feet of unused wood can be exchanged for one table, and the 20 indicates that 20 board feet of wood can be exchanged for one chair. Likewise, 5 hours of labor can be exchanged for one table, and 10 hours of labor can be exchanged for one chair.

The exchange coefficients are 0 or 1 for the basic mix variables. These numbers are not very meaningful. For example, the 1 in the first row indicates that 1 board foot of wood can be exchanged for 1 board foot of wood. The 0 in row one indicates that no unused wood is required to accommodate more unused labor.

Step 2. Find the sacrifice and improvement rows.

The next step is to expand the simplex tableau as in Table 6.

Table 6. Expanded simplex tableau.

Unit Profit		6	8	0	0		
	Basic mix	X_1	X_2	S_W	S_L	**Solution**	
0	S_W	30	20	1	0	300	
0	S_L	5	10	0	1	110	
	Sacrifice	0	0	0	0	0 ←	Current profit
	Improvement	6	8	0	0	—	

In the expanded tableau, list the per-unit profit for the basic variables in the far left-hand column (Unit profit). The per-unit profit for both slack variables is 0.

Values in the sacrifice row indicate what will be lost in per-unit profit by making a change in resource allocation. Values in the improvement row indicate what will be gained in per-unit profit by making a change in resource allocation. The sacrifice and improvement rows help you decide what corner to move to next.

Sacrifice row

Values for the sacrifice row are determined by:

Unit sacrifice = Unit profit column * Exchange coefficient column

To obtain the first sacrifice row value, calculations are:

(Unit profit column value) * (X_1 column value)

0 * 30 = 0

\+ 0 * 5 = 0 Add the products

0 First value in the sacrifice row

The first product is the unit profit of unused wood multiplied by the amount needed to make one table. The second product is the unit profit of unused labor multiplied by the amount needed to make one table. Together, these products are the profit that is sacrificed by the basic mix variables for producing one more table. Since both basic mix variables are slack variables, and slack refers to unused resources, zero profit is sacrificed by producing another table.

The next sacrifice row value is calculated in the same manner:

(Unit profit column value) * (X_2 column value)

0 * 20 = 0

\+ 0 * 10 = 0 Add the products

0 Second value in the sacrifice row

The other sacrifice row values are calculated in the same manner. In the case of our example, the unit profit values are 0, so the sacrifice row values are all 0.

The values in the solution column of the sacrifice row are calculated as:

(Unit profit column value) * (Solution column value)

0 * 300 = 0

\+ 0 * 110 = 0 Add the products

0

The sum of these products represents the current profit (Z).

Improvement row

Improvement row values are calculated by subtracting each value in the sacrifice row from the value found above it in the unit profit row. Therefore:

Unit improvement = Unit profit - Unit sacrifice

For example, the improvement for X_1 is calculated as:

Unit profit = 6 - Unit sacrifice = 0

₹6 (first value in the improvement row)

Since all of the sacrifice values are 0 in this example, all of the improvement row values are the same as those found in the unit profit row.

Step 3. Apply the entry criterion.

The next step is to apply the entry criterion, that is, to determine the entering variable. The entering variable is defined as the current non-basic variable that will most improve the objective if it is increased from 0. It's called the entering variable because it will enter the basic mix when you construct your next tableau to evaluate a new corner. For profit maximization problems, you determine the entering variable by finding the largest value in the improvement row.

In our example, the largest value in the improvement row is 8. Thus, we can increase profit (improve the current solution) by ₹8 per unit for each chair made. Increasing the value of X_2 from 0 to ₹8 is the best improvement that can be made. If we increase the value of X_1, our solution improves by only ₹6. Therefore, X_2 is the entering variable. The entering variable is marked by placing a downward facing arrow in the X_2 (chair) column (Table 7).

Table 7. Entering variable, exchange ratios, exiting variable, and pivot element.

Unit Profit		**6**	**8**	**0**	**0**		
	Basic mix	X_1	X_2 ↓	S_W	S_L	**Solution**	**Exchange ratios:**
0	S_W	30	20	1	0	300	300/20 = 15
0	S_L ←	5	(10)	0	1	110	110/10 = 11
	Sacrifice	0	0	0	0	0 ←	Current profit
	Improvement	6	8	0	0	—	

Step 4. Apply the exit criterion.

The next step is to determine the exiting variable. The exiting variable is the variable that will exit the basic mix when you construct your next simplex tableau.

We'll find the exiting variable by calculating the exchange ratio for each basic variable. The exchange ratio tells us how many tables or chairs can be made by using all of the resource for the current respective basic variable. To find the exchange ratio, divide the solution value by the corresponding exchange coefficient in the entering variable column. The exchange ratios are:

300/20 = 15 (S_w basic mix row)

and 110/10 =11 (S_L basic mix row)

By using all 300 board feet of wood, we can make 15 chairs because it takes 20 board feet of wood to make a chair. By using all 110 hours of labor, we can make 11 chairs because it takes 10 hours of labor per chair. Thus, it's easy to see the plant can't manufacture 15 chairs. We have enough wood for 15 chairs but only enough labor for 11. In this case, labor is the limiting resource. If all the labor were used, there would be leftover wood.

The exit criterion requires that the limiting resource (the basic mix variable with the smallest exchange ratio) exit the basic mix. In this case, the exiting variable is S_L. Because of this, wood (S_w) remains in the basic mix. Indicate the exiting variable by placing a small arrow pointing toward the S_L (Table 7).

Next circle the pivot element—the value found at the intersection of the entering variable column and the exiting variable row. In this case, the value 10 (X_2 column and 5 row) is the pivot element. We'll use this value to evaluate the next corner point represented by exchanging X_2 and S_L.

Step 5. Construct a new simplex tableau.

The next step is to create a new simplex tableau. First, let's look at the old constraint equations that represented the X_1 and X_2 rows in our original tableau:

$30X_1 + 20X_2 + SW + 0SL = 300$ (wood constraint)

$5X_1 + 10X_2 + 0S_W + S_L = 110$ (labor constraint)

Since X_2 is to replace S_L, we need to transform the second equation so that X_2 will have a coefficient of 1. This requires some algebraic manipulation. Although the resulting equations will look different, they will be equivalent to the original constraints of the LP problem.

First, we'll multiply the labor constraint equation by 1/10 (the same as dividing each of the variables by 10). We get the following equivalent equation:

$\frac{1}{2} X_1 + X_2 + OS_w + 1/10S_L = 11$

This now becomes the new X_2 row. By setting the non-basic variables, X_1 and S_L, both to 0, we get:

$\frac{1}{2} (0) + X_2 + 0S_W + 1/10 (0) = 11$

$X_2 = 11$

We want the solution, $X_2 = 11$, to satisfy both constraint equations. We can do this by zeroing the X_2 term in the first equation (the wood constraint). We'll do this by multiplying the second equation by -20 and adding it to the first equation:

Multiply times -20:

$-20(1/2 X_1 + X_2 + 0S_W + 1/10S_L) = 11$

$-10X_1 - 20X_2 - 0S_W - 2S_L = -220$

Add to the first equation:

$30X_1 + 20X_2 + S_w + 0S_L = 300$

$-10X_1 - 20X_2 - 0S_W - 2S_L = -220$

$20X_1 + 0X_2 + S_W - 2S_L = 80$

This equation becomes the new S_W row. Thus, our new constraint equations are:

$20X_1 + 0X_2 + S_w - S_L = 80$ (wood)

$\frac{1}{2} X_1 + X_2 + 0S_W + 1/10S_L = 11$ (labor)

When the non-basic variables X_1 and S_L are set to 0, the solution becomes:

$20(0) + 0 + S_w - 2(0) = 80$

$S_w = 80$

and $\frac{1}{2} (0) + X_2 + 0 + 1/10(0) = 11$

$X_2 = 11$

These two new equations give us some information. Remember, S_w represents the amount of surplus or slack wood, that is, the amount of wood not used. When 11 chairs are manufactured, 80 board feet of surplus or slack wood will remain.

The new simplex tableau is shown in Table 8c.

An easier method

The above equations can be calculated much more easily directly from the original simplex tableau than by doing the algebra. Refer to Tables 8a through 8c as we work through the example.

1. Fill in the new X_2 row.

Referring to Table 8a, divide all values in the exiting variable row, S_L, by the pivot element, 10. The calculations are 5/10, 10/10 (pivot element divided by itself), 0/10, and 1/10. Place the new values in the same location in the new tableau (Table 8b).

Place the unit profit row value for X_2, the new entering variable (8), into the unit profit column.

Table 8a. Original simplex tableau.

Unit Profit		**6**	**8**	**0**	**0**		
	Basic mix	X_1	X_2 ↓	S_W	S_L	**Solution**	**Exchange ratios:**
0	S_W	30	20	1	0	300	300/20 = 15
0	S_L ←	5	(10)	0	1	110	110/10 = 11
	Sacrifice	0	0	0	0	0 ←	Current profit
	Improvement	6	8	0	0	—	

Table 8b. Second simplex tableau—X_2 row.

Unit Profit		**6**	**8**	**0**	**0**	
	Basic mix	X_1	X_2	S_W	S_L	**Solution**
0	S_W					
8	X_2	0.5	1	0	0.1	11
	Sacrifice					
	Improvement					

2. Fill in the new S_w row.

Now we'll find the values for the S_w row. Referring to Table 8a, find the value in the S_w row in the old tableau in the pivot element column (20). Multiply it times the first value in the new X_2 row (0.5 from Table 8b). Subtract your answer from the value in the first position of the old S_w row.

Thus, for the first value (to replace the 30 in the first tableau):

(20 * 0.5) = 10

30 -10 = 20

For the second value (to replace 20 in the first tableau): (20 * 1) = 20

20-20 = 0

For the third value in this row:

20*0 = 0

1-0=1 (Stays the same in the new tableau.)

For the fourth value in this row: 20 * 0.1 = 2 0 - 2 = -2

For the solution column value for this row:

20*11=220

300 - 220 = 80

The new S_w row is shown in Table 8c.

Table 8c. Second simplex tableau — S_w row.

Unit Profit		**6**	**8**	**0**	**0**	
	Basic mix	X_1	X_2	S_W	S_L	**Solution**
0	S_W	20	0	1	-2	80
8	X_2	0.5	1	0	0.1	11
	Sacrifice					
	Improvement					

3. Find the sacrifice and improvement rows.

Find the sacrifice and improvement rows using the same method as in the first tableau. See Table 8d.

Table 8d. Second simplex tableau—sacrifice and improvement rows.

Unit Profit		**6**	**8**	**0**	**0**		
	Basic mix	X_1	X_2	S_W	S_L	**Solution**	
0	S_W	20	20	1	-2	80	
8	X_2	0.5	1	0	0.1	11	
	Sacrifice	4	8	0	0.8	0 ←	Current profit
	Improvement	2	0	0	-0.8	—	

We now see that profit has been improved from 0 to ₹88.

4. Complete the pivot operation (entering and exiting variables).

Recall that the pivot operation results in new entering and exiting variables. The greatest per-unit improvement is 2 (X_1 column). The others offer no improvement (either 0 or a negative number). X_1 becomes the new entering variable. Mark the top of its column with an arrow (Table 8e). Remember, when no improvement can be found at this step, the current tableau represents the optimal solution.

Now determine the exiting variable. To do so, first determine the exchange ratios:

80/20 = 4

and 11/0.5 = 22

Now choose the smallest nonnegative exchange ratio (4 versus 22). S_w becomes the exiting variable. Mark that row with an arrow. Draw a circle around the pivot element, 20. (Table 8e).

Table 8e. Second simplex tableau—pivot operation.

Unit Profit		6	8	0	0		Exchange
	Basic mix	X_1 ↓	X_2	S_W	S_L	Solution	ratios:
0	S_W ←	(20)	0	1	-2	80	80/20 = 4
8	X_2	0.5	1	0	0.1	11	11/0.5 = 22
	Sacrifice	2	8	0	0.8	88	
	Improvement	0	0	0	-0.8	—	

5. Construct the third tableau from the second tableau.

Replace the entering variable in the basic mix where the exiting variable left. Bring over the unit profit from the top row of the old table to the new table. Fill in the pivot element row by dividing through by the pivot element (Table 8f).

Table 8f. Third simplex tableau—X_1 row.

Unit Profit		6	8	0	0	
	Basic mix	X_1	X_2	S_W	S_L	Solution
6	S_W	1	0	0.05	-0.1	4
8	X_2					
	Sacrifice					
	Improvement					

Fill in the first value in the X_2 row as follows. First, multiply the previous tableau's X_2 pivot value (0.5) times the first value in the new tableau's X_1 row (1):

0.5 * 1 = 0.5

Now subtract this number from the first value in the previous tableau's X_2 row (0.5): 0.5 - 0.5 = 0

Place this value in the first position of the new tableau's X_2 row. Repeat this process to fill in the remaining values in the new X_2 row (Table 8g).

Table 8g. Third simplex tableau—X_2 row.

Unit Profit		6	8	0	0	
	Basic mix	X_1	X_2	S_W	S_L	Solution
6	X_1	1	0	0.05	-0.1	4
8	X_2	0	1	-0.025	0.15	9
	Sacrifice					
	Improvement					

Fill in the sacrifice row (Table 8h). The first value is (6*1) + (8*0) = 6.

Fill in the improvement row. The first value is 6 - 6 = 0.

Table 8h. Third simplex tableau—sacrifice and improvement rows.

Unit Profit		**6**	**8**	**0**	**0**	
	Basic mix	X_1	X_2	S_W	S_L	**Solution**
6	X_1	1	0	0.05	-0.1	4
8	X_2	0	1	-0.025	0.15	9
	Sacrifice	6	8	0.1	0.6	96
	Improvement	0	0	-0.1	-0.6	—

There are no positive numbers in the new improvement row. Thus, we no longer can improve the solution to the problem. This simplex tableau represents the optimal solution to the LP problem and is interpreted as:

$X_1 = 4$, $X_2 = 9$, $S_w = 0$, $S_L = 0$, and profit or Z = ₹96

The optimal solution (maximum profit to be made) is to manufacture four tables and nine chairs for a profit of ₹96.

Shadow Prices

The shadow price of a resource, which is a limiting factor on production is the amount by which :

(i) Total contribution would fall, if company were deprived of one unit of the scarce resource and also,

(ii) Total contribution would rise, if the company were able to obtain one extra unit of the scarce resource, provided that the resource remains an effective constraint on production and provided also that the extra unit of resource can be obtained at its normal variable cost.

The dual prices calculated on the assumption that there is a marginal increase or decrease in the availability of one scarce resource, but with the availability of other resources and demand constraint being held constant. The dual price of shadow price is sued to carry out sensitivity analysis on the availability of a scarce resource. (i.e. on the constraints in the model).

The simplex method produces the shadow prices as an automatic by-product. However, on certain occasions requirement is to calculate the shadow prices for problems that have been solved graphically, i.e., those with two unknowns. The shadow prices cannot be read from graph and some simple calculations are required. It should be remembered that every primal problem has a dual in linear programming (i.e. every LP has an equal but opposite formulation). The dual formulation of the problem gives the shadow prices. Therefore, for shadow prices for two decision variables a dual should be formed and simultaneous equation should be solved.

Learning Curve

Learning Curve Theory is concerned with the idea that when a new job, process or activity commences for the first time it is likely that the workforce involved will not achieve maximum efficiency immediately. Repetition of the task is likely to make the people more confident and knowledgeable and will eventually result in a more efficient and rapid operation. Eventually the learning process will stop after continually repeating the job. As a consequence the time to complete a task will initially decline and then stabilise once efficient working is achieved. The cumulative average time per unit is assumed to decrease by a constant percentage every time that output doubles. Cumulative average time refers to the average time per unit for all units produced so far, from and including the first one made.

Learning is the process by which an individual acquires skill, knowledge and ability. When a new product or process is started, the performance of a worker is not at its best and learning phenomenon takes place. As the experience is gained, the performance of a worker improves, time taken per unit

of activity reduces and his productivity goes up. This improvement in productivity of a worker is due to learning effect. Cost predictions especially those relating to direct labour cost must allow for the effect of learning process. This technique is a mathematical technique. It can be very much used to accurately and graphically predict cost. It is a geometrical progression, which reveals that there is steadily decreasing cost for the accomplishment of a given repetitive operation, as the identical operation is increasingly repeated. The amount of decrease is less and less with each successive unit produced. The slope of the decision curve can be expressed as a percentage. Experience curve, improvement curve and progress curve are other terms which can be synonymously used. Learning curve is essentially a measure of the experience gained in production of an article by an individual or organization. As more units are produced, people involved in production become more efficient than before. Each subsequent unit takes fewer man-hours to produce. The amount of improvement will differ with each type of article produced. This improvement or experience gain is reflected in a decrease in man-hours or cost.

Phases in Learning Curve

The learning curve will pass through three different phases. In the first phase, there will be gradual increase in production rate until the maximum expected rate is reached and this phase is generally steep. In the second phase, the learning rate will gradually deteriorate because of the limitations of equipment. In the third phase, the production rate begins to decrease due to a reduction in customer requirements and increase in costs.

Under the Learning curve model, the cumulative average time per unit produced is assumed to fall by a constant percentage every time total output of the unit doubles. Learning curve is a geometrical operation, as the identical operation is increasingly repeated.

Learning curve is essentially a measure if the experience gained in production of an article by an organization. As more and more units re produced, workers involved in production become more efficient than before. Each subsequent unit takes fewer manhours ro produce. The Learning curve exists during a worker's startup or familiarization period on a particular job. After the limits of experimental learning are reached, productivity tends to stabilize and no further improvement is possible. The learning curve ratio can be calculated with the help of the following formula :

$$\text{Learning curve ratio} = \frac{\text{Average cost of first 2 units}}{\text{Average labour cost of first units}}$$

Areas of consequence:

- A Standard Costing system would need to set standard labour times after the learning curve had reached a plateau.
- A budget will need to incorporate a learning cost factor until the plateau is reached.
- A budgetary control system incorporating labour variances will have to make allowances for the anticipated timechanges.
- Identification of the learning curve will permit the company to better plan its marketing, work scheduling, recruitment and material acquisition activities.
- The decline in labour costs will have to be considered when estimating the overhead apportionment rate.
- As the employees gain experience they are more likely to reduce material wastage.

Graphical presentation of learning curve

The learning curve (not to be confused with experience curve) is a graphical representation of the phenomenon explained by Theodore P. Wright in his "Factors Affecting the Cost of Airplanes", 1936. It refers to the effect that learning had on labour productivity in the aircraft industry, which translates

into a relation between the cumulative number of units produced (X) and the average time (or labour cost) per unit (Y), which resulted in a convex downward slope, as seen in the adjacent diagram.

There is a simple rationalisation behind all this: the more units produced by a given worker, the less time this same worker will need to produce the following units, because he will learn how to do it faster and better. Therefore, when a firm has higher cumulative volume of production, its time (or labour cost) per unit will be lower. Wright's learning curve model is defined by the following function:

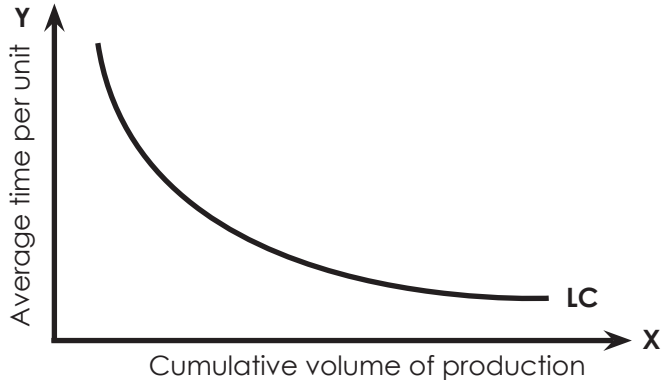
$$Y = aX^{\frac{\log b}{\log 2}}$$

where: Y = average time (or labour cost) per unit

a = time (or labour cost) per unit

X = cumulative volume of production

b = learning rate (%)



Some important implications arise from this curve. If the time (or labour cost) per unit decreases as the cumulative output increases, this will mean that firms that have been producing more and for a longer period, will have lower average time per unit and thus dominate the market.

Uses of Learning curve.

Learning curve is now being widely issued in business. Some of the uses are as follows:

1. Where applicable the learning curve suggest great opportunities for cost reduction to be achieved by improving learning.
2. The learning curve concept suggests a basis for correct staffing in continuously expanding production. The curve shows that the work force need not be increased at the same rate as the prospective output. This also helps in proper production planning through proper scheduling of work; providing manpower at the right moment permitting more accurate forecast of delivery dates.
3. Learning curve concept provides a means of evaluating the effectiveness of training programs. What level of cumulative cost reduction do they accomplish? How does the learning curve for this group or shop compare with others? Whether any of the employees who lack the aptitude to meet normal learning curve should be eliminated.
4. Learning curve is frequently used in conjunction with establishing bid price for contracts. Usually, the bid price is based on the cumulative average unit cost for all the units to be produced for a given contract. If production is not interrupted. Additional units beyond this quantity should be costed at the increment costs incurred, and not at the previous cumulative average. If the contract agreement so provides, a contract may be cancelled and production stopped before

the expected efficiency is reached. This would mean that the company having quoted on the basis of cumulative average unit cost is at a disadvantage because it can not reap the benefit of leaning. The contractor must provide for these contingencies so that it will be reimbursed for such loss.

5. The use of learning curve, where applicable, is important in the working capital required. If the requirement is based on average cumulative unit cost, the revenues from the first few units may not cover the actual expenditures. For instance, if the price was based on the average cumulative unit cost of 328 hours the first unit when produced and sold will cause a deficit of 4.72 hours (8.00 – 3.28). Provision should therefore, be made to cover the deficit of working capital in the initial stages of production.
6. As employees become more efficient, the rate of production increases and so more materials are needed, the work-in-progress inventory turns over faster, and finished goods inventory grows at an accelerated rate. A knowledge of the learning curve assists in planning the inventories of materials. Work-in-progress, and finished goods.
7. Learning curve techniques are useful in exercising control, Variable norms can be established for each situation, and a comparison between these norms and actual expenses can be made. Specific or average incremental unit cost should be used for this purpose.
8. The learning curve may be used for make-or- buy decisions especially if the outside manufacturer has reached the maximum on the learning curve. Help to calculate the sensitive rates in wage bargaining.

Limitations to the usefulness of the learning curve:

The following points limiting the usefulness of learning curves should be noted:-

1. The learning curve is useful only for new operations where machines do not constitute a major part of the production process. It is not applicable to all productions. E.g. new and experienced workmen.
2. The learning curve assumes that the production will continue without any major interruptions. If for any reason the work in interrupted, the curve may be deflected or assume a new slopes
3. Charges other than learning may effect the learning curve. For example, improvement in facilities, arrangements, and equipment as well as personnel morale and performance may be factors influencing the curve. On the other hand, negative developments in employee attitudes may also affect the curve and reverse or retard the progress of improvement.
4. The characteristic 80 percent learning curve as originally obtaining in the air force industry in U.S. A. has been usually accepted as the percentage applicable to all industries. Studies show that there cannot be a unique percentage which can be universally applied.

Factors affecting Learning Curve:

1. While pricing for bids, general tendency is to set up a very high initial labour cost so as to show a high learning curve. This should the learning curve useless and sometimes misleading.
2. The method of production, i.e. whether it is labour oriented or machine oriented influences the slop of the learning.
3. When labour turnover rate is high management has to train new workers frequently. In such situations the company may never reach its maximum efficiency potential. One of the important requisites of the learning curve concept is that there should be uninterrupted flow of work. The fewer the interruptions, the grater will be the improvement in efficiency.
4. Changes in a product or in the methods of production, designs, machinery, or the tools/used affect the slope of the learning curve. All these have the effect of starting learning a fresh because of new conditions If the changes are frequent, there may be no learning at all.

5. Also other factors influencing the learning curve are labour strikes, lock outs and shut downs due to other cause also/affect the learning curve. In each such case there is interruption in the progress of learning.

As far as possible the effects of above factors should be carefully separated from the data used to establish the curve. The effects of these factors must also be separated from the actual costs used to measure the performance. Unless this is done analysis of the projected cost or the actual cost will not be meaningful.

The experience curve

The more experience a firm has in producing a particular product, the lower its costs

The experience curve is an idea developed by the Boston Consulting Group (BCG) in the mid-1960s. Working with a leading manufacturer of semiconductors, the consultants noticed that the company's unit cost of manufacturing fell by about 25% for each doubling of the volume that it produced. This relationship they called the experience curve: the more experience a firm has in producing a particular product, the lower are its costs. Bruce Henderson, the founder of BCG, put it as follows:

Costs characteristically decline by 20-30% in real terms each time accumulated experience doubles. This means that when inflation is factored out, costs should always decline. The decline is fast if growth is fast and slow if growth is slow.

There is no fundamental economic law that can predict the existence of the experience curve, even though it has been shown to apply to industries across the board. Its truth has been proven inductively, not deductively. And if it is true in service industries such as investment banking or legal advice, the lower costs are clearly not passed on to customers.

By itself, the curve is not particularly earth shattering. Even when BCG first expounded the relationship, it had been known since the second world war that it applied to direct labour costs. Less labour was needed for a given output depending on the experience of that labour. In aircraft production, for instance, labour input decreased by some 10–15% for every doubling of that labour's experience.

The strategic implications of the experience curve came closer to shattering earth. For if costs fell (fairly predictably) with experience, and if experience was closely related to market share (as it seemed it must be), then the competitor with the biggest market share was going to have a big cost advantage over its rivals. QED: being market leader is a valuable asset that a firm relinquishes at its peril.

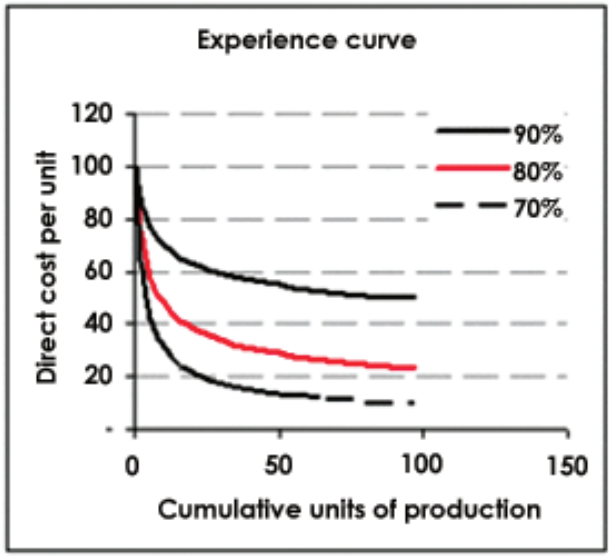
This was the logical underpinning of the idea of the growth share matrix. The experience curve justified allocating financial resources to those businesses (out of a firm's portfolio of businesses) that were (or were going to be) market leaders in their particular sectors. This, of course, implied starvation for those businesses that were not and never would be market leaders.

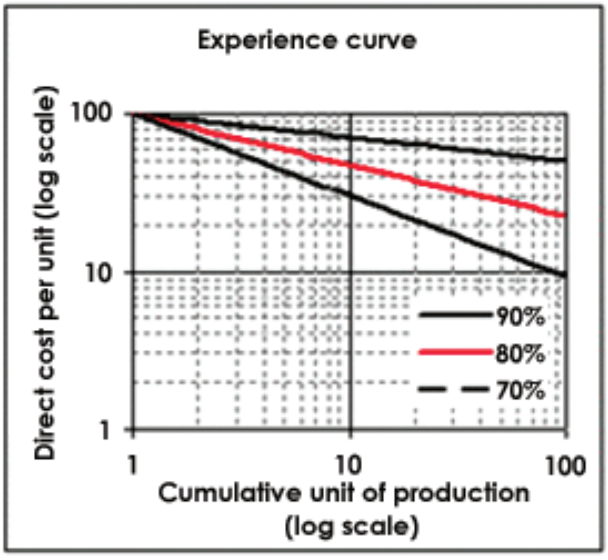
Over time, managers came to find the experience curve too imprecise to help them much with specific business plans. Inconveniently, different products had curves of a different slope and different sources of cost reduction. They did not, for instance, all have the same downward gradient as the semiconductor industry, where BCG had first identified the phenomenon. A study by the Rand Corporation found that "a doubling in the number of [nuclear] reactors [built by an architect–engineer] results in a 5% reduction in both construction time and capital cost".

Part of the explanation for this discrepancy was that different products provided different opportunities to gain experience. Large products (such as nuclear reactors) are inherently bound to be produced in smaller volumes than small products (such as semiconductors). It is not easy for a firm to double the volume of production of something that it takes over five years to build, and whose total market may never be more than a few hundred units.

In theory, the experience curve should make it difficult for new entrants to challenge firms with a substantial market share. In practice, new firms enter old industries all the time, and before long many of them become major players in their markets. This is often because they have found ways of

bypassing what might seem like the remorseless inevitability of the curve and its slope. For example, experience can be gained not only first-hand, by actually doing the production and finding out for yourself, but also second-hand, by reading about it and by being trained by people who have first-hand experience. Furthermore, firms can leapfrog over the experience curve by means of innovation and invention. All the experience in the world in making black and white television sets is worthless if everyone wants to buy colour ones.





Simulation Technique

Effective evaluations of many real-world situations are too complex. Alternative methods must be used to evaluate the performance of such systems. Simulation is a modeling and analysis tool widely used for the purpose of designing, planning, and control of manufacturing systems. Simulation in general is to pretend that one deals with a real thing while really working with an imitation. In operations research, the imitation is a computer model of the simulated reality. The task of executing simulations provides insight and a deep understanding of physical processes that are being modeled.

Simulation is generally referred to as computer simulation, which simulates the operation of a manufacturing system. A computer simulation or a computer model is a computer program which attempts to simulate an abstract model of a particular system. Computer simulation was developed hand-in-hand with the rapid growth of the computer, following its first large-scale deployment during the Manhattan Project in World War II to model the process of nuclear detonation. Computer simulation is often used an adjunct to, or substitution for, modeling systems for which simple closed form analytic solutions are not possible. There are many different types of computer simulation; the common feature they all share is the attempt to generate a sample of representative scenarios for a model in which a complete enumeration of all possible states of the model would be prohibitive or impossible.

Computer simulations have become a useful part of modeling many natural systems in physics, chemistry and biology, human systems in economics and social science and in the process of new technology in the field of engineering, to gain insight into the operation of those systems. Traditionally, the formal modeling of systems has been via a mathematical model, which attempts to find analytical solutions to problems which enables the prediction of the behaviour of the system from a set of parameters and initial conditions. Computer simulations build on, and are a useful adjunct to purely mathematical models in science and technology and entertainment.

With a computer simulation model, a manager or system analyst is able to observe the behaviour of a process without the necessity of experimenting with the actual system. In order to evaluate the system's performance given various disturbances, or to identify the bottlenecks, they may try out different manufacturing runs, new operational conditions, new equipment layouts or different cycle times.

A simple example of a simulation involves the tossing of a ball into the air. The ball can be said to "simulate" a missile, for instance. That is, by experimenting with throwing balls starting at different initial heights and initial velocity vectors, it can be said that we are simulating the trajectory of a missile. This kind of simulation is known as analog simulation since it involves a physical model of a ball. A flight simulator on a PC is a computer model of some aspects of the flight: it shows on the screen the controls and what the "pilot" (the youngster who operates it) is supposed to see from the "cockpit" (his armchair).

Application of Simulation

- Scheduling aircraft,
- Job-ship scheduling and personnel scheduling,
- Manpower-hiring decisions,
- Traffic light-timing,
- Transport-scheduling,
- Evaluating alternative investment opportunities, and
- Design of parking lots, harbor, and communication systems etc.

Advantages of Simulation

(a) Enables to experiment and study complex interactions of a system (e.g. company operations, economic policies).

(b) Possible to study the effects of organizational environment informational changes in the operations of a system (e.g. number of stocking points, industrial policies).

(c) Better insight and understanding of a complex system to indication for improvement.

(d) Assists in teaching and training (management games).

(e) New situations policies can be protested.

(f) Probabilistic features can be easily incorporated.

(g) A process can be studies in extended or compressed time.

(h) Risks involved in experimenting with real problems can be eliminated.

Limitations of Simulations

(a) Simulated results are not precise. Unlike mathematical models, it does not give optimum solutions. At times one may not be able to assess the extent of error in a simulated result.

(b) Some situations are not amenable to simulation.

(c) Simulation may be expensive needing advanced computer supports

(d) Simulation by itself does not generate solutions, but only indicates a way of evaluating solutions.

(e) It is often a long, complicated process to develop a model.

Steps involved in constructing and using a Simulation Model

All simulation projects follow the following steps :

(i) Define the problem

(ii) Data collection

(iii) Problem analysis

(iv) Simulation model specification

(v) Model programming

(vi) Model validation

(vii) Simulation experimentation

(viii) Evaluation and interpretation of simulation results

(ix) Report generation and plans for implementation of the results

Design of Simulation Model

One should consider the characteristic of the system in question and the nature of the problems to be tackled while choosing a modeling approach. In general the simulation model used in the area of Manufacturing Systems Engineering (MSE) can be classified as :

(i) Static and Dynamic Simulation Models

(ii) Continuous and Discrete Simulation Model

(iii) Stochastic and Deterministic Simulation Model

(iv) Social Simulation

(v) Web based Simulation

(vi) Parallel and Distributed Simulation

Types of Simulation

Simulators are usually divided into the following categories or simulation modes :

- Behavioral simulation
- Functional simulation
- Static timing analysis
- Gate-level simulation
- Switch-level simulation
- Transistor-level or circuit-level simulation

This list is ordered from high-level to low-level simulation (high-level being more abstract, and low-level being more detailed). Proceeding from high-level to low-level simulation, the simulations become more accurate, but they also become progressively more complex and take longer to run. While it is just possible to perform a behavioral-level simulation of a complete system, it is impossible to perform a circuit-level simulation of more than a few hundred transistors.

There are several ways to create an imaginary simulation model of a system. One method models large pieces of a system as black boxes with inputs and outputs. This type of simulation (often using VHDL or Verilog) is called behavioral simulation . Functional simulation ignores timing and includes unit-delay simulation , which sets delays to a fixed value (for example, 1 ns). Once a behavioral or functional simulation predicts that a system works correctly, the next step is to check the timing performance. At

this point a system is partitioned into ASICs and a timing simulation is performed for each ASIC separately (otherwise the simulation run times become too long). One class of timing simulators employs timing analysis that analyzes logic in a static manner, computing the delay times for each path. This is called static timing analysis because it does not require the creation of a set of test (or stimulus) vectors (an enormous job for a large ASIC). Timing analysis works best with synchronous systems whose maximum operating frequency is determined by the longest path delay between successive flip-flops. The path with the longest delay is the critical path .

Logic simulation or gate-level simulation can also be used to check the timing performance of an ASIC. In a gate-level simulator a logic gate or logic cell (NAND, NOR, and so on) is treated as a black box modeled by a function whose variables are the input signals. The function may also model the delay through the logic cell. Setting all the delays to unit value is the equivalent of functional simulation. If the timing simulation provided by a black-box model of a logic gate is not accurate enough, the next, more detailed, level of simulation is switch-level simulation which models transistors as switches—on or off. Switch-level simulation can provide more accurate timing predictions than gate-level simulation, but without the ability to use logic-cell delays as parameters of the models. The most accurate, but also the most complex and time-consuming, form of simulation is transistor-level simulation . A transistor-level simulator requires models of transistors, describing their nonlinear voltage and current characteristics.

Each type of simulation normally uses a different software tool. A mixed-mode simulator permits different parts of an ASIC simulation to use different simulation modes. For example, a critical part of an ASIC might be simulated at the transistor level while another part is simulated at the functional level. Be careful not to confuse mixed-level simulation with a mixed analog/digital simulator, these are mixed-level simulators .

Simulation is used at many stages during ASIC design. Initial prelayout simulations include logic-cell delays but no interconnect delays. Estimates of capacitance may be included after completing logic synthesis, but only after physical design is it possible to perform an accurate postlayout simulation .

Monte Carlo Simulation

Monte Carlo simulation, or probability simulation, is a technique used to understand the impact of risk and uncertainty in financial, project management, cost, and other forecasting models.

Uncertainty in Forecasting Models

When you develop a forecasting model – any model that plans ahead for the future – you make certain assumptions. These might be assumptions about the investment return on a portfolio, the cost of a construction project, or how long it will take to complete a certain task. Because these are projections into the future, the best you can do is estimate the expected value.

You can't know with certainty what the actual value will be, but based on historical data, or expertise in the field, or past experience, you can draw an estimate. While this estimate is useful for developing a model, it contains some inherent uncertainty and risk, because it's an estimate of an unknown value.

Estimating Ranges of Values

In some cases, it's possible to estimate a range of values. In a construction project, you might estimate the time it will take to complete a particular job; based on some expert knowledge, you can also estimate the absolute maximum time it might take, in the worst possible case, and the absolute minimum time, in the best possible case. The same could be done for project costs. In a financial market, you might know the distribution of possible values through the mean and standard deviation of returns.

By using a range of possible values, instead of a single guess, you can create a more realistic picture of what might happen in the future. When a model is based on ranges of estimates, the output of the model will also be a range.

This is different from a normal forecasting model, in which you start with some fixed estimates – say the time it will take to complete each of three parts of a project – and end up with another value – the total

time for the project. If the same model were based on ranges of estimates for each of the three parts of the project, the result would be a range of times it might take to complete the project. When each part has a minimum and maximum estimate, we can use those values to estimate the total minimum and maximum time for the project.

Network Analysis

Network analysis is the general name given to certain specific techniques which can be used for planning, management and control of project. It often acts as a network management tool for breaking down projects into components or individual activities and recording the result on a flow chart or network diagram. These results generally reveal information that is used to determine duration, resource limitations and cost estimates associated with the project.

It offers insight into what is occurring at each critical point of the network. Project management and efficient resource allocation are two critical aspects of the production and operations managers' responsibilities. Since a project is non-repetitive and temporal in nature, the mode of management differs from the usual job shop or other related types of scheduling.

Network analysis enables us to take a systematic quantitative structural approach to the problem of managing a project through to successful completion. Also, since it has a graphical representation, it can be easily understood and used by those with a less technical background.

Network is a graphical representation of all the Activities and Events arranged in a logical and sequential order. Network analysis plays an important role in project management. A project is a combination of interrelated activities all of which must be executed in a certain order for its completion. Activity is the actual performance of the job. This consumes resources (Time, human resources, money, and material. An event refers to start or completion of a job. This does not consume any resources.

Applications:

- Construction of a Residential complex,
- Commercial complex,
- Petro-chemical complex
- Ship building
- Satellite mission development
- Installation of a pipe line project etc...

The procedure of drawing a network is:

1. **Specify the Individual Activities:** From the work breakdown structure, a listing can be made of all the activities in the project. This listing can be used as the basis for adding sequence and duration information in later steps.
2. **Determine the Sequence of the Activities:** Some activities are dependent on the completion of others. A listing of the immediate predecessors of each activity is useful for constructing the CPM network diagram.
3. **Draw the Network Diagram:** Once the activities and their sequencing have been defined, the CPM diagram can be drawn. CPM originally was developed as an activity on node (AON) network, but some project planners prefer to specify the activities on the arcs.
4. **Estimate Activity Completion Time:** The time required to complete each activity can be estimated using past experience or the estimates of knowledgeable persons. CPM is a deterministic model that does not take into account variation in the completion time, so only one number is used for an activity's time estimate.

5. **Identify the Critical Path:** The critical path is the longest-duration path through the network. The significance of the critical path is that the activities that lie on it cannot be delayed without delaying the project. Because of its impact on the entire project, critical path analysis is an important aspect of project planning.

The critical path can be identified by determining the four parameters for each activity. The four parameters are Earliest Start, Earliest Finish, Latest Finish and Latest Start.

Rules for drawing the network diagrams.

In a network diagram, arrows represent the activities and circles represent the events.

- The tail of an arrow represents the start of an activity and the head represent the completion of the activity.
- The event numbered 1 denotes the start of the project and is called initial event.
- Event carrying the highest number in the network denotes the completion of the project and is called terminal event.
- Each defined activity is represented by one and only arrow in the network.
- Determine which operation must be completed immediately before other can start.
- Determine which other operation must follow the other given operation.
- The network should be developed on the basis of logical, analytical and technical dependencies between various activities of the project.

The basic network construction – Terminology used.

Network representation: There are two types of systems –

AOA system (Activity on Arrow system)	AON system (Activity on Node system)
In this activities are represented by an arrows.	In this method activities are represented in the circles.

A project consists of tasks with definite starting and ultimate ending points and hence a project manager is saddled with the responsibilities of getting job done on schedule within allowable cost and time constraint specified by the management. Typically all projects can be broken into:

Separate activities – where each activity has an associated completion time (time from the start of the activity to its finish).

Precedence relationships – which govern order in which we may perform the activities.

The main problem is to bring all these activities together in a coherent fashion to complete the project at a required time.

Apart from the traditional method of adding activity durations, these exist two different techniques for network analysis namely the PERT – Program Evaluation and Review Technique and CPM – Critical Path Management.

PERT has the ability to cope with uncertainty in activity completion times while CPM emphasized on the trade-off between cost of the project and its overall completion time.

The CPM has the advantage of decreasing completion times by probably spending more money.

Differences between PERT & CPM

PERT	CPM
1. It is a technique for planning scheduling & controlling of projects whose activities are subject to uncertainty in the performance time. Hence it is a probabilistic model.	1. It is a technique for planning scheduling & controlling of projects whose activities not subjected to any uncertainty and the performance times are fixed. Hence it is a deterministic model.
2. It is an Event oriented system	2. It is an Activity oriented system
3. Basically does not differentiate critical and non-critical activities.	3. Differentiates clearly the critical activities from the other activities.
4. Used in projects where resources (men, materials, money) are always available when required.	4. Used in projects where overall costs is of primarily important. Therefore better utilized resources.
5. Suitable for Research and Development projects where times cannot be predicted.	5. Suitable for civil constructions.

Critical Path Analysis and PERT are powerful tools that help you to schedule and manage complex projects. They were developed in the 1950s to control large defense projects, and have been used routinely since then.

As with Gantt Charts, Critical Path Analysis (CPA) or the Critical Path Method (CPM) helps you to plan all tasks that must be completed as part of a project. They act as the basis both for preparation of a schedule, and of resource planning. During management of a project, they allow you to monitor achievement of project goals. They help you to see where remedial action needs to be taken to get a project back on course.

Within a project it is likely that you will display your final project plan as a Gantt Chart (using Microsoft Project or other software for projects of medium complexity or an excel spreadsheet for projects of low complexity).The benefit of using CPA within the planning process is to help you develop and test your plan to ensure that it is robust. Critical Path Analysis formally identifies tasks which must be completed on time for the whole project to be completed on time. It also identifies which tasks can be delayed if resource needs to be reallocated to catch up on missed or overrunning tasks. The disadvantage of CPA, if you use it as the technique by which your project plans are communicated and managed against, is that the relation of tasks to time is not as immediately obvious as with Gantt Charts. This can make them more difficult to understand.

A further benefit of Critical Path Analysis is that it helps you to identify the minimum length of time needed to complete a project. Where you need to run an accelerated project, it helps you to identify which project steps you should accelerate to complete the project within the available time.

Critical Path Analysis (**CPA**) is a project management tool that:

- Sets out all the individual activities that make up a larger project.
- Shows the order in which activities have to be undertaken.
- Shows which activities can only taken place once other activities have been completed.
- Shows which activities can be undertaken simultaneously, thereby reducing the overall time taken to complete the whole project.
- Shows when certain resources will be needed – for example, a crane to be hired for a building site.

In order to construct a CPA, it is necessary to estimate the elapsed time for each activity – that is the time taken from commencement to completion.

Then the CPA is drawn up based on dependencies such as:

- The availability of labour and other resources
- Lead times for delivery of materials and other services
- Seasonal factors – such as dry weather required in a building project

Once the CPA is drawn up, it is possible to see the **CRITICAL PATH** itself – this is a route through the CPA, which has no spare time (called '**FLOAT**' or 'slack') in any of the activities. In other words, if there is any delay to any of the activities on the critical path, the whole project will be delayed unless the firm makes other changes to bring the project back on track.

The total time along this critical path is also the **minimum** time in which the whole project can be completed.

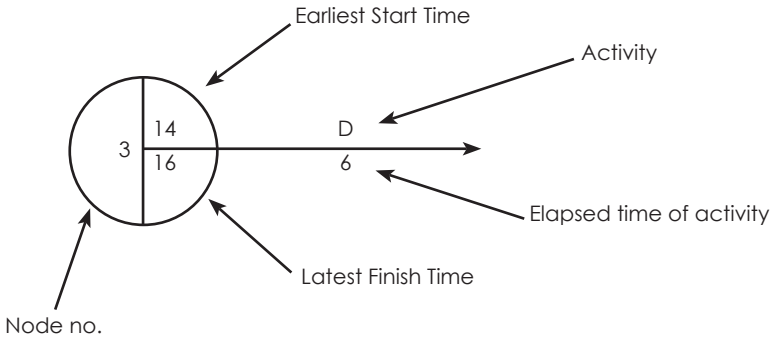
Some branches on the CPA may have **FLOAT**, which means that there is some spare time available for these activities.

What can a business do if a project is delayed?

- Firstly, the CPA is helpful because it shows the likely impact on the whole project if no action were taken.
- Secondly, if there is float elsewhere, it might be possible to switch staff from another activity to help catch up on the delayed activity.
- As a rule, most projects can be brought back on track by using extra labour – either by hiring additional people or overtime. Note, there will be usually be an extra cost. Alternative suppliers can usually be found – but again, it might cost more to get urgent help.
- Nodes are numbered to identify each one and show the Earliest Start Time (EST) of the activities that immediately follow the node, and the Latest Finish Time (LFT) of the immediately preceding activities
- The CPA must begin and end on one 'node' – see below
- There must be no crossing activities in the CPA
- East activity is labelled with its name eg 'print brochure', or it may be given a label, such as 'D', below.
- The activities on the critical path are usually marked with a '//'

In the example below

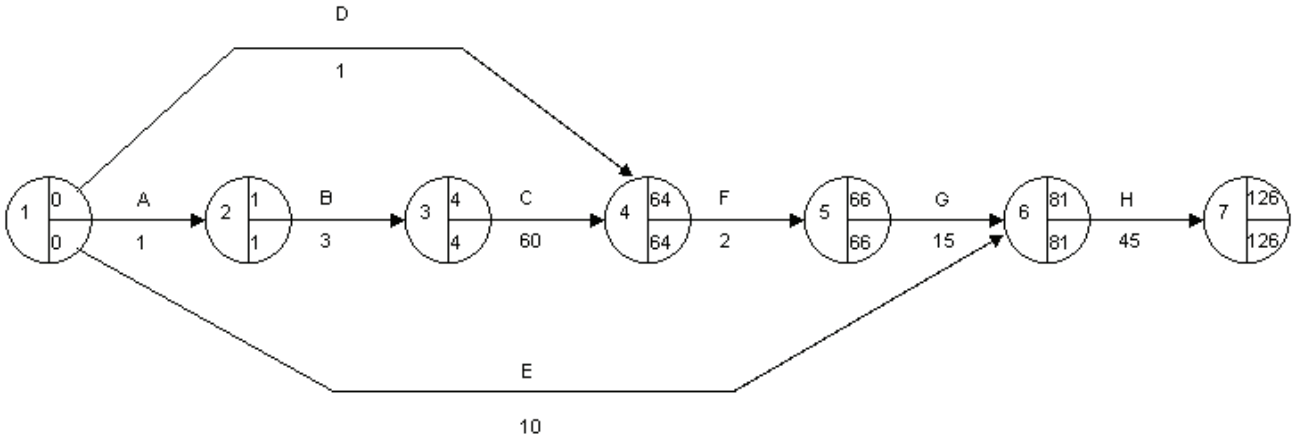
- The Node is number 3
- The EST for the following activities is 14 days
- The LFT for the preceding activities is 16 days
- There is 2 days' float in this case (difference between EST and LFT)
- The activity that follows the node is labelled 'D' and will take 6 days



A simple example – baking a loaf of bread

Here is a simple example, in which some activities depend on others having been undertaken in order, whereas others can be done independently.

Activity	Preceded by	Elapsed time (minutes)
A - Weigh ingredients	-	1
B - Mix ingredients	A	3
C - Dough rising time	B	60
D - Prepare tins	-	1
E - Pre-heat oven	-	10
F - Knock back dough and place in tins	C&D	2
G - 2 nd dough rising time	F	15
H - Cooking time	E & G	40



In this example, there is a clear sequence of events that have to happen in the right order. If any of the events on the critical path is delayed, then the bread will not be ready as soon. However, tasks D (prepare tins) and E (heat the oven) can be started at any time as long as they are done by the latest finish time in the following node.

So, we can see that the oven could be switched on as early as time 0, but we can work out that it could be switched on at any time before 71 – any later than this and it won't be hot enough when the dough is ready for cooking. There is some 'float' available for tasks D and E as neither is on the critical path.

This is a fairly simple example, and we can see the LST and LFT are the same in each node. In a more complex CPA, this will not necessarily be the case, and if so, will indicate that there is some 'float' in at least one activity leading to the node. However, nodes on the critical path will always have the same EST and LFT.

CPA is a planning and project management tool. Whilst it can help ensure a project is completed as quickly as possible, and resources used as efficiently as possible, it does depend on the accuracy of the information used.

Just drawing up a CPA will not in itself ensure a project runs to plan; most projects encounter some delay or something unexpected, so managers need to use tool such as CPA to monitor the project and take swift action to rectify any problems.

Drawing a Critical Path Analysis Chart

Use the following steps to draw a CPA Chart:

Step 1. List all activities in the plan

For each activity, show the earliest start date, estimated length of time it will take, and whether it is parallel or sequential. If tasks are sequential, show which stage they depend on.

Figure 1. Task List: Planning a custom-written computer project

Task	Earliest start	Length	Type	Dependent on...
A. High level analysis	Week 0	1 week	Sequential	
B. Selection of hardware platform	Week 1	1 day	Sequential	A
C. Installation and commissioning of hardware	Week 1.2	2 weeks	Parallel	B
D. Detailed analysis of core modules	Week 1	2 weeks	Sequential	A
E. Detailed analysis of supporting modules	Week 3	2 weeks	Sequential	D
F. Programming of core modules	Week 3	2 weeks	Sequential	D
G. Programming of supporting modules	Week 5	3 weeks	Sequential	E
H. Quality assurance of core modules	Week 5	1 week	Sequential	F
I. Quality assurance of supporting modules	Week 8	1 week	Sequential	G
J. Core module training	Week 6	1 day	Parallel	C,H
K. Development and QA of accounting reporting	Week 5	1 week	Parallel	E
L. Development and QA of management reporting	Week 5	1 week	Parallel	E
M. Development of Management Information System	Week 6	1 week	Sequential	L
N. Detailed training	Week 9	1 week	Sequential	I, J, K, M

Step 2. Plot the activities as a circle and arrow diagram

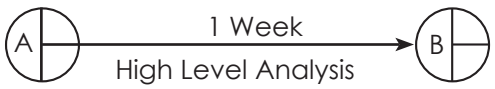
Critical Path Analyses are presented using circle and arrow diagrams.

In these, circles show events within the project, such as the start and finish of tasks. The number shown in the left hand half of the circle allows you to identify each one easily. Circles are sometimes known as nodes.

An arrow running between two event circles shows the activity needed to complete that task. A description of the task is written underneath the arrow. The length of the task is shown above it. By convention, all arrows run left to right. Arrows are also sometimes called arcs.

An example of a very simple diagram is shown below:

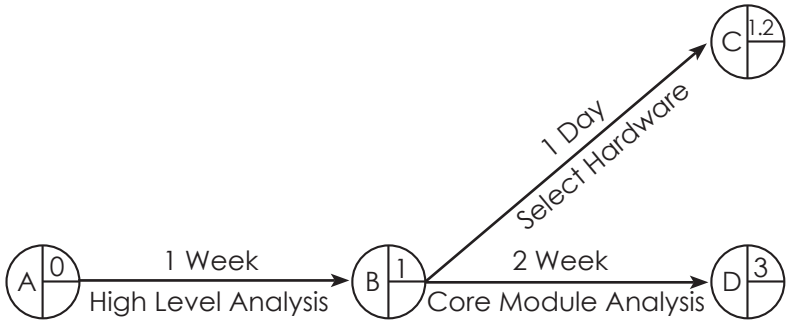
Figure 2: Simple Circle and Arrow Diagram



This shows the start event (circle 1), and the completion of the 'High Level Analysis' task (circle 2). The arrow between them shows the activity of carrying out the High Level Analysis. This activity should take 1 week.

Where one activity cannot start until another has been completed, we start the arrow for the dependent activity at the completion event circle of the previous activity. An example of this is shown below:

Circle and Arrow Diagram showing two activities that cannot be started until the first activity has been completed.

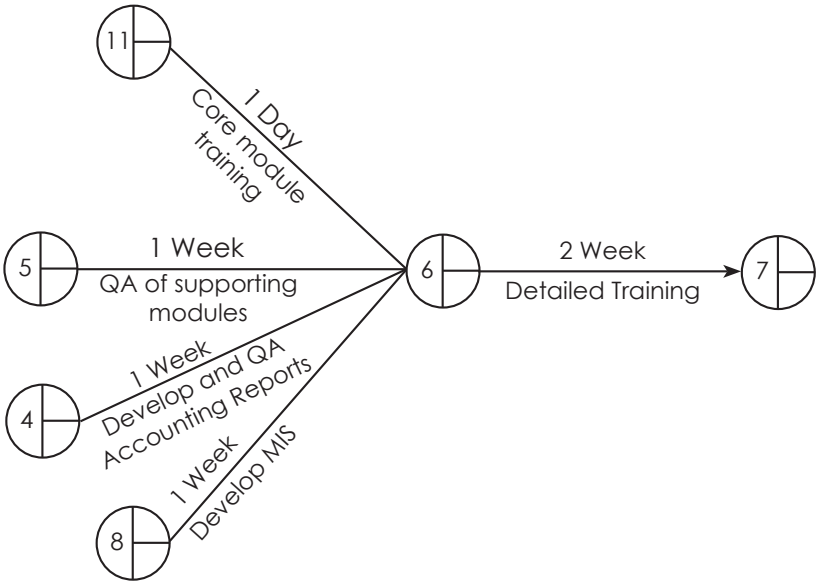


Here the activities of 'Select Hardware' and 'Core Module Analysis' cannot be started until 'High Level Analysis' has been completed. This diagram also brings out a number of other important points:

- Within Critical Path Analysis, we refer to activities by the numbers in the circles at each end. For example, the task 'Core Module Analysis' would be called activity 2 to 3. 'Select Hardware' would be activity 2 to 9.
- Activities are not drawn to scale. In the diagram above, activities are 1 week long, 2 weeks long, and 1 day long. Arrows in this case are all the same length.
- In the example above, you can see a second number in the top, right hand quadrant of each circle. This shows the **earliest start time** for the following activity. It is conventional to start at 0. Here units are whole weeks.

A different case is shown below:

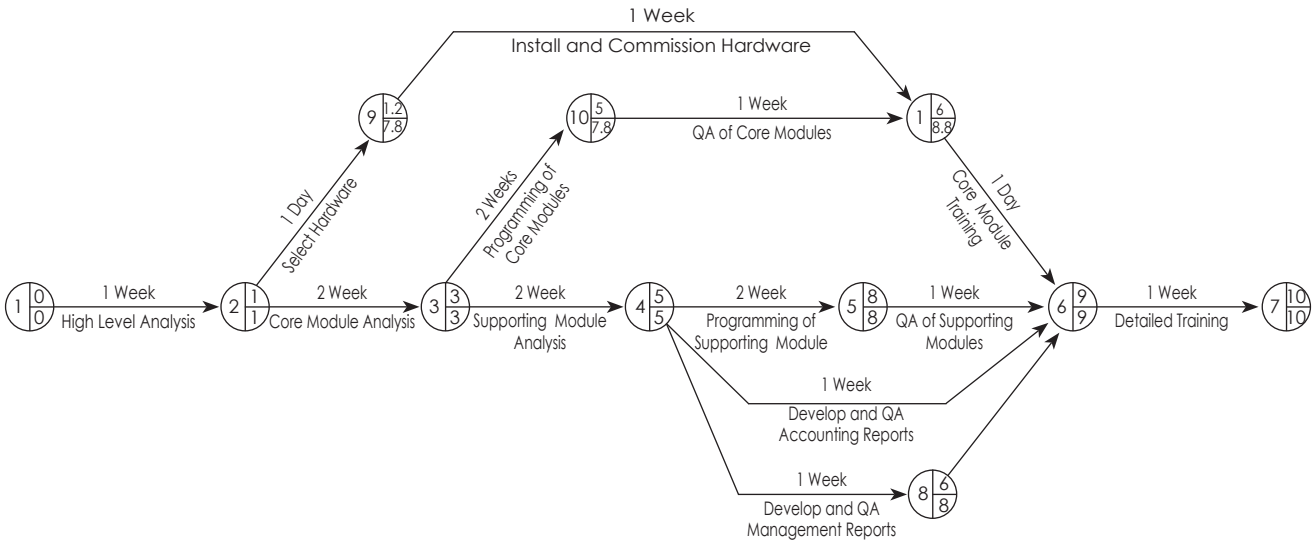
Circle and Arrow Diagram showing an activity (6 to 7) that cannot start until other activities (11 to 6, 5 to 6, 4 to 6, and 8 to 6) have been completed.



Here activity 6 to 7 cannot start until the other four activities (11 to 6, 5 to 6, 4 to 6, and 8 to 6) have been completed.

Click the link below for the full circle and arrow diagram for the computer project we are using as an example.

Critical Path Analysis for Example Computer Project



This shows all the activities that will take place as part of the project. Notice that each event circle also has a figure in the bottom, right hand quadrant. This shows the latest finish time that's permissible for the preceding activity if the project is to be completed in the minimum time possible. You can calculate this by starting at the last event and working backwards. The latest finish time of the preceding event and the earliest start time of the following even will be the same for circles on the critical path.

You can see that event M can start any time between weeks 6 and 8. The timing of this event is not critical. Events 1 to 2, 2 to 3, 3 to 4, 4 to 5, 5 to 6 and 6 to 7 must be started and completed on time if the project is to be completed in 10 weeks. This is the 'critical path' – these activities must be very closely managed to ensure that activities are completed on time. If jobs on the critical path slip, immediate action should be taken to get the project back on schedule. Otherwise completion of the whole project will slip.

'Crash Action'

You may find that you need to complete a project earlier than your Critical Path Analysis says is possible. In this case you need to re-plan your project.

You have a number of options and would need to assess the impact of each on the project's cost, quality and time required to complete it. For example, you could increase resource available for each project activity to bring down time spent on each but the impact of some of this would be insignificant and a more efficient way of doing this would be to look only at activities on the critical path.

As an example, it may be necessary to complete the computer project in Figure 5 in 8 weeks rather than 10 weeks. In this case you could look at using two analysts in activities 2 to 3 and 3 to 4. This would shorten the project by two weeks, but may raise the project cost – doubling resources at any stage may only improve productivity by, say, 50% as additional time may need to be spent getting the team members up to speed on what is required, coordinating tasks split between them, integrating their contributions etc.

In some situations, shortening the original critical path of a project can lead to a different series of activities becoming the critical path. For example, if activity 4 to 5 were reduced to 1 week, activities 4 to 8 and 8 to 6 would come onto the critical path.

PERT (Program Evaluation and Review Technique)

PERT is a variation on Critical Path Analysis that takes a slightly more skeptical view of time estimates made for each project stage. To use it, estimate the shortest possible time each activity will take, the most likely length of time, and the longest time that might be taken if the activity takes longer than expected.

Use the formula below to calculate the time to use for each project stage:

$$\frac{\text{shortest time} + 4 \times \text{likely time} + \text{longest time}}{6}$$

This helps to bias time estimates away from the unrealistically short time-scales normally assumed.

11.3 TIME SERIES ANALYSIS

Time series analysis refers to problems in which observations are collected at regular time intervals and there are correlations among successive observations. Applications cover virtually all areas of Statistics but some of the most important include economic and financial time series, and many areas of environmental or ecological data.

One definition of a time series is that of a collection of quantitative observations that are evenly spaced in time and measured successively. Examples of time series include the continuous monitoring of a person's heart rate, hourly readings of air temperature, daily closing price of a company stock, monthly rainfall data, and yearly sales figures. Time series analysis is generally used when there are 50 or more data points in a series. If the time series exhibits seasonality, there should be 4 to 5 cycles of observations in order to fit a seasonal model to the data.

Goals of time series analysis:

1. **Descriptive:** Identify patterns in correlated data—trends and seasonal variation
2. **Explanation:** understanding and modeling the data
3. **Forecasting:** prediction of short-term trends from previous patterns
4. **Intervention analysis:** how does a single event change the time series?
5. **Quality control:** deviations of a specified size indicate a problem

Characteristics of Time Series Analysis

(a) Some movements exhibit (persistent) growth or decline.

(b) Few movements are regular and periodic exceeding a year.

(c) Again some are regular and periodic exceeding a year.

(d) Some are irregular, mild or violent in movements.

Note: All the above movements may not occur at a time.

COMPONENTS OF TIME SERIES

The four components of time series are:

1. Secular trend
2. Seasonal variation
3. Cyclical variation
4. Irregular variation

Secular trend: A time series data may show upward trend or downward trend for a period of years and this may be due to factors like increase in population, change in technological progress ,large scale shift in consumers demands, etc. For example, population increases over a period of time, price increases over a period of years, production of goods on the capital market of the country increases over a period of years. These are the examples of upward trend. The sales of a commodity may decrease over a period of time because of better products coming to the market. This is an example of declining trend or downward trend. The increase or decrease in the movements of a time series is called Secular trend.

Seasonal variation: Seasonal variation are short-term fluctuation in a time series which occur periodically in a year. This continues to repeat year after year. The major factors that are responsible for the repetitive pattern of seasonal variations are weather conditions and customs of people. More woollen clothes are sold in winter than in the season of summer .Regardless of the trend we can observe that in each year more ice creams are sold in summer and very little in Winter season. The sales in the departmental stores are more during festive seasons that in the normal days.

Cyclical variations: Cyclical variations are recurrent upward or downward movements in a time series but the period of cycle is greater than a year. Also these variations are not regular as seasonal variation. There are different types of cycles of varying in length and size. The ups and downs in business activities are the effects of cyclical variation. A business cycle showing these oscillatory movements has to pass through four phases-prosperity, recession, depression and recovery. In a business, these four phases are completed by passing one to another in this order.

Irregular variation: Irregular variations are fluctuations in time series that are short in duration, erratic in nature and follow no regularity in the occurrence pattern. These variations are also referred to as residual variations since by definition they represent what is left out in a time series after trend ,cyclical and seasonal variations. Irregular fluctuations results due to the occurrence of unforeseen events like floods, earthquakes, wars, famines, etc.

There are two approaches for the relationship amongst theses components

1. $Y = T \times S \times C \times I$ (Multiplicative Model)
2. $Y = T + S + C + I$ (Additive Model)

Where Y is the result of the four components.

Trend is the long-term movement of a Time Series. Any increase or decrease in the values of a variable occurring over a period of several years gives a Trend.

Trends may be either - (a) linear, or (b) non-linear. There are other types of trends like parabolic (or quadratic) and logarithmic (or exponential).

The various methods of fitting a straight-line trend to a Time Series are -

(a) Free Hand Method, (Graphic)

(b) Semi-Average Method,

(c) Moving Average Method, and

(d) Least Squares Method.

Freehand Method of finding a Straight Line Trend.

Procedure –

- Plot the Time Series on a Graph Paper.
- Fit a Straight-Line through the plotted points, in such a way that the Straight Line shows the trends of the Series.

Merit - Simplest method of finding a Trend Line.

Demerit - Not an accurate method of fitting a Trend, as different persons may fit different trend lines to the same set of data.

Average Method of finding a Straight Line Trend

Procedure –

- Sort the data into two parts of equal time periods each.
- Determine the average for each of the two parts as determined above.
- Plot the Averages on a Graph Paper, and connect the averages.
- Fit a Straight-Line through the plotted points, in such a way that the Straight shows the trends of the Series.

Merit - Simple, method of finding a Trend Line.

Demerit –

- It is a subjective method,
- It doe s not recognise movements on an annual basis.

Moving Averages Method of finding a Straight Line Trend.

Procedure –

- Determine the Moving Average for the data given.
- Plot the Moving Averages on the Graph Paper to determine a Straight Line Trend.

Merit –

- It is used not only to fit Trend Lines, but also to find out seasonal and cyclical variation
- To be appropriate and effective it should be seen whether a regular periodic cycle in the Time Series exists.
- If the basic nature of the time series is linear, it will give a Linear Trend. In case of a curvilinear nature, the trend will be a Curve.

Demerit –

- It is a subjective method,
- It does not recognise movements on an annual basis.

Least Squares Method of fitting a Straight Line Trend.

Procedure-

- Set 'X' value for the given years, in the manner specified in Note below.
- List the values of variable 'y' for each year.
- Compute xy and x^2.

- Compute Totals, i.e. $\sum x$, $\sum y$, $\sum xy$, $\sum x^2$
- Solve the two Normal Equations and obtain the value of 'a' and 'b'.
  (a) Equation 1: $\sum y = na + b\sum x$ (where n = total number of observations)
  (b) Equation 2: $\sum xy = a\sum x + b\sum x^2$
- Trend Line is given by Y = a + bx, where x = time period, Y = variable being measured time, a = Y-intercept, b = slope of trend line (co-efficient of x)
- Forecasting: Putting values of 'x' for different years, we can get values of 'Y' which are called Trend Values. For forecasting, calculate the value of x, for a given future year, and substitute the value of x in the trend equation, to get the forecasted value

Note: Setting 'X' Value

If the data is given for	Mid value of 'x'	'x' value for preceding years	'x' value for subsequent years	Unit of 'x'
Odd number of years	'x' = 0 for mid year	-1, -2, -3, etc	+ 1, +2, +3, etc	1 year
Even number of years	x= - 1, x = + 1 for 2 mid years	-3, -5, -7, etc	+3, +5, +7, etc	½ year

Method of Least Squares in fitting a Higher Degree Polynomial Trend

Step	Procedure for fitting Higher Degree Polynomial Trend Equation ($Y = a + bx + cx^2$)
1	Set 'X' value for the given years, in the manner specified in Note to the previous question.
2	List the values of variable 'y' for each year.
3	Compute xy and x^2, x^2y, x^3, x^4.
4	Compute Totals, i.e. $\sum x$, $\sum y$, $\sum xy$, $\sum x^2$, $\sum x^2y$, $\sum x^3$, $\sum x^4$
5	Solve the three equations and obtain the value of 'a', 'b' and 'c' (a) Equation 1: $\sum y = na + b\sum x + c\sum x^2$ (where n = total number of observations) (b) Equation 2: $\sum xy = a\sum x + b\sum x^2 + c\sum x^3$ (c) Equation 3: $\sum y = a\sum x^2 + b\sum x^3 + c\sum x^4$
6	Trend Line is given by $Y = a + bx + cx^2$.
7	Forecasting: Same as in the previous method

Detrending

The process of eliminating the trend is called Detrending. After elimination of trend, the balance left is the short—term variation, expressed as under -

1. Additive Model: S + C + I
2. Multiplicative Model: S X C X I

Seasonal Variations

Seasonal Variations are short-term movements, which recur after a period (e.g. a month or quarter). (Note: Such period is normally less than a year)

Example: The prices of grain vary between the harvest season and non-harvest season.

For the purpose of Time Series Analysis, the seasonal element should be analysed / isolated / separated due to the following reasons -

(a) To study Seasonal Variation: Seasonal Variation by themselves give a clear idea about the relative position of each season on the basis of which it is possible to plan for the season.

(b) To eliminate Seasonal Variation: It is necessary to eliminate seasonal variation factor to get the cyclical or irregular factors.

Seasonal Variations can be separated using any of the following methods -

(a) Under Additive Model: Moving Average Method.

(b) Under Multiplicative Model:

- Simple Average Method.
- Ratio to Trend Method.
- Ratio to Moving Average Method.
- Link Relative Method

Simple Average method of finding short period variations and its limitations.

Procedure for calculation of Seasonal Index:

- Step 1: Compute Monthly or Quarterly Average.
- Step 2: Find out Grand Average for the months or quarters for the entire period.
- Step 3: Seasonal Index = Step 1 + Step 2.

Limitations:

(a) Ignores Trend: This method is not very scientific since it assumes that there is no trend component in the series, i.e. the original series comprise, C x S x I. Since most economic series have trends, the index computed by this method is actually an index of seasonal variation plus trend.

(b) Incomplete analysis: The effect of cycles on the original values may not be eliminated by the averaging process. It is only in case that the duration of the cycle coincides with the number of months or quarters .included in the average that the cyclical fluctuations will be avoided. In absence of this the Seasonal Index will also include the effect of trend.

Ratio to Trend method of finding short-term variations.

Step	procedure
1	Compute Year Total, i.e. X.
2	Calculate Quarterly Average, i.e. y = X ÷ 4.
3	Calculate deviation from the mid year 'd'.
4	Compute dy, d^2 and total all columns $\sum X$, $\sum Y$, $\sum dy$ and $\sum d^2$
5	Compute the value of constants a and b from the following equations – a = $\sum Y \div n$, Where n is the no. of observations, where a = Trend Value for the mid year. b = $\sum Y \div \sum d^2$, where b is the annual increment. Therefore, Quarterly increment = Annual Increment (b) ÷ 4.
6	Calculate Trend Values for 4 quarters of all the years, based on 'a' and 'b' derived above
7	Find out Actual Quarterly Values as a percentage of Quarterly Trend Values.
8	Compute Quarterly Average for all the years
9	Find out the Adjustment Factor (i.e. no. of quarters. X 100) ÷ Sum of the Quarterly Averages
10	Compute Adjusted Seasonal Index, i. e. multiply adjustment factor and. Quarterly Averages.

Note: In Ratio to-Moving Average Method, instead of calculating the annual Trend by the Least Squares Method (i.e. in Step 5), the Moving Average is used. It is more suitable in case of monthly data

Link Relative Method for finding short-term variations.

Procedure

- Calculate Seasonal Link Relative for each season -

  Link Relative = (Current Season Figure ÷ Previous Season Figure) X 100
- Calculate Average of the Link Relatives for each season. Generally arithmetic mean is used.
- Convert the Averages into Chain Relatives on the basis of first season.

Note: Chain Link Relative for first season is taken as 100.

- Calculate the Chain Link Relative of the first season on the basis of last season =

  (Average of First Season X Chain Relative of Last Season) ÷ 100
- (a) Compute Correction Factor per year= (Step 4 - 100).

  (b) Compute Correction Factor per quarter = Step 5(a) ÷ 4 quarters.
- Subtract the Correction Factor per quarter from their respective Chain Relatives and compute Corrected Chain Relatives.
- Calculate Average of the Corrected Chain Relatives.
- Compute Seasonal Variations for each season as under -

Seasonal Variation = (Corrected Chain Relative -T- Average of Corrected Chain Relatives). X.I 00

Different methods of Forecasting

Qualitative Forecasting - When historical data not available

Quantitative Forecasting - When historical data available

Causal Forecasting - Involves determination of factors which relate to the variable to be predicted.

Time Series Forecasting - Involves projection of future values of a variable based entirely on the past and present observation of that variable.

Different methods of Time Series Forecasting

Naive Forecast

- Under this method, Forecast of Period 't'= Actual Value of previous period.
- So, Naive Forecast $Y_t = Y_{t-1}$
- This is based on the assumption that there is a high correlation between successive pairs of values in the Time Series.

Mean Forecast

- Under this method, Forecast of Period 't'= Mean of the Series. So, Y, = Avg(Y).
- It is a simple forecasting method.

Linear Trend Forecast

- Under this method, Forecast of Period 't' is given by the linear relationship $Y = a + bX + cX^2$, where X is determined from the value of t, and a, b are constants.
- A linear relationship between the time and the response value is established here.

Non - Linear Trend Forecast

- Here, Forecast of Period 't' is given by the non-linear relationship $Y = a + bX + cX^2$, where X is determined from the value of t, and a, b, c are constants.

- Under this method, a non-linear relationship between time and response value is established, by using the method of Least Squares.

Exponential Smoothing

Exponential Smoothing is a quicker & theoretically sound method of short-term forecasting. This method is mainly applied in Production and Inventory Control.

Smoothing Co-efficient:

(a) Weightage is given to various values in the Time Series. The ratio of the geometric progression of the series of the weights' is $(1- \propto)$, where $\propto$ is a constant called Smoothing Coefficient.

(b) As the weights show an exponentially decreasing trend, this method is called Exponential Smoothing.

(c) Value of '$\propto$' may range from zero to one. Low Values of '$\propto$' are to be used where the Series is stable, and High Values of '$\propto$' are to be used where the series is rather fluctuating.

Advantages : Exponential Smoothing provides a convenient and systematic method for revising the forecast for the next period whenever discrepancy exists between the previous forecast sales for the current period and the actual demand for the current period.

Disadvantages:

(a) The method is useful for short-term forecasting only,

(b) It relies only on past-history of data. There are cases where subjective estimates may provide better forecasts.

Procedure: (A) When no trend is expected

- Determine Initial Forecast (F_0), Smoothing Coefficient ($\propto$) & Initial Error (=0).
- Compute Error E_t = Actuals Y_t- Forecast F_t. (In computing Error for t = 1, Initial Forecast is used
- Compute Correction Factor = αE_t
- Compute Next Period Forecast $F_{t+1} = F_t + \alpha E_t$

(B) When a trend is expected

- Determine Initial Smoothed Average (μ_0), Initial Smoothed Trend (ST_0), Smoothing Coefficient (α) and Initial Error (= 0)
- Compute Smoothed Average μ_t such, that $\mu_t = \mu_{t-1} + \alpha E_t$ where,
- μ_t = Smoothed Average for Period 't' (this period).
- μ_{t-1} = Smoothed Average for Period 't-1' (previous period) [For Period '0', Initial Average is μ_0.]
- E = Error = This Period Actuals - Previous Period Smoothed Average, i.e. $Y_t - \mu_{t-1}$
- Compute Smoothed Trend $(ST_t) = \alpha (\mu_t - \mu_{t-1}) + (1 - \alpha) ST_{t-1}$
- Compute Forecast $Ft + 1 = \mu_t + \left[\frac{1- \propto}{\propto} + 1\right] ST_1$

PROBLEMS AND SOLUTIONS

Illustration 1.

Six men are available for different jobs. From past records the time in hours taken by different persons for different jobs are given below.

		Jobs					
		1	2	3	4	5	6
Men	1	2	9	2	7	9	1
	2	6	8	7	6	14	1
	3	4	6	5	3	8	1
	4	4	2	7	3	10	1
	5	5	3	9	5	12	1
	6	9	8	12	13	9	1

Find out an allocation of men to different jobs which will lead to minimum operation time.

Solution:

Job / Man	1	2	3	4	5	6
1	2	9	2	7	9	1
2	6	8	7	6	14	1
3	4	6	5	3	8	1
4	4	2	7	3	10	1
5	5	3	9	5	12	1
6	9	8	12	13	9	1

Row Operation

Job / Man	1	2	3	4	5	6
1	1	8	1	6	8	0
2	5	7	6	5	13	0
3	3	5	4	2	7	0
4	3	1	6	2	9	0
5	4	2	8	4	11	0
6	8	7	11	12	8	0

Column Operation Improved

Job / Man	1	2	3	4	5	6
1	0	7	0	4	1	0
2	4	6	5	3	6	0
3	2	4	3	0	0	0
4	2	0	5	0	2	0
5	3	1	7	2	4	0
6	7	6	10	10	1	0

Man \ Job	1	2	3	4	5	6
1	[0]	7	0	4	1	0
2	4	6	5	3	6	[0]
3	2	4	3	[0]	0	0
4	2	[0]	5	0	2	0
5	3	1	7	2	4	0
6	7	6	10	10	8	0

Improved Matrix Assignment

Man \ Job	1	2	3	4	5	6
1	[0]	7	0	4	1	1
2	3	5	4	2	5	[0]
3	2	4	3	[0]	0	1
4	2	[0]	5	0	2	1
5	2	0	6	1	3	0
6	6	5	9	9	7	0

Man \ Job	1	2	3	4	5	6
1	0	9	[0]	6	3	1
2	1	5	2	2	5	[0]
3	[0]	4	1	0	0	1
4	0	0	3	[0]	2	1
5	0	[0]	4	1	3	0
6	4	5	7	9	[0]	0

Optimal Assignment, then is

1	→	3	-	2	
2	→	6	-	1	
3	→	1	-	4	
4	→	4	-	3	
5	→	2	-	3	
6	→	5	-	9	
				22	Minimum Hours

Illustration 2.

A captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

		Batting Position				
		III	IV	V	VI	VII
Batsmen	A	40	40	35	25	50
	B	42	30	16	25	27
	C	50	48	40	60	50
	D	20	19	20	18	25
	E	58	60	59	55	53

Make the assignment so that the expected total average runs scored by these batsmen are maximum.

Solution:

	III	**IV**	**V**	**VI**	**VII**
A	40	40	35	25	50
B	42	30	16	25	27
C	50	48	40	60	50
D	20	19	20	18	25
E	58	60	59	55	53

Loss Matrix

20	20	25	35	10
18	30	44	35	33
10	12	20	0	10
40	41	40	42	35
2	0	1	5	7

Row Operation

10	10	15	25	0
0	12	26	17	15
10	12	20	0	10
5	6	5	7	0
2	0	1	5	7

Column Operation

10	10	14	25	0
0	12	25	17	15
10	12	19	0	10
5	6	4	7	0
2	0	0	5	7

Minimum No. of lines

Batsman	BATTING POSITIONS				
	III	IV	V	VI	VII
A	10	10	14	25	0
B	~~0~~	~~12~~	~~25~~	~~17~~	~~15~~
C	10	12	19	0	10
D	5	6	4	7	0
E	~~2~~	~~0~~	~~0~~	~~5~~	~~7~~

As the minimum number of limes are not equal to order of matrix, let's take steps to increase the number of zeros.

Batsman	BATTING POSITIONS				
	III	IV	V	VI	VII
A	6	6	10	25	0
B	0	12	25	21	19
C	6	8	15	0	10
D	1	2	0	7	0
E	2	0	0	9	11

Minimum No. of lines

Batsman	BATTING POSITIONS				
	III	IV	V	VI	VII
A	~~6~~	6	10	25	0
B	~~0~~	12	25	21	19
C	~~6~~	8	15	0	10
D	~~1~~	2	0	7	0
E	~~2~~	0	0	9	11

As the minimum number of lines are equal to order of matrix, optimal assignment should be made.

Optimal assignment

Batsman	BATTING POSITIONS				
	III	IV	V	VI	VII
P	~~6~~	6	10	25	[0]
Q	[0]	12	25	21	19
R	~~6~~	8	15	[0]	10
S	~~1~~	2	[0]	7	0
T	~~2~~	[0]	0	9	11

Maximum runs

Batsman	Position	Runs
P	VII	50
Q	III	42
R	VI	60
S	V	20
T	IV	60
TOTAL		**232**

Illustration 3.

Six salesmen are to be allocated to six sales regions so that the cost of allocation of the job will be minimum. Each salesman is capable of doing the job at different cost in each region.

The cost matrix is given below:

		Region					
		I	II	III	IV	V	VI
Salesmen	A	15	35	0	25	10	45
	B	40	5	45	20	15	20
	C	25	60	10	65	25	10
	D	25	20	35	10	25	60
	E	30	70	40	5	40	50
	F	10	25	30	40	50	15

(Figures are in Rupees)

(a) Find the allocation to give minimum cost what is the cost?

(b) Now suppose the above table gives earning of each salesman at each region. How can you find an allocation so that the earning will be maximum? Determine the solution with optimum earning.

(c) There are restrictions for commercial reasons that A cannot be posted to region V and E cannot be posted to region II. Write down the cost matrix suitably after imposing the restrictions.

Solution:

Row Operation

15	35	0	25	10	45
40	5	45	20	15	20
25	60	10	65	25	10
25	20	35	10	25	60
30	70	40	5	40	50
10	25	30	40	50	15

15	35	0	25	10	45
35	0	40	15	10	15
15	50	0	55	15	0
15	10	25	0	15	50
25	65	35	0	35	45
0	15	20	30	40	5

Column Operation

15	35	[0]	25	10	45
35	[0]	40	15	0	15
15	50	0	55	5	[0]
15	10	25	[0]	5	50
25	65	35	0	25	45
[0]	15	20	30	30	5

Improved Matrix

20	35	[0]	30	0	45
40	[0]	40	20	0	15
20	50	0	60	5	[0]
15	5	20	0	[0]	45
25	60	30	[0]	20	40
[0]	10	15	30	30	0

A	→	III	-	0	
B	→	II	-	5	
C	→	VI	-	10	
D	→	V	-	25	
E	→	IV	-	5	
F	→	I	-	10	
				₹ 55	Minimum Cost

(b) **Loss Matrix**

55	35	70	45	60	25
30	65	25	50	55	50
45	10	60	5	45	60
45	50	35	60	45	10
40	0	30	65	30	20
60	45	40	30	20	55

Row Operation

30	10	45	20	35	0
5	40	0	25	30	25
40	5	55	0	40	55
35	40	25	50	35	0
40	0	30	65	30	20
40	25	20	10	0	35

Column Operation

25	10	45	20	35	[0]
[0]	40	0	25	30	25
35	5	55	[0]	40	55
30	40	25	50	35	0
35	[0]	30	65	30	20
35	25	20	10	[0]	35

Improved Matrix

[5]	10	25	20	35	[0]
0	60	0	15	50	45
15	5	35	[0]	40	55
10	40	5	50	35	0
15	[0]	10	65	30	20
15	25	[0]	10	0	35

[0]	10	20	20	30	0
0	65	[0]	50	50	50
10	5	30	[0]	35	55
5	40	0	50	30	[0]
10	[0]	5	65	25	20
15	30	0	15	[0]	40

A	→	I	-	15	
B	→	III	-	45	
C	→	IV	-	65	
D	→	VI	-	60	
E	→	II	-	70	
F	→	I	-	50	
				₹ 305	Maximum

(c) The cost matrix after imposing the given restriction is

Region

		I	II	III	IV	V	VI
	A	15	35	0	25	a	45
	B	40	5	45	20	15	10
Sales man	C	25	60	10	65	25	10
	D	25	20	35	10	25	60
	E	30	a	40	5	40	50
	F	10	25	30	40	50	15

Illustration 4.

A company has four zones open and four salesmen available for assignment. The zones are not equally rich in their sales potentials. It is estimated that a typical salesman operating in each zone would bring in the following annual sales:

Zone: A: 1,26,000: Zone B:1,05,000; Zone C: 84,000; Zone D: 63,000.

The four salesmen are also considered to differ in ability. It is estimated that working under the same condition their yearly sales would be proportionately as follows:

Salesman P:7; Salesman Q: 5; Salesman R:5; Salesman S:4. If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment.

Solution:

Sales Man	A	B	C	D
P	42	35	28	21
Q	30	25	20	15
R	30	25	20	15
S	24	20	16	12

Loss Matrix

0	7	14	21
12	17	22	27
12	17	22	27
18	22	26	30

Row Operation

0	7	14	21
0	5	10	15
0	5	10	15
0	4	8	12

[0]	2	5	8
0	[0]	1	2
0	0	1	2
1	0	[0]	0

Column Operation

[0]	3	6	9
0	1	2	3
0	1	2	3
0	[0]	0	0

[0]	2	4	7
0	[0]	0	1
0	0	[0]	1
2	1	0	[0]

P	→	A	-	42	
Q	→	B	-	25	
R	→	C	-	20	
S	→	D	-	12	
				99	x 3000 = ₹ 2,97,000 Maximum sales

Illustration 5.

A salesman has to visit five cities A,B,C,D and E. The inter-city distances are tabulated below. Note the distance between two cities need not be same both ways.

From / To	A	B	C	D	E
A	-	12	24	25	15
B	6	-	16	18	7
C	10	11	-	18	12
D	14	17	22	-	16
E	12	13	23	25	-

Note further that the distances are in km.

Required:

If the salesman starts from city A and has to come back to city A, which route would you advise him to take that total distance traveled by him is minimised?

Solution:

Profit Matrix

-	12	24	25	15
6	-	16	18	7
10	11	-	18	12
14	17	22	-	16
12	13	23	25	-

Row Operation

-	0	12	13	3
0	-	10	12	1
0	1	-	8	2
0	3	8	-	2
0	1	11	13	-

Column Operation

-	0	4	5	2
0	-	2	4	0
0	1	-	0	1
0	3	0	-	1
0	1	3	5	-

A→ B → E → D → C → A

12 + 7 + 25 + 22 + 10 = 76 Kms

Optimum Distance 76 Kms.

Illustration 6.

The cost conscious company requires for the next month 300, 260 and 180 tonnes of stone chips for its three constructions C1,C2 and C3 respectively. Stone chips are produced by the company at three mineral fields taken on short lease by the company. All the available boulders must be crushed into chips. Any excess chips over the demands at sites C1, C2 and C3 will be sold ex-fields.

The fields are M1, M2 and M3 which will yield 250,320 and 280 tones of stone chips respectively.

Transportation costs from mineral fields to construction sites vary according to distances, which are given below in monetary unit (MU).

	To	C1	C2	C3
From	M1	8	7	6
	M2	5	4	9
	M3	7	5	5

(i) Determine the optimal economic transportation plan for the company and the overall transportation cost in MU.

(ii) What are the quantities to be sold from M1, M2 and M3 respectively?

Solution:

	C_1	C_2	C_3	Dummy		
M_1	8	7	6	0	250/140	6*/1/1/1
			140	110		
M_2	5	4	9	0	320/20/0	4/1/5*
	300	20				
M_3	7	5	5	0	280/40/0	5/0/0/0
		240	40			
	300 / 0	260 / 240 / 0	180 / 0	110 / 0	850	——
	2 / *2	1 / 1 / 1 / *2	1 / 1 / 1 / 1	0		

Hence,there are m + n – 1 allocations. Hence Optimality test is to be performed.

					U_i
	8	7	6	0	**0**
	1	1	140	110	
	5	4	9	0	**-2**
	300	20	5	2	
	7	5	5	0	**-1**
	1	240	40	1	
V_j	**7**	**6**	**6**	**0**	

Since $\Delta_{ij} \geq 0$ Solution is optimum.

		Qty	Minimum Cost
M_1	C_3	140 x 6 =	840
	C_4	110 x 0 =	0
M_2	C_1	300 x 5 =	1,500
	C_2	20 x 4 =	80
M_3	C_2	240 x 5 =	1,200
	C_3	40 x 5 =	200
		850	₹ 3,820

Illustration 7.

Ladies fashion shop wishes to purchase the following quantity of summer dresses:

Dress size	I	II	III	IV
Quantity	100	200	450	150

Three manufacturers are willing to supply dresses.

The quantities given below are the maximum that they are able to supply of any given combination of orders for dresses:

Manufacturers	A	B	C
Total quantity	150	450	250

The shop expects the profit per dress to vary with the manufacturer as given below:

Size

	I	II	III	IV
A	2.5	4.0	5.0	2.0
B	3.0	3.5	5.5	1.5
C	2.0	4.5	4.5	2.5

Required:

(a) Use the transportation technique to solve the problem of how the orders should be placed with the manufacturers by the fashion shop is order to maximise profit.

(b) Explain how you know there is no further improvement possible.

Solution:

Profit Matrix

Introducting dummy Row

	I	II	III	IV	
A	2.5	4	5	2	**150**
B	3	3.5	5.5	1.5	**450**
C	2	4.5	4.5	2.5	**250**
D	0	0	0	0	**50**
	100	**200**	**450**	**150**	

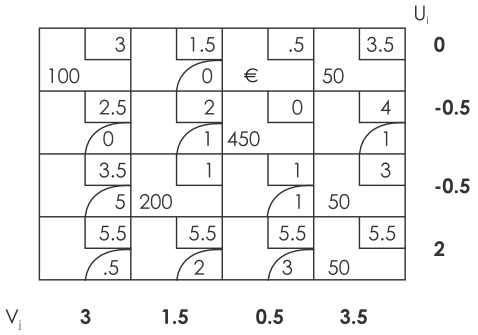
Profit Matrix is converted into Loss Matrix.

	I	II	III	IV		
A	3 100	1.5 €	0.5	3.5	150/50/0	1/1.5/0.5*
B	2.5	2	0 450	4	450/0	2*
C	3.5	1 200	1	3 50	250/50/0	0/2*/0.5
D	5.5	5.5	5.5	5.5 50	50/0	0/0/0

100	**200**	**450**	**150**
0	**0**	**0**	**100**
			0
0.5	0.5	1	0.5
0.5	0.5		0.5
0.5			0.5

There are 1 less than m + n – 1 allocations.

Hence € (Epsilon) is introduced in least cost unallocated cell.



Since Δ_{ij} is > 0, the solution is optimum

	Quantity	Maximum Profit		
A	I	100 x 2.5	=	250
	IV	50 x 2	=	100
B	III	450 x 5.5	=	2475
C	II	200 x 4.5	=	900
C	IV	50 x 2.5	=	125
Dummy	IV	50 x 0	=	0
		900	=	₹ 3850

Illustration 8.

Departmental store wishes to purchase the following quantities of Sprees:

Types of sprees	A	B	C	D	E
Quantity	150	100	75	250	200

Tenders are submitted by 4 different manufacturers who undertake to supply not more than the quantities mentioned below (all types of sprees combined):

Manufacturer	W	X	Y	Z
Total quantity	300	250	150	200

The store estimates that its profit/spree will vary with the manufacturer as shown in the following matrix.

Sprees

Manufacturers	A	B	C	D	E
W	275	350	425	225	150
X	300	325	450	175	100
Y	250	350	475	200	125
Z	325	275	400	250	175

How should the orders be placed?

Solution:

Profit matrix

	A	B	C	D	E	F	
W	275	350	425	225	150	0	**300**
X	300	325	450	175	100	0	**250**
Y	250	350	475	200	125	0	**150**
Z	325	275	400	250	175	0	**200**
	150	**100**	**75**	**250**	**200**	**125**	

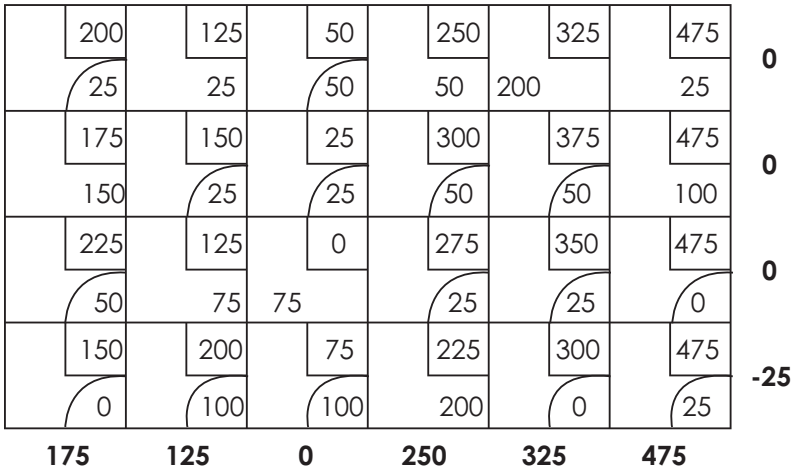
We have to convert the Profit Matrix to a Loss Matrix or opportunity loss matrix. For doing this, identify the highest element in the table and then deduct all elements of this table from such value.

Loss Matrix

200	125 25	50	250 50	325 200	475 25	300/275/225/25 75/75/75/125*/75/75*
175	150	25	300	375	475 100	250/100/0 125/25/125*/75/5
225	125 75	0 75	275	350	475	150/75/0 125* 100*
150	200	75	225 200	300	475	200/0 75/50/50/75/75*

150 0	100 25 0	75 0	250 50 0	200 0	125 100 0
25 25 25 25	0 0 25	25	25 25 25 25 25 50	25 25 25 25 25 50	0 0 0 0 0 0

m + n – 1 allocation s are there, optimality test can be performed.



As $\Delta_{ij} \geq 0$, maximum profit is as follows.

		Qty		Maximum Profit
W	B	25 x 350	=	8,750
	D	50 x 225	=	11,250
	E	200 x 150	=	30,000
	F	25 x 0	=	0
X	A	150 x 300	=	45,000
	F	100 x 0	=	0
Y	B	75 x 350	=	26,250
	C	75 x 475	=	35,625
Z	D	200 x 250	=	50,000
Max. Profit.				₹ 2,06,875

Illustration 9.

A Company is spending ₹ 1000 on transportation of its units from these to four warehouses the supply and demand of units with the units cost of transportation are as:

	W1	W2	W3	W4	Supply
P1	19	30	50	12	7
P2	70	30	40	60	10
P3	40	10	60	20	18
Demand	5	8	7	15	35

What can be the maximum saving by optimum scheduling?

Solution:

Using VAM and determine the initial basic feasible solution as shown in the Table 1 below:

Table I

Plant or factory	Warehouse				Capacity	Row Number U_i
	W1	W2	W3	W4		
P1	19 (5)	30	50	12 (2)	~~7~~ ~~2~~ 0	~~7~~ ~~18~~ 38
P2	70	30	40 (7)	60 (3)	~~10~~ ~~3~~ 0	~~10~~ 20
P3	40	10 (8)	60	20 (10)	~~18~~ ~~10~~ 0	~~10~~ ~~40~~
Demand	5 0	8 0	7 0	15 5 0	35	
Row Penalty	21	20	10	8 48		

The transportation cost, according to the above solution is

= 5 x 19 + 2 x 12 + 7 x 40 + 3 x 60 + 8 x 10 + 10 x 20 = ₹ 859.

Further, the solution is the basic feasible solution as there are (m+n-1) i.e. 4+3 -1 = 6 allocations in the independent positions.

Now we determine the set of values for each row and each column, the row and column numbers are computed by means of the unit cost of in the respective occupied cell. We select U_2 and assign a zero value to it. With $U_1 = 0$, we can identify the values of the remaining variables in the next relationship as given below:

$U_1 + V_1 = 19$	$\longrightarrow 0 + V_1 = 19$	$\longrightarrow V_1 = 19$
$U_1 + V_4 = 12$	$\longrightarrow 0 + V_4 = 12$	$\longrightarrow V_4 = 12$
$U_2 + V_4 = 60$	$\longrightarrow U_2 + 12 = 60$	$\longrightarrow U_2 = 48$
$U_2 + V_3 = 40$	$\longrightarrow 48 + V3 = 40$	$\longrightarrow V_3 = -8$
$U_3 + V_4 = 20$	$\longrightarrow U_3 + 12 = 20$	$\longrightarrow U_3 = 8$
$U_3 + V_2 = 10$	$\longrightarrow 8 + V_2 = 10$	$\longrightarrow V_2 = 2$

After the row and column, numbers have been computed the next step is to evaluate the opportunity cost for each of the unoccupied cells by using the relationship

Cost change = $C_{ij} - (U_i + V_j)$ as follows:-

Unoccupied cell	**$C_{ij} - (U_i + V_j)$**	**Net cost change**
(P_1, W_2)	30 -(0+2)	28
(P_1, W_3)	50 -(0-8)	58
(P_2, W_1)	70 -(48+19)	3
(P_2, W_2)	30 -(48+2)	-20
(P_3, W_1)	40 -(8+19)	13
(P_3, W_3)	60 -(8-8)	60

Since the opportunity cost in P2 W2 is negative, the current basic feasible solution is not optimal and can be further improved towards optimality.

Table II

Plant or factory	Warehouse				Capacity	Row Number U_i
	W1	W2	W3	W4		
P1	19 (5)	30 28	50 58	12 (2)	7	$U_1=0$
P2	70 3	30 + -20	40 (7)	60 - (3)	10	$U_2=48$
P3	40 13	10 - (8)	60 50	20 + (10)	18	$U_3=48$
Demand	5	8	7	15	35	
Row Penalty	$V_1=19$	$V_2=2$	$V_3=-8$	$V_4=12$		

Since the unoccupied cell P2 W2 has the largest improvement potential, we trace a close path or loop that begins- with and ends at cell.

Since one of the assigned cell will now be converted into unoccupied cell, we examine the assigned cell having (-) sign select the one with the least number of units (3 units) here will be transferred to the new cell and cell P2 W2 will be treated as the occupied cell and the cell P2 W4will be treated as unoccupied cell. The improved feasible solution is given in the Table III.

Table III

Plant or factory	Warehouse				Capacity
	W1	W2	W3	W4	
P1	19 (5)	30	50	12 (2)	7
P2	70	30 (3)	40 (7)	60	10
P3	40	10 (5)	60	20 (13)	18
Demand	5	8	7	15	35

The transportation cost, according to the above solution is

= 5 x 19 + 2 x 12 + 3 x 30 + 7 x 40 + 5 x 10 + 13 x 20 = ₹ 799,

which is, less then the initial solution.

To test this solution for further improvement, we recalculate the values of U_i and V_j Thus, first using occupied cells we have the following equations

$U_1 + V_1 = 19$	$0 + V_1 = 19$	$V_1 = 19$
$U_1 + V_4 = 12$	$0 + V_4 = 12$	$V_4 = 12$
$U_2 + V_2 = 30$	$U_2 + 12 = 30$	$U_2 = 28$
$U_2 + V_3 = 40$	$28 + V_3 = 40$	$V_3 = -12$
$U_3 + V_2 = 10$	$8 + V_2 = 10$	$U_2 = 2$
$U_3 + V_4 = 20$	$U_3 + 12 = 20$	$V_3 = 8$

New row and column number with second solution is given in table IV.

Table IV

Plant or factory	Warehouse				Supply	Row Number U_i
	W1	W2	W3	W4		
P1	19 (5)	30	50	12 (2)	7	$U_1=0$
P2	70	30 (3)	40 (7)	60	10	$U_2=28$
P3	40	10 (5)	60	20 (13)	18	$U_3=8$
Demand	5	8	7	15	35	
Column Number	$V_1=19$	$V_2=2$	$V_3=12$	$V_4=12$		

Now we use the relationship Cost change = C_{ij}- ($U_i + V_j$) as for the unoccupied cells as follows:

Unoccupied cell	C_{ij}- ($U_i + V_j$)	Net cost change
(P_1, W_2)	30-(0+2)	28
(P_1, W_3)	50-(0+12)	38
(P_2, W_1)	70-(28+19)	23
(P_2, W_4)	60-(28+12)	20
(P_3, W_1)	40-(8+19)	13
(P_3, W_3)	60-(12+8)	40

From the above analysis, we can see that there is no negative value in the unoccupied cell therefore the solution given in the table IV is the optimum solution with the transportation cost of `. 799.

Thus saving by optimal scheduling = ₹ 1000 - ₹ 799 = ₹ 201.

Illustration 10.

A firm manufacturers and sells two products Alpha and Beta. Each unit of Alpha requires 1 hour of machining and 2 hours of skilled labour, whereas each unit of Beta uses 2 hours of machining and 1 hour of labour. For the coming month the machine capacity is limited to 720 machine hours and the skilled labour is limited to 780 hours. Not more than 320 units of Alpha can be sold in the market during a month.

(i) Develop a suitable model that will enable determination of the optimal product mix.

(ii) Determine the optimal product-mix and the maximum contribution. Unit contribution from Alpha is ₹ 6 and from Beta is ₹ 4.

(iii) What will be the incremental contribution per unit of the machine hour, per unit of labour, per unit of Alpha saleable?

Solution:

Products	Machining	Skilled Labour	Contribution
Alpha	1 hr	2 hr	₹ 6
Beta	2 hr	1 hr	₹ 4
Available hours	720 hr	780 hr	

Let x_1 be the no. of units of Alpha produced

x_2 be the no. of units of Beta produced.

Objective function:

Max. $Z = 6x_1 + 4x_2$

Subject to constraints

$x_1+2x_2 \leq 720$

$2x_1+x_2 \leq 780$

$x_1 \leq 320$ and

$x_1, x_2 \geq 0$ (Non-negative)

Introducing Slack Variables, the equation will be:

$x_1+2x_2+ S_1=720$

$2 x_1+x_2+ S_2=780$

$x_1+S_3 = 320$

Max. $Z = 6x_1+4x_2 + 0.S_1+ 0.S_2+ 0.S_3$

		6	4	0	0	0	
C_B	X_B	X_1	X_2	S_1	S_2	S_3	Min. Ratio
0	720	1	2	1	0	0	720/1 = 720
0	780	2	1	0	1	0	780/2 = 390
0	320	1	0	0	0	1	320/1 = 320
	0	6	4	0	0	0	

0	400	0	2	1	0	-1	400/2=200
0	140	0	1	0	1	-2	140/1=140
6	320	1	0	0	0	1	320/0 = ∞
	1920	0	-4	0	0	6	

0	120	0	0	1	-2	3	120/3=40
4	140	0	1	0	1	-2	140/-2=-70
6	320	1	0	0	0	1	320/1=320
	2480	0	0	0	4	-2	

0	40	0	0	1/3	-2/3	1
4	220	0	1	2/3	-1/3	0
6	280	1	0	-1/3	2/3	0
	2560	0	0	2/3	8/3	0

$\therefore x_1 = 280 ; x_2 = 220 ; Z = 2560$

Illustration 11.

A Chemical Company produces two compounds A and B. The following table gives the units of ingredients C and D per kg of compounds A and B as well as minimum requirements of C and D and costs/kg of A and B. State the mathmetical formulation of the following:

		Table Compound		Minimum requirement
		A	**B**	
Ingredient	C	1	2	80
	D	3	1	75
Cost per kg.		4	6	

Solution:

Let x_1 be the no. of units of A

Let x_2 be the no. of units of B

Objective function: Min.$Z = 4x_1 + 6x_2$

Subject to Constraints:

$x_1+2x_2 \geq 80$

$3x_1+x_2 \geq 75$

and $x_1, x_2 \geq 0$

Illustration 12.

A pension fund manager is considering investing in two shares A and B. It is estimated that:

(i) Share A will earn a dividend of 12% per annum and share B 4% per annum.

(ii) Growth in the market value in one year of share A will be 10 paise per ₹ 1 invested and in B 40 paise per ₹ 1 invested.

He requires investing the minimum total sum which will give:

Dividend income of at least ₹ 600 per annum and growth in one year of at least ₹ 1,000 on the initial investment.

You are required to:

Formulate the problem mathmetically.

Solution:

Shares	Dividend	Growth in ₹
A	12%	10/100=0.1
B	4%	40/100 = 0.4
Min-income	600	1,000

Let x_1 be the amount invested on share A

Let x_2 be the amount invested on share B

Objective function: Min. $Z = x_1+x_2$

Subject to constraints:

$0.12\ x_1 + 0.04\ x_2 \geq 600$

$0.1\ x_1 + 0.4\ x_2 \geq 1000$

And $x_1, x_2 \geq 0$.

Illustration 13.

A company possesses two manufacturing plants each of which can produce three products X, Y and Z from a common raw material. However, the proportions in which the products are produced are different in each plant and so are the plant's operating costs per hour. Data on production per hour costs are given below, together with current orders in hand for each product.

	Product			Operating cost/hour in ₹
	X	Y	Z	
Plant A	2	4	3	9
Plant B	4	3	2	10
Orders on hand	50	24	60	

You are required to use the simplex method to find the number of production hours needed to fulfill the orders on hand at minimum cost.

Solution:

Let α be no. of hours of plant A in use

Let β be no. of hours of plant B in use

Objective function: Min $Z = 9\alpha + 10\beta$

Subject to constraints:

$2\alpha + 4\beta \geq 50$

$4\alpha + 3\beta \geq 24$

$3\alpha + 2\beta \geq 60$

And $\alpha, \beta \geq 0$

Illustration 14.

A Company produces the products P, Q and R from three raw materials A, B and C. One unit of product P requires 2 units of A and 3 units of B. A unit of product Q requires 3 units of A, 2 units of B and 5 units of C and one unit of product R requires, 2 unit of B and 4 units of C. The Company has 8 units of material A, 10 units of B and 15 units of C available to it. Profits/unit of products P, Q and R are ₹ 3, ₹ 5 and ₹ 4 respectively.

(a) Formulate the problem mathematically,

(b) Write the Dual problem.

(c) How many units of each product should be produced to maximize profit?

Solution:

(a)

Raw Materials	P	Q	R	Available units
A	2	-	3	8
B	3	2	2	10
C	-	5	4	15

Profits ₹ 3, ₹ 5, ₹ 4

Let x_1 be the no. of units of P

Let x_2 be the no. of units of Q

Let x_3 be the no. of units of R

Objective function: Max. $Z = 3x_1 + 5x_2 + 4x_3$

Subject to constraints:

$2x_1 + 3x_2 \leq 8$

$3x_1 + 2x_2 + 2x_3 \leq 10$

$5x_2 + 4x_3 \leq 15$

and $x_1, x_2, x_3 \geq 0$.

(b) **Primal**

Max.$Z = 3x_1 + 5x_2 + 4x_3$

Subject to

$2x_1 + 3x_3 \leq 8$

$3x_1 + 2x_2 + 2x_3 \leq 10$

$5x_2 + 4x_3 \leq 15$

And $x_1, x_2, x_3 \geq 0$

Dual

Min. $Z^* = 8y_1 + 10y_2 + 15y_3$

Subject to

$2y_1 + 3y_2 \geq 3$

$2y_2 + 5y_3 \geq 5$

$3y_1 + 3y_2 + 4y_3 \geq 4$

And $y_1, y_2, y_3 \geq 0$

(c) $2x_1+3x_2 + S_1 = 8$

$3x_1+2x_2+2x_3 + S_2 = 10$

$5x_2+4x_3 + S_3 = 15$

Max $Z = 3x_1 + 5x_2+4x_3+0.S_1+0.S_2+0.S_3$

		3	5	4	0	0	0	
C_B	X_B	X_1	X_2	X_3	S_1	S_2	S_3	Min. Ratio>0
0	8	2	3	0	1	0	0	8/3=2.67
0	10	3	2	2	0	1	0	10/3=3.33
0	15	0	5	4	0	0	1	15/5=3
	0	-3	-5	-4	0	0	0	

5	8/3	2/3	1	0	1/3	0	0	8/3/0 = α
0	14/3	5/3	0	2	-2/3	1	0	14/3/2 = 7/3
0	5/3	-10/3	0	4	-5/3	0	1	5/3/4 = 5/12
	40/3	1/3	0	-4	5/3	0	0	
5	8/3	2/3	1	0	1/3	0	0	8/3/2/3 = 4
0	23/6	10/3	0	0	1/6	1	-1/2	23/6/10/3 = 23/20
4	5/12	-10/12	0	1	-5/12	0	1/4	5/12/-10/12 = -1/12
	15	-3	0	0	0	0	1	

5	19/10	0	1	0	3/10	-1/5	1/10
3	23/20	1	0	0	1/20	3/10	-3/20
4	11/8	0	0	1	-3/8	1/4	1/8
	2952/160=18.45	0	0	0	3/20	9/10	11/20

$\therefore x_1 = 23/20 \quad x_2 = 19/10 \; x_3 = 11/8$

$Z = 18.45$

Illustration 15.

A Factory manufactures 3 products which are processed through 3 different production stages. The time required to manufacture one unit of each of the three products and the daily capacity of the stages are given in the following table:

State	**Time/unit in minutes**			
	Product 1	**Product 2**	**Product 3**	**Stage capacity (minutes)**
1	1	2	1	430
2	3	-	2	460
3	1	4	-	420
Profit/unit	₹ 3	₹ 2	₹ 5	

(i) Set the data in a simplex table.

(ii) Find the table for optimum solution

(iii) State from the table - maximum profit, production pattern, and surplus capacity of any stage.

(iv) What is the meaning of the shadow price? Where is it shown in this table? Explain it in respect of resource of stages having shadow price.

(v) How many units of other resources will be required so as to completely utilise the surplus resource?

Solution:

Let x_1 be the no. of units of product 1

Let x_2 be the no. of units of product 2

Let x_3 be the no. of units of product 3

Objective function: Max $Z = 3x_1+2x_2 + 5x_3$

Subject to constraints:

$x_1+2x_2+ x_3 \leq 430$

$3x_1+2x_3 \leq 460$

$x_1+4x_2 \leq 420$

And $x_1, x_2, x_3 \geq 0$

$x_1+2x_2+ x_3+S_1 = 430$

$3x_1+2x_3 +S_2 = 460$

$x_1+4x_2 + S_3 = 420$

Max $Z = 3x_1+2x_2 + 5x_3+0.S_1+0.S_2+0.S_3$

		3	2	5	0	0	0	
C_B	X_B	X_1	X_2	X_3	S_1	S_2	S_3	Min. Ratio > 0
0	430	1	2	1	1	0	0	430/1 = 430
0	460	3	0	2	0	1	0	460/2 = 230
0	420	1	4	0	0	0	1	420/0 = α
	0	-3	-2	-5	0	0	0	

0	200	-1/2	2	0	1	-1	0	200/2 = 100
5	230	3/2	0	1	0	1	0	230/10 = α
0	420	1	4	0	0	0	1	420/4 = 105
	1150	9/2	-2	0	0	5	0	

2	100	-1/4	1	0	1/2	-1/2	0	
5	230	3/2	0	1	0	1	0	
0	20	2	0	0	-2	2	1	
	1350	4	0	0	1	4	0	

∴ $x_1 = 0$

$x_2 = 100$

$x_3 = 230$

$z = 1350$

Illustration 16.

The products P, Q and R are being produced in a plant having profit margin as ₹ 3, ₹ 5 and ₹ 4 respectively. The raw materials A, B and C are of scarce supply and the availability is limited to 8, 15 and 10 units respectively. Specific consumption is indicated in the table below:

	P	Q	R	Available units
A	2	3	-	8
B	3	2	4	15
C	-	2	5	10
	₹3	₹5	₹4	

(a) Write down the problem mathematically for maximization of profit margin.

(b) Solve the problem by Simplex Method for obtaining optimum production pattern.

(c) What are the opportunity costs of each of the raw material?

Solution:

Let x_1 be the no. of units of product P

Let x_2 be the no. of units of product Q

Let x_3 be the no. of units of product R

Objective function: Max. $Z = 3x_1+5x_2 + 4x_3$

Subject to constraints:

$2x_1+3x_2 \leq 8$

$3x_1+2x_2 + 4x_3 \leq 15$

$2x_2+5x_3 \leq 10$

and $x_1, x_2, x_3 \geq 0$

$2x_1+3x_2 + S_1 = 8$

$3x_1+2x_2 + 4x_3 + S_2 = 15$

$2x_2+5x_3+ S_3 = 10$

Max $Z = 3x_1+5x_2 + 4x_3 + 0.S_1+ 0.S_2+ 0.S_3$

		3	5	4	0	0	0	
C_B	X_B	X_1	X_2	X_3	S_1	S_2	S_3	Min. Ratio>0
0	8	2	3	0	1	0	0	8/3=2.67
0	15	3	2	4	0	1	0	15/2=7.5
0	10	0	2	5	0	0	1	10/2=5
	0	-3	-5	-4	0	0	0	

5	8/3	2/3	1	0	1/3	0	0	8/3/0 = α
0	29/3	5/3	0	4	-2/3	1	0	29/3/4=29/12
0	14/3	-4/3	0	5	-2/3	0	1	14/3/5=14/15
	40/3	1/3	0	-4	5/3	0	0	

5	8/3	2/3	1	0	1/3	0	0	8/2=4
0	89/15	41/15	0	0	-2/15	1	-4/5	89/41
4	14/15	-4/15	0	1	-2/15	0	1/5	14/-4= -7/2
	256/15	-11/15	0	0	17/15	0	4/5	

5	150/123=50/41	0	1	0	45/123=15/41	-10/41	8/41
3	89/41	1	0	0	-2/41	15/41	-12/41
4	62/41	0	0	1	-6/41	4-41	5/41
	765/41	0	0	0	45/41	11/41	24/41

$\therefore$ $x_1 = 89/41$

$x_2 = 50/41$

$x_3 = 62/41$; $Z = 765/41$

Illustration 17.

Formulate Linear programming model for the following problem and solve the problem using simplex method. A company sells two types of fertilizers, one is liquid and the other is dry. The liquid fertilizer contains 2 units of chemical A and 4 units of chemical B per jar and the dry fertilizer contains 3 units of each of the chemicals A and B per carton. The liquid fertilizer sells for ₹ 3 per jar and the dry fertilizer sells for ₹ 4 per carton. A farmer requires at least 90 units of chemical A and at least 120 units of the chemical B for his farm. How many of each type of fertilizers should the farmer purchase to minimize the cost while meeting his requirements?

Solution :

	Fertilizers		Required Units
	Liquid	Dry	
Chemical A	2	3	90
Chemical B	4	3	120
Cost (₹)	3	4	

Let x_1 be the no. of liters of Liquid

Let x_2 be the no. of kilograms of dry

Objective Function:

Min. $Z = 3x_1+4x_2$

Subject to constraints:

$2x_1+3x_2 \geq 90$

$4x_1+3x_2 \geq 120$

And $x_1, x_2 \geq 0$

$2x_1+3x_2-x_3 +A_1 = 90$

$4x_1+3x_2-x_4 +A_2 = 120$

Max $Z = -3x_1-4x_2-o.x_3- o.x4-M.A_1-M.A_2$

		-3	-4	0	0	-M	-M	
C_B	X_B	X_1	X_2	X_3	X_4	A_1	A_2	Min. Ratio>0
-M	90	2	3	-1	0	1	0	90/2=45
-M	120	4	3	0	-1	0	1	120/4=30
	-210M	-6M+3	-6M+4	M	M	0	0	
-M	30	0	3/2	-1	½	1	-1/2	30/3/2=20
-3	30	1	3/4	0	-1/4	0	¼	30/3/4=40
	-90-30M	0	-3/2M+7/4	M	-M/2+3/4	0	3M/2-3/4	
-4	20	0	1	-2/3	1/3	2/3	-1/3	
-3	15	1	0	½	-1/2	-1/2	½	
	-125	0	0	7/6	1/6	7/6+M	-1/6+M	

$\therefore$ $x_1 = 15$

$x_2 = 20$;

Z = 125

Illustration 18.

An Investor has ₹ 15 lakhs for investment in four alternatives. Table below gives data on price per share, average growth rate in the price, the annual dividend and the associated risk. Return per share is defined as the difference in current price and price a year later plus the dividend for the year. The following constraints have to be must:

(i) At most ₹ 4,00,000 may be invested in share1.

(ii) At least 100 shares of each stock must be bought.

(iii) At least 15% of the investment made should be in shares 3 and 4 combines;

(iv) The total weighted risk should not exceed 0.08, where total weighted risk = (Σ investment in share j x risk in j)/total investment;

(v) Dividend for the year should be at least ₹ 20,000.

The objective is to maximize the earnings at the end of the first year from both dividends and growth. Formulate a Linear Program Model that will determine the optimal no. of shares to be invested in each script.

Share No.	1	2	3	4
Current price per share	90	120	200	180
Expected annual growth rate	0.10	0.08	0.12	0.15
Expected annual dividend per share (₹)	5.00	7.50	4.00	3.00
Expected risk	0.07	0.05	0.10	0.08

Solution :

Let x_1 be the no. of shares in share type 1

Let x_2 be the no. of shares in share type 2

Let x_3 be the no. of shares in share type 3

Let x_4 be the no. of shares in share type 4

No. of shares return type 1 = (current price per share x expected annual growth rate) + expected annual divided per share = 90 x 0.10 + 5 = 9 + 5 = 14

No. of shares return type 2 = 120 x 0.08 + 7.5 = 9.6 + 7.5 = 17.1

No. of shares return type 3 = 200 x 0.12 + 4 = 24 + 4 = 28

No. of shares return type 4 = 180 x 0.15 + 3 = 27 + 3 = 30

Objective function:

Max Z = 14 x_1 + 17.1 x_2+28x_3+30x_4

Difference in current Price = current price per share x expected annual growth rate

Return: Expected annual dividend per share + difference in current price

Subject to Constraints = 90x_1 + 120x_2+200x_3+180x_4 ≤ 15 lakhs

(i) 90x_1 ≤ 4 lakhs

(ii) x_1, x_2, x_3, x_4 ≥ 100

(iii) 200x_3+180x_4 ≥ 0.15 (90x_1 + 120x_2+200x_3+180x_4)

(iv) (90x_1 x 0.07 + 120x_2 x 0.05 + 200x_3x 0.10 + 180x_4 x 0.08) /
(90x_1 + 120x_2+200x_3+180x_4) ≤ 0.08

(v) 5x_1 + 7.5x_2+4x_3+3x_4 ≥ 20,000

Illustration 19.

A Bank is in the process of formulating its loan policy. Involving a maximum of ₹ 600 Million. Table below gives the relevant types of loans. Bad debts are not recoverable and produce no interest receive. To meet competition from other Banks the following policy guidelines have been set. At least 40% of the funds must be allocated to the agricultural and commercial loans. Funds allocated to housing must be at least 50% of all loans given to personal, car, Housing. The overall bad debts on all loans may not exceed 0.06.

Formulate a linear program Model to determine optimal loan allocations.

Type of loan	Interest rate %	Bad debts (Probability)
Personal	17	0.10
Car	14	0.07
Housing	11	0.05
Agricultural	10	0.08
Commercial	13	0.06

Solution:

Let x_1 be the amount allocated for personal loan

Let x_2 be the amount allocated for car loan

Let x_3 be the amount allocated for Housing loan

Let x_4 be the amount allocated for agricultural loan

Let x_5 be the amount allocated for Commercial loan

Objective Function: Max Z

= 0.17x_1+0.14x_2+0.11x_3+0.1x_4+0.13x_5 – (0.10x_1+0.07x_2+0.05x_3+0.08x_4+0.06x_5)

= (0.17-0.10) x_1+ (0.14-0.07) x_2 + (0.11 -0.05) x_3 + (0.10 - 0.08) x_4+(0.13 – 0.06) x_5

= 0.07x_1+ 0.07x_2 + 0.06x_3 + 0.02x_4+ 0.07 x_5

Subject to constraints

(i) $x_1 + x_2 + x_3 + x_4 + x_5 \leq 600$ Millions

(ii) $x_4 + x_5 \geq 0.4 (x_1 + x_2 + x_3 + x_4 + x_5)$

(iii) $x_3 \geq 0.5 (x_1 + x_2 + x_3)$

(iv) $0.1x_1 + 0.07x_2 + 0.05x_3 + 0.08x_4 0.06 \geq 20,000$

Illustration 20.

The usual learning curve model is $Y = ax^b$ where

Y is the average time per unit for x units.

a is the time for first unit

x is the cumulative number of units

b is the learning coefficient and is

equal to log 0.8/log 2 = 0.322 of a learning rate of 80%

Given that a = 10 hours and learning rare 80%, you are required to Calculate:

(i) The average time for 20 units.

(ii) The total time for 30 units.

(iii) The time for units 31 to 40.

Given that log 2 = 0.301, Antilog of 0.5811 = 3.812

log 3 = 0.4771,Antilog of 0.5244 = 3.345.

log 4 = 0.6021,Antilog of 0.4841 = 3.049.

Solution:

(i) $Y = AX^b$

$Y = 10(20)^{-0.322}$

Taking log on both sides

$\text{Log}y = \log 10 + \log 20^{(-0.322)}$

$\text{Log}y = \log 10 - (0.322) \log 20$

$= 1 - (0.322) \log 20$

$= 1 - (0.322) \times (1.3010)$

$= 1 - 0.41892 = 0.5811$

Log y = 0.5811

Y = Anti log (0.5811) = 3.812 hrs (average time)

(ii) $\text{Log } y = \log 10 + \log 30^{(-0.322)}$

$\text{Log } y = 1 - (0.322) \times (1.4771)$

$= 1 - (0.4756) = 0.5244$

Y = anti log (0.5244) = 3.345 hrs (average time)

Total time = 3.345 x 30 = 100.35 hrs

(iii) Log y = log 10 + log$40^{(-0.322)}$

= 1-(0.322) x (1.6021)

Log y = 0.4841

Y = anti log (0.4841) = 3.049hrs

Total time = 40 x 3.049 = 121.96hrs

Time from 31 to 40 units = 121.96 – (100.35) = 21.61hrs

Illustration 21.

The learning curve as a management accounting has now become or going to become an accepted tool in industry, for its applications are almost unlimited. When it is used correctly, it can lead to increase business and higher profits; when used without proper knowledge, it can lead to lost business and bankruptcy. State precisely:

(i) Your understanding of the learning curve:

(ii) The theory of learning curve;

(iii) The areas where learning curves may assist in management accounting; and

(iv) Illustrate the use of learning curves for calculating the expected average units cost of making.

(a) 4 machines (b) 8 machines

Using the data below:

Data:

Direct Labour need to make first machine	= 1,000 hrs.
Learning curve	= 90%
Direct Labour cost	= ₹ 15 per hour.
Direct materials cost	= ₹ 1,50,000
Fixed cost for either size orders	= ₹ 60,000.

Solution:

Statement showing computation of cost of making 4 machines & 8 machines:

No of machines	Average time	Labour cost	Material	Fixed cost	Total
	Hours	₹	₹	₹	₹
1	1,000	15,000	1,50,000	60,000	2,25,000
2	900	13,500	1,50,000	30,000	1,93,500
4	810	12,150	1,50,000	15,000	1,77,150
8	729	10,935	1,50,000	7,500	1,68,435

Average cost of making 4 machines ₹1,77,150

Average cost of making 8 machines ₹ 1,68,435

Illustration 22.

Z.P.L.C experience difficulty in its budgeting process because it finds it necessary to qualify the learning effect as new products are introduced.

Substantial product changes occur and result in the need for retraining.

An order for 30 units of a new product has been received by Z.P.L.C So far, 14 have been completed; the first unit required 40 direct labour hours and a total of 240 direct labour has been recorded for the 14 units. The production manager expects an 80% learning effect for this type of work.

The company use standard absorption costing. The direct costs attributed to the centre in which the unit is manufactured and its direct materials costs are as follows:

	₹
Direct material	30.00 per unit.
Direct Labour	6.00 per hour.
Variable overhead	0.50 per direct labour hour.
Fixed overhead	6,000 per four-week operating period.

There are ten direct employees working a five-day week, eight hours per day. Personal and other downtime allowances account for 25% of total available time.

The company usually quotes a four-week delivery period for orders.

You are required to:

(i) Determine whether the assumption of an 80% learning effect is a reasonable one in this case, by using the standard formula $y = ax^b$

Where Y = the cumulative average direct labour time per unit (productivity)

a = the average labour time per unit for the first batch.

x = the cumulative number of batches produced.

b = the index of learning.

(ii) Calculate the number of direct labour hours likely to be required for an expected second order of 20 units.

(iii) Use the cost data given to produce an estimated product cost for the initial order, examine the problems which may be created for budgeting by the presence of the learning effect.

Solution:

(i) Total time taken to produce 14 units

$Y = ax^6$

$Y = 40\ (14)^{-0.322}$

$= 17.14$

Total time = 17.14 x 14 = 239.96

= 240 hours

It is true that learning ratio 80% is effective.

(ii) 30 units

$Y = 40 (30)^{-0.322}$ = 13.380 hours (Average time)

50 units

$Y = 40 (50)^{-0.322}$ = 11.35 hours (Average time)

Total time for 30 units = 13.38 x 30 = 401.4 hours

Total time for 50 units = 11.35 x 50 = 567.5 hours

Time taken for 20 units from 31 to 50 units (567.5 – 401.4) = 166.1 hours

(iii)

Man hours = 10 x 8 x 5 x 4	=	1,600
(-) down time	=	400
		1,200

Fixed Cost per hour = 6,000/1,200 = ₹ 5

Computation of total cost for the initial order

		₹
Material (30 x 30)	=	900.0
Labour (401.4 x 6)	=	2408.4
Variable Overheads (0.5 x 401.4)	=	200.7
Fixed Overheads (5 x 401.4)	=	2007.0
	=	5516.1

Illustration 23.

A firm received an order to make and supply eight units of standard product which involves intricate labour operations. The first unit was made in 10 hours. It is understood that this type of operations is subject to 80% learning rate. The workers are getting a wages rate of ₹ 12 per hour.

(i) What is the total time and labour cost required to execute the above order?

(ii) If a repeat order of 24 units is also received from the same customer, what is the labour cost necessary for the second order?

Solution:

80% Learning Curve results are given below:

Production (Units)	Cumulative Average Time (hours)	Total Time (hours)
1	10	10
2	8	16
4	6.4	25.6
8	5.12	40.96
16	4.096	65.54
32	3.2768	104.86

Labour time required for first eight units = 40.96 hours

Labour cost required for 8 units = 40.96 hours x ₹ 12/hr = ₹ 491.52

Labour time for 32 units = 104.86 hours

Labour time for first eight units = 40.96 hours

Labour time required for 2nd order for 24 units = 63.90 hours

Labour cost for 24 units = 63.90 hours x ₹ 12/hr = ₹ 766.80

Illustration 24.

A confectioner sells confectionery items. Past data of demand per week in hundred kilograms with frequency is given below:

Demand/Week	0	5	10	15	20	25
Frequency	2	11	8	21	5	3

Using the following sequence of random numbers, generate the demand for the next 10 weeks. Also find out the average demand per week

Random numbers	35	52	13	90	23	73	34	57
	35	83	94	56	67	66	60	

Solution:

Random No. Range Table for demand				
Demand per week	**Frequency**	**Probability**	**Cumulative Probability**	**Range**
0	2	0.04	0.04	0-3
5	11	0.22	0.26	4-25
10	8	0.16	0.42	26-41
15	21	0.42	0.84	42-83
20	5	0.10	0.94	84-93
25	3	0.06	1.00	94-99
	∑f = 50	1.00		

Simulated Values for next 10 weeks		
Weeks	**R. Nos.**	**Demand**
1	35	10
2	52	15
3	13	5
4	90	20
5	23	5
6	73	15
7	34	10
8	57	15
9	35	10
10	83	15
		120

Average weekly demand = 120/10 = 12

Illustration 25.

The manager of a book store has to decide the number of copies of a particular tax law book to order. A book costs ₹ 60 and is sold for ₹ 80. Since some of the tax laws change year after year, any copies unsold while the edition is current must be sold for ₹ 30. From past records, the distribution of demand for this book has been obtained as follows:

Demand (No of copies)	15	16	17	18	19	20	21	22
Proportion	0.05	0.08	0.20	0.45	0.10	0.07	0.03	0.02

Using the following sequence of random numbers, generate the demand for 20 time periods(years). Calculate the average profit obtainable under each of the courses of action open to the manager. What is the optimal policy? Considering the following Random Nos.

14	02	93	99	18	71	37	30	12	10
88	13	00	57	69	32	18	08	92	73

Solution:

Random No. Range Table			
Demand	**Probability**	**Cumulative Probability**	**Random Range**
15	0.05	0.05	0-4
16	0.08	0.13	5-12
17	0.20	0.33	13-32
18	0.45	0.78	33-77
19	0.10	0.88	78-87
20	0.07	0.95	88-94
21	0.03	0.98	95-97
22	0.02	1.00	98-99
	1.00		

Calculation of demand and profit for next 20 years					
Year	**Random Numbers**	**Expected demand**	**No. of books unsold if stock is**		
			16	**17**	**18**
1	14	17	-	-	1
2	02	15	1	2	3
3	93	20	-	-	-
4	99	22	-	-	-
5	18	17	-	-	1
6	71	18	-	-	-
7	37	18	-	-	-
8	30	17	-	-	1
9	12	16	-	1	2
10	10	16	-	1	2
11	88	20	-	-	-

12	13	17	-	-	1
13	00	15	1	2	3
14	57	18	-	-	-
15	69	18	-	-	-
16	32	17	-	-	1
17	18	17	-	-	1
18	08	16	-	1	2
19	92	20	-	-	-
20	73	18	-	-	-
Total			**2**	**7**	**18**

Statement Showing Computation of Profit			
No. of Books order	**No. of Books sold**	**Profit**	**Average Profit**
15	15 x 20 = 300	₹ 6,000	₹ 300
16	16 x 20 – 2 = 318	₹ 6,300 (318 x 20) – (2 x 30)	₹ 315
17	(17 x 20) – 7 = 333	₹ 6,450 (333 x 20) - (7 x 30)	₹ 322.5
18	(18 x 20) – 18 = 342	₹ 6,300 (342 x 20) – (18 x 30)	₹ 315

Since profit is more at 17 books order, it is the best quantity and ordering is more optimum.

Illustration 26.

A Small retailer has studied the weekly receipts and payments over the past 200 weeks and has developed the following set of information:

Weekly Receipts	**Probability**	**Weekly Payments**	**Probability**
(₹)		(₹)	
3,000	0.20	4,000	0.30
5,000	0.30	6,000	0.40
7,000	0.40	8,000	0.20
12,000	0.10	10,000	0.10

Using the following set of random numbers, simulate the weekly pattern of receipts and payments for the 12 weeks of the next quarter, assuming further that the beginning bank balance is ₹ 8000. What is the estimated balance at the end of the 12 weekly period? What is the highest weekly balance during the quarter? What is the average weekly balance for the quarter?

Random Numbers

For Receipts	03	91	38	55	17	46	32	43	69	72	24	22
For payments	61	96	30	32	03	88	48	28	88	18	71	99

According to the given information, the random number interval is assigned to both the receipts and the payments.

Solution:

Range of random numbers							
Receipt (₹)	**Probability**	**Cumulative probability**	**Range**	**Payments (₹)**	**Probability**	**Cumulative probability**	**Range**
3000	0.20	0.20	0-19	4000	0.30	0.30	0-29
5000	0.30	0.50	20-49	6000	0.40	0.70	30-69
7000	0.40	0.90	50-89	8000	0.20	0.90	70-89
12000	0.10	1.00	90-99	10000	0.10	1.00	90-99

Simulation of Data for a period of 12 weeks					
Week	**Random No. for receipt**	**Expected Receipt (₹)**	**Random No. for payment**	**Expected Payment (₹)**	**Week end Balance (₹)**
Opening Balance					8,000
1	03	3,000	61	6,000	5,000 (8,000 + 3,000 – 6,000)
2	91	12,000	96	10,000	7,000
3	38	5,000	30	6,000	6,000
4	55	7,000	32	6,000	7,000
5	17	3,000	03	4,000	6,000
6	46	5,000	88	8,000	3,000
7	32	5,000	48	6,000	2,000
8	43	5,000	28	4,000	3,000
9	69	7,000	88	8,000	2,000
10	72	7,000	18	4,000	5,000
11	24	5,000	71	8,000	2,000
12	22	5,000	99	10,000	(3,000)

Estimated balance at the end of 12th week = ₹ (3,000)

Highest balance = ₹ 7,000

Average balance during the quarter = 45,000/12 = ₹ 3,750

Illustration 27.

Patients arriving at a village dispensary are treated by a doctor on a first-come-first-served basis. The inter-arrival time of the patients is known to be uniformly distributed between 0 and 80 minutes, while their service time is known to be uniformly distributed between 15 and 40 minutes. It is desired to simulate the system and determine the average time a patient has to be in the queue for getting service and the proportion of time the doctor would be idle. It has been assumed that starting time be 8.00 A.M.

Carry out the simulation using the following sequences of random numbers. The numbers have been selected between 00 and 80 to estimate inter-arrival times and between 15 and 40 to estimate the service times required by the patients.

Series 1	07	21	12	80	08	03	32	65	43	74
Series 2	23	37	16	28	30	18	25	34	19	21

Solution:

Simulation of data at a village dispensary							
No. of patients	**Inter arrival time Random No. (minutes)**	**Entry time in to queue (hrs)**	**Service Time Random No. (minutes)**	**Service Start time (hrs)**	**End time (hrs)**	**Waiting time of patient (minutes)**	**Idle time of doctor (minutes)**
1	07	8.07	23	8.07	8.30	-	07
2	21	8.28	37	8.30	9.07	2	-
3	12	8.40	16	9.07	9.23	27	-
4	80	10.00	28	10.00	10.28	-	37
5	08	10.08	30	10.28	10.58	20	-
6	03	10.11	18	10.58	11.16	47	-
7	32	10.43	25	11.16	11.41	33	-
8	65	11.48	34	11.48	12.22	-	07
9	43	12.31	19	12.31	12.50	-	09
10	74	01.45	21	01.45	02.06	-	55
Total (in minutes)						129	115

Average waiting time of patient = 129/10 = 12.9 minutes

Average idle time of doctor = 115/10 = 11.5 minutes

Illustration 28.

An automobile production line turns out about 100 cars a day, but deviations occur owing to many causes. The production is more accurately described by the probability distribution given below

Production/Day	Prob.	Production/Day	Prob.
95	0.03	101	0.15
96	0.05	102	0.10
97	0.07	103	0.07
98	0.10	104	0.05
99	0.15	105	0.03
100	0.20		
		Total	1.00

Finished cars are transported across the bay, at the end of each day, by ferry. If the ferry has space for only 101 cars. **Using the Random numbers viz. 20, 63, 46, 16, 45, 41, 44, 66, 87, 26, 78, 40, 29, 92, 21** what will be the average number of cars waiting to be shipped, and what will be the average number of empty space on the boat?

Solution:

Simulation of data of an Automobile Production line			
Production/day	**Probability**	**Cumulative Probability**	**Random No. Range**

95	0.03	0.03	0-2
96	0.05	0.08	3-7
97	0.07	0.15	8-14
98	0.10	0.25	15-24
99	0.15	0.40	25-39
100	0.20	0.60	40-59
101	0.15	0.75	60-74
102	0.10	0.85	75-84
103	0.07	0.92	85-91
104	0.05	0.97	92-96
105	0.03	1.00	97-99
	1.00		

Stimulated data				
Day	**Random No.**	**Production**	**No.of cars waiting to be shipped**	**No. of empty space on the boat**
1	20	98	-	3
2	63	101	-	-
3	46	100	-	1
4	16	98	-	3
5	45	100	-	1
6	41	100	-	1
7	44	100	-	1
8	66	101	-	-
9	87	103	2	-
10	26	99	-	2
11	78	102	1	-
12	40	100	-	1
13	29	99	-	2
14	92	104	3	-
15	21	98	-	3
Total			6	18

Average no. of cars waiting to be shipped = 6/15 = 0.40

Average no. of empty space on the boat = 18/15 = 1.2

Illustration 29.

A book store wishes to carry 'Ramayana' in stock. Demand is probabilistic and replenishment of stock takes 2 days (i.e. if an order is placed on March 1, it will be delivered at the end of the day on March 3). The probabilities of demand are given below

Demand (daily)	0	1	2	3	4
Probability	0.05	0.10	0.30	0.45	0.10

Each time an order is placed, the store incurs an ordering cost of ₹ 10 per order. The store also incurs a carrying cost of ₹ 0.50 per book per day. The inventory carrying cost in calculated on the basis of stock at the end of each day.

The manager of the bookstore wishes to compare two options for his inventory decision.

A. Order 5 books when the inventory at the beginning of the day plus order outstanding is less than 8 books.

B. Order 8 books when the inventory at the beginning of the day plus order outstanding is less than 8.

Currently (beginning 1st day) the store has a stock of 8 books plus 6 books ordered two days ago and expected to arrive next day.

Using Monte-Carlo Simulation for 10 cycles, recommend, which option the manager, should choose.

The two digit random numbers are given below:

89 34 78 63 61 81 39 16 13 73

Solution:

Demand	Prob.	Cumm. Prob.	Random No
0	0.05	0.05	00 – 04
1	0.10	0.15	05 – 14
2	0.30	0.45	15 – 44
3	0.45	0.90	45 – 89
4	0.10	1.00	90 - 99

Stock in hand = 8 and stock on order = 6 (excepted next day)

Option A

R. No.	Demand	Op. stock in hand	Receipt	Cl. Stock	Op. stock on order	Order Qty	Cl. Stock on order
89	3	8	-	5	6	-	6
34	2	5	6	9	-	-	-
78	3	9	-	6	-	5	-
63	3	6	-	3	5	-	5
61	3	3	-	0	5	5	10
81	3	0	5	2	5	5	10
39	2	2	-	0	10	-	10
16	2	0	5	3	5	-	5
13	1	3	5	7	0	5	5
73	3	7	-	4	5	-	5
			Total	39			

No of orders = 4 orders, ordering cost = ₹10 ×4 = ₹ 40

Closing stock of 10 days = 39, carrying cost = 39 × ₹ 0.50 = ₹19.50

Total cost for 10 days = ₹ 59.50.

Option B

R. No.	Demand	Op. stock in hand	Receipt	Cl. Stock	Op. stock on order	Order Qty	Cl. Stock on order
89	3	8	-	5	6	-	6
34	2	5	6	9	-	-	-
78	3	9	-	6	-	8	8
63	3	6	-	3	8	-	8
61	3	3	-	0	8	-	8
81	3	3	8	5	-	8	8
39	2	5	-	3	8	-	8
16	2	3	-	1	8	-	8
13	1	1	8	8	-	-	-
73	3	8	-	5	-	8	8
			Total	45			

No of orders = 3 orders, ordering cost = ₹10 × 3 = ₹30

Closing stock of 10 days = 45, carrying cost = 45 × ₹0.50 = ₹22.50

Total cost for 10 days = ₹52.50

Option B has the lower cost, thus manager should choose B.

Illustration 30.

After observing heavy congestion of customers over a period of time in a petrol station, Mr. Petro has decided to set up a petrol pump facility on his own in a nearby site. He has compiled statistics relating to the potential customer arrival pattern an service pattern as given below. He has also decided to evaluate the operations by using the simulation technique.

Arrivals		Services	
Inter-arrival time (minutes)	Probability	Inter-arrival time (minutes)	Probability
2	0.22	4	0.28
4	0.30	6	0.40
6	0.24	8	0.22
8	0.14	10	0.10
10	0.10		

Assume:

(i) The clock starts at 8:00 hours

(ii) Only one pump is set up.

(iii) The following12 Random Numbers are to be used to depict the customer arrival pattern:

78, 26, 94, 08, 46, 63, 18, 35, 59, 12, 97 and 82.

(iv) The following 12 Random Numbers are to be used to depict the service pattern:

44, 21, 73, 96, 63, 35, 57, 31, 84, 24, 05, 37

You are required to find out the

(i) probability of the pump being idle, and

(ii) Average time spent by a customer waiting in queue.

Solution:

	Inter-arrival time				Service time		
Minutes	**Probability**	**Cumulative probability**	**Range**	**Minutes**	**Probability**	**Cumulative probability**	**Range**
2	0.22	0.22	00-21	4	0.28	0.28	00-27
4	0.30	0.52	22-51	6	0.40	0.68	28-67
6	0.24	0.76	52-75	8	0.22	0.90	68-89
8	0.14	0.90	76-89	10	0.10	1.00	90-99
10	0.10	1.00	90-99				

Sl. No.	**Random No. for inter arrival**	**Inter arrival time**	**Entry time in queue**	**Service start time**	**Random no for service.**	**Service time**	**Service end time**	**Waiting time of customer**	**Idle time**
1	78	8	8.08	8.08	44	6	8.14	-	8
2	26	4	8.12	8.14	21	4	8.18	2	-
3	94	10	8.22	8.22	73	8	8.30	-	4
4	08	2	8.24	8.30	96	10	8.40	6	-
5	46	4	8.28	8.40	63	6	8.46	12	-
6	63	6	8.34	8.46	35	6	8.52	12	-
7	18	2	8.36	8.52	57	6	8.58	16	-
8	35	4	8.40	8.58	31	6	9.04	18	-
9	59	6	8.46	9.04	84	8	9.12	18	-
10	12	2	8.48	9.12	24	4	9.16	34	-
11	97	10	8.58	9.16	05	4	9.20	18	-
12	82	8	9.06	9.20	37	6	9.26	14	-
Total Time								**140**	**12**

Average waiting time spent by the customer = 140/12 = 11.67 minutes

Probability of idle time of petrol station = 12/86 = 0.1395

Illustration 31.

The Tit-Fit Scientific Laboratories is engaged in producing different types of high class equipment for use in science laboratories. The company has two different assembly lines to produce its most popular product 'Pressure'. The processing time for each of the assembly lines is regarded as a random variable and is described by the following distributions.

Process Time (minutes)	Assembly A1	Assembly A2
10	0.10	0.20
11	0.15	0.40
12	0.40	0.20
13	0.25	0.15
14	0.10	0.05

Using the following random numbers, generate data on the process times for 15 units of the item and compute the expected process time for the product. For the purpose, read the numbers vertically taking the first two digits for the processing time on assembly A1 and the last two digits for processing time on assembly A_2.

4134	8343	3602	7505	7428
7476	1183	9445	0089	3424
4943	1915	5415	0880	9309

Solution:

Computation of Random Interval for Processing Time

	A1			A2		
Process time Minutes	P_i	$\sum P_i$	**Range**	P_i	$\sum P_i$	**Range**
10	0.10	0.10	0-9	0.20	0.20	0-19
11	0.15	0.25	10-24	0.10	0.60	20-59
12	0.40	0.65	25-64	0.20	0.80	60-79
13	0.25	0.90	65-89	0.15	0.95	80-94
14	0.10	1.00	90-99	0.05	1.00	95-99

Simulated date for 15 units

	Random No.	Process Time	Random No.	Process Time	Total
1	41	12	34	11	23
2	74	13	76	12	25
3	49	12	43	11	23
4	83	13	43	11	24
5	11	11	83	13	24
6	19	11	83	13	24
7	36	12	02	10	22
8	94	14	45	11	25
9	54	12	15	10	22
10	75	13	05	10	23
11	00	10	89	13	23
12	08	10	80	13	23

13	74	13	28	11	24
14	34	12	24	11	23
15	93	14	09	10	24
		182		**167**	**349**

Average Process time for

A1 = 182/15 = 12.13 Minutes

A2 = 167/15 = 11.13 Minutes

For product = 349/15 = 23.27 Minutes

Expected process time for the product = 23.27 minutes (12 .13 + 11.13)

Illustration 32.

A businessman is considering taking over a certain new business. Based on past information and his own knowledge of the business, he works out the probability distribution of the monthly costs and sales revenues, as given here:

Cost (in ₹)	Probability	Sales Revenue (₹)	Probability
17,000	0.10	19,000	0.10
18,000	0.10	20,000	0.10
19,000	0.40	21,000	0.20
20,000	0.20	22,000	0.40
21,000	0.20	23,000	0.15
		24,000	0.05

Use the following sequences of random numbers to be used for estimating costs and revenues. Obtain the probability distribution of the monthly net revenue.

Sequence 1	82	84	28	82	36	92	73	91	63	29
	27	26	92	63	83	02	10	39	10	10
Sequence 2	39	72	38	29	71	83	19	72	92	59
	49	39	72	94	04	92	72	18	09	00

Solution:

Cost (₹)	Probability	Cumulative Probability	Random Range	Sales Revenue (₹)	Probability	Cumulative Probability	Random Range
17,000	0.1	0.1	00-09	19,000	0.1	0.1	00.09
18,000	0.1	0.2	10-19	20,000	0.1	0.2	10-19
19,000	0.4	0.6	20-59	21,000	0.2	0.4	20-39
20,000	0.2	0.8	60-79	22,000	0.4	0.8	40-79
21,000	0.2	1.0	80-99	23,000	0.15	0.95	80-94
				24,000	0.05	1.00	95-99

Month	Random No. for Cost	Sales Revenue (₹)	Random No. for Sales	Cost (₹)	Monthly Net Revenue (₹)
1	82	21000	39	21000	-
2	84	21000	72	22000	1000
3	28	19000	38	21000	2000
4	82	21000	29	21000	-
5	36	19000	71	22000	3000
6	92	21000	83	23000	2000
7	73	20000	19	20000	-
8	91	21000	72	22000	1000
9	63	20000	92	23000	3000
10	29	19000	59	22000	3000
11	27	19000	49	22000	3000
12	26	19000	39	21000	2000
13	92	21000	72	22000	1000
14	63	20000	94	23000	3000
15	83	21000	04	19000	(2000)
16	02	17000	92	23000	6000
17	10	18000	72	22000	4000
18	39	19000	18	20000	1000
19	10	18000	09	19000	1000
20	10	18000	00	19000	1000
					35000

Average = 35,000/20 = ₹ 1,750

Illustration 33.

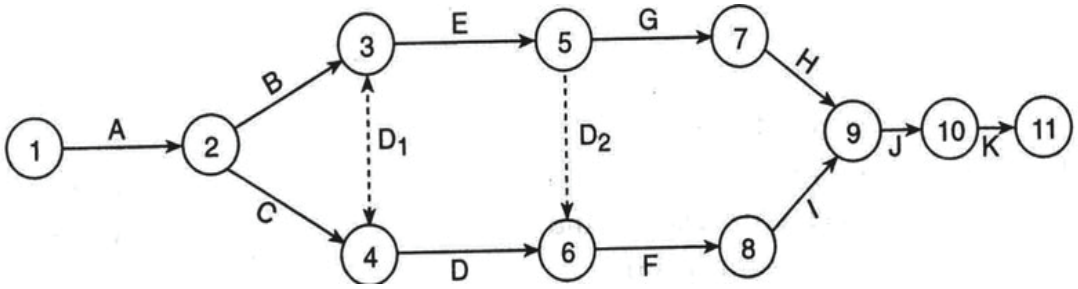
XYZ Auto-manufacturing company has to prepare a design of its latest model of motorcycle. The various activities to be performed to prepare design are as follows:

Activity	Description of activity	Preceding activity
A	Prepare drawing	—
B	Carry out cost analysis	A
C	Carry out financial analysis	A
D	Manufacture tools	C
E	Prepare bill of material	B, C
F	Receive material	D,E
G	Order sub-accessories	E
H	Receive sub-accessories	G
I	Manufacture components	F
J	Final assembly	I,H
K	Testing and shipment	J

Prepare an appropriate network diagram.

Solution:

The network diagram will be as follows:



Where D_1 and D_2 are dummy activities.

Illustration 34.

A civil engineering firm has to bid for the construction of a dam. The activities and time estimates are given below:

Activity	DURATION		
	Optimistic	Most likely	Pessimistic
1—2	14	17	25
2—3	14	18	21
2—4	13	15	18
2—8	16	19	28
3—4 (dummy)			
3—5	15	18	27
4—6	13	17	21
5—7 (dummy)			
5—9	14	18	20
6—7 (dummy)			
6—8 (dummy)			
7—9	16	20	41
8—9	14	16	22

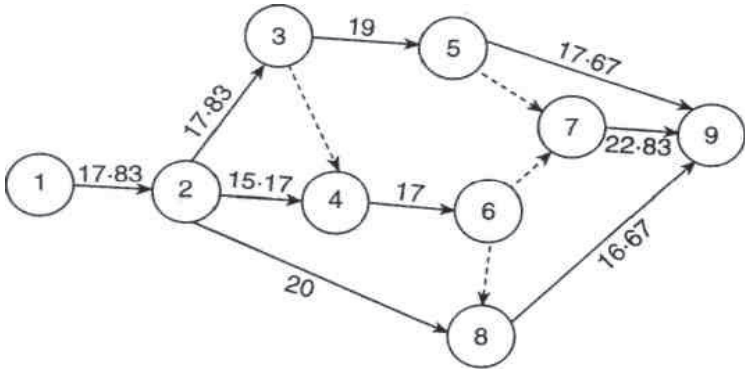
The policy of the firm with respect to submitting bids is to bid the minimum amount that will provide a 95% of probability of at best breaking even. The fixed costs for the project are 8 lakhs and the variable costs are ₹9,000 everyday spent working on the project. The duration is in days and the costs are in terms of rupees.

What amount should the firm bid under this policy? (You may perform the calculations on duration etc. upto two decimal places.

Solution:

The expected duration and variance of each activity is computed in the following table :

Activity	Optimistic (t_0)	Time most likely (t_m)	Pessimistic (t_p)	Expected duration $t_e = \frac{1}{6}(t_0 + 4t_m + t_p)$	Variance $\left[\frac{1}{6}(t_p - t_0)\right]^2$
1—2	14	17	25	17.83	3.36
2—3	14	18	21	17.83	1.36
2-4	13	15	18	15.17	
2—8	16	19	28	20.00	
3—4	—	—	—	—	
3—5	15	18	27	19.00	4
4—6	13	17	21	17.00	
5—7	—	—	—	—	
5—9	14	18	20	17.67	
6—7	—	—	—	—	
6—8	—	—	—	—	
7—9	16	20	41	22.83	17.36
8—9	14	16	22	16.67	



The various paths and their lengths are as follows:

	Path	Duration
I.	1-2-3-5-7-9	77.49*
II.	1-2-3-5-9	72.33
III.	1-2-3-4-6-7-9	75.49
IV.	1-2-3-4-6-8-9	69.33
V.	1-2-8-9	54.50
VI.	1-2-4-6-8-9	66.67
VII.	1-2-4-6-7-9	72.83

Thus, the critical path is 1—2—3—5—7—9 with project duration of 77.49 days. Project variance is obtained by summing variances of critical activities, $\sigma^2 = 3.36 + 1.36 + 4 + 17.36 = 26.08$.

$\therefore$ Standard duration of project length, $\sigma = \sqrt{26.08} = 5.11$

To calculate the project duration which will have 95% chances of its completion, we find the value of Z corresponding to 95% area from normal distribution area table which is 1.645. Thus

$$P(X \le T_s) = P\left(Z \le \frac{T_s - 77.49}{5.11}\right) = 0.95$$

$$= \frac{T_s - 77.49}{5.11} = 1.645 \quad \text{or} \quad T_s = 1.645 \times 5.12 + 77.49 = 86 \text{ days.}$$

Since the fixed cost of the project is ₹ 8 lakhs and the variable cost is ₹ 9000 per day, amount to bid = ₹8 lakhs + ₹ 9000 x 86 = ₹ 15,74,000.

Illustration 35.

The following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1—2	6	600	4	1,000
1—3	4	600	2	2,000
2—4	5	500	3	1,500
2—5	3	450	1	650
3—4	6	900	4	2,000
4—6	8	800	4	3,000
5—6	4	400	2	1,000
6—7	3	450	2	800

The indirect cost per day is ₹ 100.

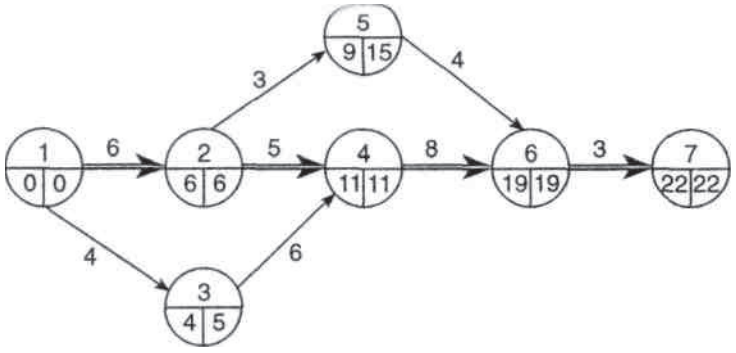
(i) Draw the network and identify the critical path.

(ii) What are the normal project duration and associated cost?

(iii) Crash the relevant activities systematically and determine the optimum project completion time and cost.

Solution:

(i) The network for normal activity times indicates a project time of 22 weeks with the critical path 1-2-4-6-7.



(ii) Normal project duration is 22 weeks and the associated cost is as follows:

Total cost = Direct normal cost + Indirect cost for 22 weeks.

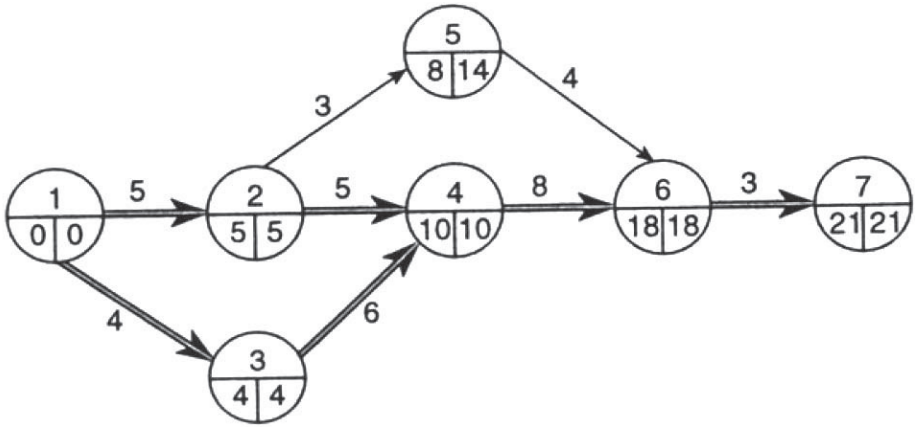
= 4,700 + 100 x 22 = ₹ 6,900.

(iii) For critical activities, crash cost - slope is given below:

Critical activity	Crash cost-slop
1-2	$\frac{1000 - 600}{6 - 4} = 200$
2-4	$\frac{1500 - 500}{5 - 3} = 500$
4-6	$\frac{3000 - 800}{8 - 4} = 550$
6-7	$\frac{800 - 450}{3 - 2} = 350$

Of the activities lying on the critical path, activity 1—2 has lowest cost slope Therefore, we shall first crash this activity by just one day.

Duration = 21 days, and cost = 4700 + 1 x 200 + 100 x 21 = ₹ 7000.



Other activities too have become critical. Now we have 2 critical paths:

1→2→3→6→7 and 1→3→4→6→7.

To reduce duration of the activity further, we shall have to reduce duration of both the paths. We have following alternatives:

Crash activity 6 — 7 by 1 day at a cost of ₹ 350.

Crash activity 4 — 6 by 4 days at the cost of ₹ 550 per day.

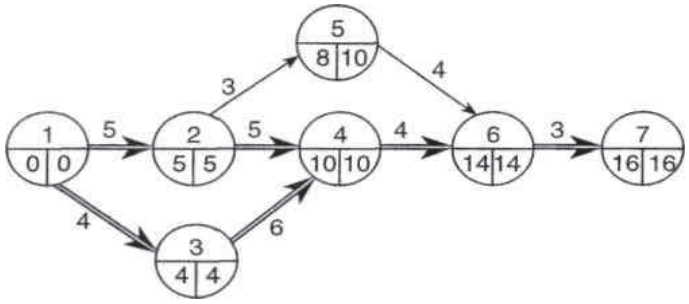
Crash activities 1—2 and 1 — 3 by 1 day each at a cost of ₹ (200 + 700) = ₹ 900.

Crash activities 2 — 4 and 3 — 4 by 2 days each at a cost of ₹ (500 + 550) = ₹ 1050/day.

Thus, we shall first crash activities 6 — 7 by 1 day and then activity 4 — 6 by 4 days.

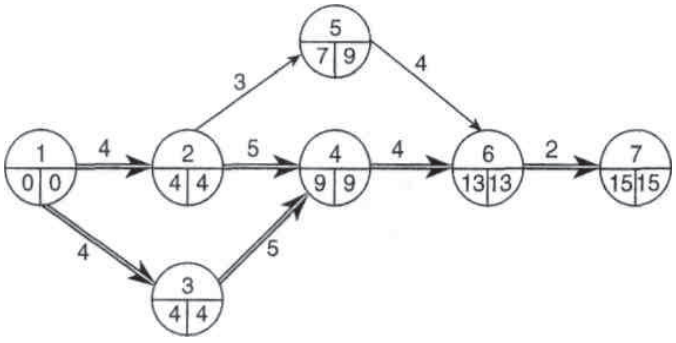
On crashing activity 6 — 7 by 1 day, cost = 4900 + 350 x 1 + 100 x 20 = ₹ 7250, and duration = 20 days. Next we crash 4—6 by 4 days.

Cost = 5250 + 550 x 4 + 100 x 16 = ₹ 9050. Duration = 16 days.



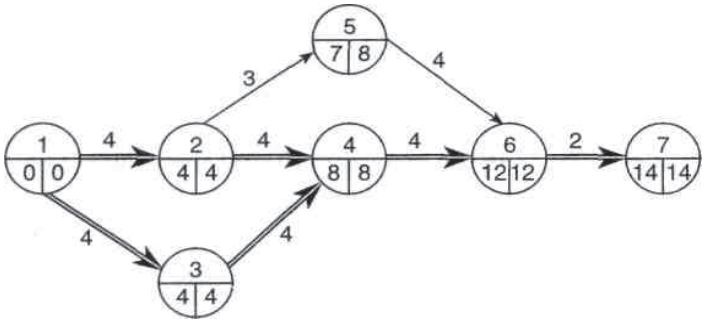
Next we crash activities 1—2 and 3—4 by 1 day each.

Cost = 7450 + 200 x 1 + 550 x 1 + 100 x 15 = ₹ 9700.



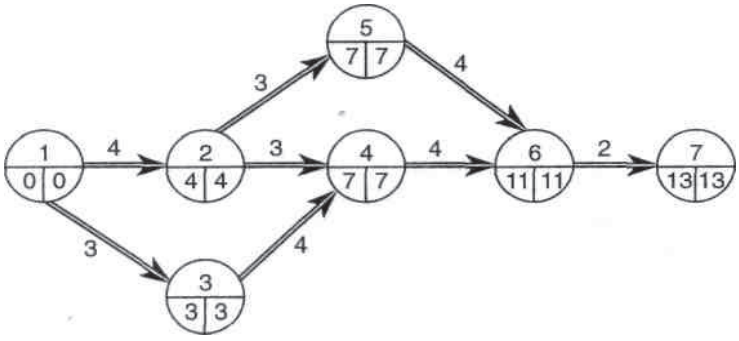
Next we crash activities 2 ⟶ 4 and 3 ⟶ 4 by 1 day each.

Cost = 8200 + 500 x 1 + 550 x 1 + 100 x 14 = ₹ 10,650. Duration = 14 days.



We crash activities 1—3 and 2—4 by 1 day each.

Cost = 9250 + 700 x 1 + 500 x 1 + 100 x 13 = ₹ 11,750 Duration = 13 days.



Now there are three critical paths:

1—2—5—6—7, 1—2—4—6—7, 1—3—4—6—7

Also, no further crashing is possible. Hence minimum duration of the project =13 days with cost ₹ 11,750.

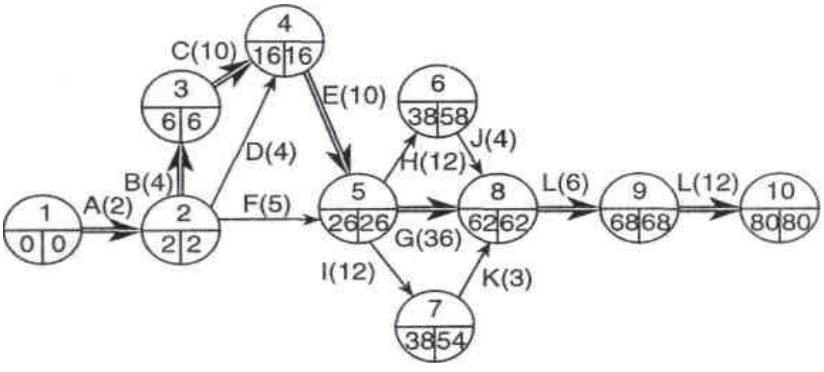
Illustration 36.

Draw a network of the following activities and tabulate earliest and latest starting and finishing times of each activity and the total and free floats of them:

Event numbers	Activity symbol	Activity description	No. of days
1—2	A	Study of plan layout	2
2—3	B	Clearance of site	4
3—4	C	Earth work	10
2—4	D	Procurement of line, sand, cement and concrete	4
4—5	E	Laying of foundations	10
2—5	F	Procurement of bricks	5
5—8	G	Construction of building	36
5—6	H	Laying of conduit pipe lines for electric wires	12
6—8	I	Laying of electric wires	4
5—7	J	Laying of drainage and sewage system	12
7—8	K	Laying of water pipe lines and taps	8
8—9	L	Connecting building to water and electricity	6
9—10	M	Finishing work in building	12

Solution:

The graphical representation of network and time schedule is shown in Fig. below:



The critical path is : A—B—C—E—G—L—M.

TABLE: COMPUTATION OF SCHEDULING TIME ESTIMATES AND FLOATS

Activity	Sequence code	Duration	Earliest time		Latest time		Float	
			Start	Finish	Start	Finish	Start	Finish
A	1-2	2	0	2	0	2	0	0
B	2-3	4	2	6	2	6	0	0
C	3-4	10	6	16	6	16	0	0
D	2-4	4	2	6	12	16	10	10
E	4-5	10	16	26	16	26	0	0
F	2-5	5	2	7	21	26	19	19
G	5-8	36	26	62	26	62	0	0
H	5-6	12	26	38	46	58	20	20
I	6-8	4	38	42	58	62	20	20
J	5-7	12	26	38	42	54	16	16
K	7-8	8	38	46	54	62	8	8
L	8-9	6	62	68	62	68	0	0
M	9-10	12	68	82	68	80	0	0

Illustration 37.

Find the trend of annual profit of an organization by moving average method

Year:	2001	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14
Annual:	31	34	33	35	34	32	30	36	34	35	39	34	34	42

Profit ('000 ₹)

(Use the most appropriate period of moving average.)

It is known to us that the appropriate period of moving average is the period of cyclical variations. In the given data we do not find any such regular cycle of fixed period. Examining the given data we find the peaks at the following points.

Year	**2**		**4**		**8**		**11**		**14**
Peak Value	34		35		36		39		42
Period		2		4		3		3	

So the given data show 4 cycles with different periods, 2, 4, 3 and 3. In this case the most appropriate period of moving average will be the average (A.M.) of periods of different cycles. So the period of moving average is $\frac{1}{4}(2+4+3+3)=\frac{1}{4}\times 12=3.$

Year	Annual profits ('000 ₹)	3-yearly moving total	3-yearly moving average col. (3) ÷ 3
(1)	(2)	(3)	(4)
2001	31	—	—
2002	34	98	32.67
2003	33	102	34
2004	35	102	34
2005	34	101	33.67
2006	32	96	32
2007	30	98	32.67
2008	36	100	33.33
2009	34	105	35
2010	35	108	36
2011	39	108	36
2012	34	109	36.33
2013	36	112	37.33
2014	42	—	—

Illustration 38.

Fit a straight line trend to the given time series data and estimate the value for the year 2015.

Year:	2008	2009	2010	2011	2012	2013	2014
Average production per month ('000 tones):	20	22	21	24	25	23	28

Let the straight line trend be represented by die equation = a + bt. The values of a and b will be determined by solving the normal equations $\sum y = na + b\sum t$... (i) and $\sum yt = a\sum t + b\sum t^2$. Here since the number of years is odd i.e. seven, the midyear i. e. 2006 is taken as origin and one year as unit.

Fitting straight line trend

year	Average prod, per month ('000 tons) (y)	t = year - 2011	t^2	y. t.
2008	20	-3	9	-60
2009	22	-2	4	-44
2010	21	- 1	1	-21
2011	24	0	0	0
2012	25	1	1	25
2013	23	2	4	46
2014	28	3	9	84
Total	163	0	28	30

From normal equ. (i) 163 =7.a + b.0 or, a = 23.29, as n = 7, $\sum y$ = 163

From equ. (ii), 30 = a.0. + b.28 or, b = 1.07, as $\sum yt$= 30, $\sum t^2$ = 28

∴ the trend equation is y = 23.29 + 1.07t, with origin = 2006 and t unit = 1 year

The value of t for 2015 is 4, so estimated value for 2010 is

23.29 + 1.07 × 4 = 23.29 + 4.28 = 27.57 ('0000 tons)

Illustration 39.

Fit by the method of least squares a parabolic curve to the following data :

Year:	2009	2010	2011	2012	2013	2014	2015
Production in tons:	23	20	18	18	14	13	13

Let the parabolic curve (trend) be represented by $y = a + bt + ct^2$. Since the number of years is odd the origin is taken at the mid-year, i.e., 2012 and unit as one year.

Fitting of Parabolic Trend

Year	Production (y)	t = Year -2012	t^2	t^3	t^4	yt	yt^2
2009	23	-3	9	-27	81	-69	207
2010	20	-2	4	-8	16	-40	80
2011	18	-1	1	- 1	1	- 18	18
2012	18	0	0	0	0	0	0
2013	14	1	1	1	1	12	14
2014	13	2	4	8	16	26	52
2015	13	3	9	27	81	39	117
Total	119	0	28	0	196	-48	488

From the normal equation

$\sum y = an + b\sum t + c\sum t^2$ ..... (i)

$\sum yt = a\sum t + b\sum t^2 + c\sum t^3$ ..... (ii)

$\sum yt^2 = a\sum t^2 + b\sum t^3 + c\sum t^4$ ..... (iii)

Now, putting the values of $\sum t = 0$, $\sum t^2 = 28$, $\sum t^3 = 0$, $\sum t^4 = 196$, $\sum yt = -48$ and $\sum Yt^2 = 488$ we get,

$119 = 7a + 28c$ ..... (iv)

$-48 = 28b$ ..... (v)

$488 = 28a + 196\ c$ ..... (vi)

Solving the three equations,

$A = 16.43$, $b = -1.71$, $c = 0.143$

Thus, $y = 16.43 - 1.71t + 0.143\ t^2$ with origin 2012 and t unit one year.

Illustration 40.

Fit a quadratic trend equation by method of least squares from the following data and estimate the trend value for the year 2014 :

Year:	2007	2008	2009	2010	2011	2012
Price(₹)	250	207	228	240	281	392

Let the quadratic equation be represented by $y = a + bt + ct^2$. Since the number of years is even the origin is taken at the mid-point of 2009 and 2010 t unit = $\frac{1}{2}$ years.

Fitting of Parabolic Trend

Year	Price (y)	$t = \frac{\text{year} - 2009.5}{1/2}$	t^2	t^3	t^4	yt	yt^2
2007	250	-5	25	-125	625	-1250	6250
2008	207	-3	9	-27	81	-621	1863
2009	228	-1	1	-1	1	-228	228
2010	240	1	1	1	1	240	240
2011	281	3	9	27	81	843	2529
2012	392	5	25	125	625	1960	9800
Total	1598	0	70	0	1414	944	20910

From the normal equations $\sum y = na + b\sum t + c\sum t^2$……. (i)

$\sum yt = a\sum t + b\sum t^2 + c\sum t^3$ …… (ii)

and $\sum yt^2 = a\sum t^2 + b\sum t^3 + c\sum t^4$ …… (iii)

and putting respective values for the above table we get, …..

$1598 = 6a + 70c$ …… (iv)

$944 = 70b$ or, $b = 13.49$ …… (v)

$20910 = 70a + 1414c$ (vi)

Solving (iv) & (vi) we have, a = 222.03, c = 3.80

Thus $y = 222.03 + 13.49t + 3.80t^2$ with origin mind- point of 2009 & 2010, t unit = $\frac{1}{2}$ year.

For 2014, t = 9. So estimated trend value for 2004 is

$y = 222.03 + 13.49 \times 9 + 3.80 \times 81 = ₹651.24$

Illustration 41.

Quarterly sales in (₹ '000) of a company is given below:

Quarters		**Years**	
	2012	**2013**	**2014**
I	7.2	7.4	8.4
II	5.0	6.8	6.0
III	7.8	7.4	6.2
IV	9.2	9.0	7.6

Calculate the seasonal indices.

As no appreciable trend is noticed in the given data method of quarterly averages to be used here.

Solution:

Calculation for seasonal Indices

Quarter	Year			Total	Average
	2012	2013	2014		
I	7.2	7.4	8.4	23.0	7.67
II	5.0	6.8	6.0	17.8	5.93
III	7.8	7.4	6.2	21.4	7.13
IV	9.9	9.0	7.6	25.8	8.60
Total					29.33

Average of averages $= \frac{29.33}{4} = 7.33$

Seasonal Index for Quarter **I** $= \frac{7.67}{7.33} \times 100 = 104.6$

Seasonal Index for Quarter **II** $= \frac{5.93}{7.33} \times 100 = 80.9$

Seasonal Index for Quarter **III** $= \frac{7.13}{7.33} \times 100 = 97.2$

Seasonal Index for Quarter **IV** $= \frac{8.60}{7.33} \times 100 = 117.3$

Note. Since the total of Seasonal Index for the 4 quarters is 400, no adjustment is necessary.

Study Note - 12

ENTREPRENEURIAL APPROACH TO COST MANAGEMENT WITH REFERENCE TO CORE COMPETENCIES

This Study Note includes

12.1 STRATEGIC ADVANTAGES AND LONG-TERM PERSPECTIVE OF COST MANAGEMENT

In the traditional organizational structure, the marketing function, the engineering/design function, and the manufacturing function are quasi-independent groups. In some cases, products are designed without much information on market demand or much understanding of the demands on manufacturing resources. Similarly, goods are often marketed with a view of making the sale that disregards the ability of manufacturing to meet promised delivery dates or design specification alterations. Finally, manufacturing scheduling and processes are often predicated on low cost or contribution margin throughput, not on providing customer satisfaction. In recent years, as manufacturers have learned to become "flatter" and more integrated across functional lines, engineering, manufacturing, and marketing have begun to work more closely together. Surprisingly enough, one of the ways in which this closer cooperation has manifested itself is in the area of cost planning.

The Concept of Strategic Cost Management

Managers are often quite concerned about costs, but the proper time for this concern is *before* the costs have been incurred, not after. Managers want cost data to help them manage costs. Of course, the temptation is for managers to use the data that comes out of the cost accounting system for this purpose. However, since unit costs from the cost accounting system are seldom appropriate views of cost from the perspective of taking actions, this use of cost accounting data must be applied with caution.

In the not too distant past, manufacturing companies operated in an environment where the single most powerful technique managers had for managing costs was increasing productivity by increasing production volume. For the vast majority of managers today, simply increasing production volume is the route to disaster!

What has changed? In the past, there were few really successful mass producers. Their market opportunities were great. If they could produce goods at substantially lower average costs, they could lower their prices. If they could lower their prices, they could increase their sales. Today, nearly every manufacturer understands how to mass produce goods. Thus, no one can effectively lower prices without frightening competitors into doing the same. Extra production means extra stuff you cannot sell.

Today, product lives tend to be much shorter and the variety of products and models is quite large. The general, single-product market (like Model T Fords) is a thing of the past. The dimension of time has become a critical attribute of competitive advantage. The first product of its kind with desirable features has a distinct market advantage, but only if the product has sufficient quality, good delivery, good responsiveness to customer needs, and, of course, the right price.

Smart managers have begun to focus in on other issues in order to manage costs. Now the motto is "spend money to make money" -- that is, make sure that every rupee spent is a rupee that adds value to what the customer perceives. If it does not add value, do not spend it! In this note, we examine some of the latest thinking that companies are using to wisely manage costs.

12.2 STRATEGIC COST BENEFIT ANALYSIS OF DIFFERENT RESTRUCTURING PROPOSITIONS AND STRATEGIC BUSINESS DECISION MAKING ASPECTS

When executives develop corporate strategy, they nearly always begin by analyzing the industry or environmental conditions in which they operate. They then assess the strengths and weaknesses of the players they are up against. With these industry and competitive analyses in mind, they set out to carve a distinctive strategic position where they can outperform their rivals by building a competitive advantage. To obtain such advantage, a company generally chooses either to differentiate itself from the competition for a premium price or to pursue low costs. The organization aligns its value chain accordingly, creating manufacturing, marketing, and human resource strategies in the process. On the basis of these strategies, financial targets and budget allocations are set.

The underlying logic here is that a company's strategic options are bounded by the environment. In other words, structure shapes strategy. This "structuralist" approach, which has its roots in the structure-conduct-performance paradigm of industrial organization economics, has dominated the practice of strategy for the past 30 years. According to it, a firm's performance depends on its conduct, which in turn depends on basic structural factors such as number of suppliers and buyers and barriers to entry. It is a deterministic worldview in which causality flows from external conditions down to corporate decisions that seek to exploit those conditions.

Even a cursory study of business history, however, reveals plenty of cases in which firms' strategies shaped industry structure, from Ford's Model T to Nintendo's Wii. For the past 15 years, we have been developing a theory of strategy, known as blue ocean strategy, that reflects the fact that a company's performance is not necessarily determined by an industry's competitive environment. The blue ocean strategy framework can help companies systematically reconstruct their industries and reverse the structure-strategy sequence in their favor.

Blue ocean strategy has its roots in the emerging school of economics called endogenous growth[3], whose central paradigm posits that the ideas and actions of individual players can shape the economic and industrial landscape. In other words, strategy can shape structure. We call this approach "reconstructionist."

While the structuralist approach is valuable and relevant, the reconstructionist approach is more appropriate in certain economic and industry settings. Indeed, today's economic difficulties have heightened the need for a reconstructionist alternative. The first task of an organization's leadership, therefore, is to choose the appropriate strategic approach in light of the challenges the organization faces. Choosing the right approach, however, is not enough. Executives then need to make sure that their organizations are aligned behind it to produce sustainable performance.

What Is the Right Strategic Approach for You?

There are three factors that determine the right approach: the structural conditions in which an organization operates, its resources and capabilities, and its strategic mind-set. When the structural conditions of an industry or environment are attractive and you have the resources and capabilities to

carve out a viable competitive position, the structuralist approach is likely to produce good returns. Even in a not-so-attractive industry, the structuralist approach can work well if a company has the resources and capabilities to beat out the competition. In either case, the focus of strategy is to leverage the organization's core strengths to achieve acceptable risk-adjusted returns in an existing market.

Choosing the Right Strategic Approach

A structuralist approach is a good fit when:

- Structural conditions are attractive and the organization has the resources and capabilities to build a distinctive position
- Structural conditions are less than attractive but organization has the resources and capabilities to outperform competitors
- The organization has bias toward defending current strategic positions and a reluctance to venture into unfamiliar territory

A reconstructionist approach is a good fit when:

- Structural conditions are attractive but players are well-enterenched and the organization lacks the resources or capabilities to outperform them
- Structural conditions are unattractive and they work against an organization irrespective of its resources and capabilities
- The organization has an orientation toward innovation and a willingness to pursue new opportunities

When structureal contidions and resources and capabilities do not distinctively indicate one approach or the other, the right choice will turn on the oganization's strategic mind-set.

But when conditions are unfavorable and they are going to work against you whatever your resources and capabilities might be, a structuralist approach is not a smart option. This often happens in industries characterized by excess supply, cutthroat competition, and low profit margins. In these situations, an organization should adopt a reconstructionist approach and build a strategy that will reshape industry boundaries.

The prolonged global economic downturn has enforced continuous waves of restructuring across industries. As the recovery is predicted to take years, companies have decided to reduce headcount in less performing units. Unfortunately, many have selected an easy approach and initiated "across the board" cuts without clear choices on what to cut and where to invest.

Those adopting a more strategic approach have emphasized understanding of the company's value levers, with constant cost structure management both directed from the top but also managed within businesses.

Restructuring has become the New Norm in Many Industries

In many industries, the impact of economic downturn has been exacerbated by macroeconomic trends like digitization, consumerization, globalization and sustainability, changing the dynamics of not only these industries but whole value chains. For example, content development is now an entirely different industry due to information technology, which also affects the media and paper industries. Similarly, sustainability and renewable energy sources are impacting the energy industry value chain, and cloud services and consumerization are transforming the IT industry, only to name a few examples.

Due to globalization, the changes affect not only multinational corporations but also SMEs that face global competition all the earlier. The trends also drive demand from developed to developing markets, contributing to overcapacity in the former, and due to the unbalanced structure of some industries have led to price erosions of up to 5-10% per annum, squeezing margins from both sides. All of this has resulted in a situation, where companies need to constantly restructure their businesses to stay competitive. Ever changing industry dynamics, with new entrants and substitutes introducing disruptive business models, call for more strategic cost management than what many companies have traditionally been used to.

Often, the incumbent companies with traditionally profitable business models are reluctant to change because of good historical performance that has enabled a heavy overhead structure fiercely defended by the managers. Employees accustomed to managing their own cost centers do not see the need to change behaviors, which ultimately leads to a culture of tolerated underachievement, until the situation is bad enough to justify a major restructuring.

Also, in the face of changing industry dynamics, the business and operating models of incumbent companies tend to be under-optimized, with blurred value creation logic, overlapping functions between businesses and even subsidization of underperforming businesses. Therefore, as the industries evolve, revising company value creation logic is needed to adapt to the changing landscape.

CASE STUDY

A Newspaper Snippet

"June 11, 2008 - Daiichi Sankyo Company, Limited (TSE: 4S68.JP) ("Daiichi Sankyo"), one of the largest pharmaceutical companies in Japan, and Ranbaxy Laboratories Limited (NSE/BSE: Ranbaxy/500359) ("Ranbaxy"), among the top 10 generic companies in the world and India's largest pharmaceutical company, today announced that a binding Share Purchase and Share Subscription Agreement (the "SPSSA") was entered into between Daiichi Sankyo, Ranbaxy and the Singh family, the largest and controlling shareholders of Ranbaxy (the "Sellers"), pursuant to which Daiichi Sankyo will acquire the entire shareholding of the Sellers in Ranbaxy and further seek to acquire the majority of the voting capital of Ranbaxy at a price of ₹ 737 per share with the total transaction value expected to be between US$ 3.4 to US$ 4.6 billion (currency exchange rate: US$ 1 = ₹ 43). On the post closing basis, the transaction would value Ranbaxy at US$ 8.5 billion."

The Deal

Daiichi Sankyo Co, Ltd. signed an agreement to acquire 34.8% of Ranbaxy Laboratories Ltd. from its promoters for $2.4 billion at $17 per share. Daiichi Sankyo expects to increase its stake in Ranbaxy through various means such as preferential allotment, public offer and preferential issue of warrants to acquire a majority in Ranbaxy, i.e. at least 50.1%. After the acquisition, Ranbaxy will operate as Daiichi Sankyo's subsidiary but will be managed independently under the leadership of its current CEO & Managing Director Malvinder Singh.

The main benefit for Daiichi Sankyo from the merger is Ranbaxy's low-cost manufacturing infrastructure and supply chain strengths. Ranbaxy gains access to Daiichi Sankyo's research and development expertise to advance its branded drugs business. Daiichi Sankyo's strength in proprietary medicine complements Ranbaxy's leadership in the generics segment and both companies acquire a broader

product base, therapeutic focus areas and well distributed risks. Ranbaxy can also function as a low-cost manufacturing base for Daiichi Sankyo. Ranbaxy, for itself, gains smoother access to and a strong foothold in the Japanese drug market. The immediate benefit for Ranbaxy is that the deal frees up its debt and imparts more flexibility into its growth plans. Most importantly, Ranbaxy's addition is said to elevate Daiichi Sankyo's position from #22 to #15 by market capitalization in the global pharmaceutical market.

Synergies

The key areas where Daiichi Sankyo and Ranbaxy are synergetic include their respective presence in the developed and emerging markets. While Ranbaxy's strengths in the 21 emerging generic drug markets can allow Daiichi Sankyo to tap the potential of the generics business, Ranbaxy's branded drug development initiatives for the developed markets will be significantly boosted through the relationship. To a large extent, Daiichi Sankyo will be able to reduce its reliance on only branded drugs and margin risks in mature markets and benefit from Ranbaxy's strengths in generics to introduce generic versions of patent expired drugs, particularly in the Japanese market.

Both Daiichi Sankyo and Ranbaxy possess significant competitive advantages, and have profound strength in striking lucrative alliances with other pharmaceutical companies. Despite these strengths, the companies have a set of pain points that can pose a hindrance to the merger being successful or the desired synergies being realized.

With R&D perhaps playing the most important role in the success of these two players, it is imperative to explore the intellectual property portfolio and the gaps that exist in greater detail. Ranbaxy has a greater share of the entire set of patents filed by both companies in the period 1998-2007. While Daiichi Sankyo's patenting activity has been rather mixed, Ranbaxy, on the other hand, has witnessed a steady uptrend in its patenting activity until 2005. In fact, during 2007, the company's patenting activity plunged by almost 60% as against 2006.

Post Acquisition Strategic Objectives

In light of the above analyses, Daiichi Sankyo's focus is to develop new drugs to fill the gaps and take advantage of Ranbaxy's strong areas. To overcome its current challenges in cost structure and supply chain, Daiichi Sankyo's primary aim is to establish a management framework that will expedite synergies. Having done that, the company seeks to reduce its exposure to branded drugs in a way that it can cover the impact of margin pressures on the business, especially in Japan. In a global pharmaceutical industry making a shift towards generics and emerging market opportunities, Daiichi Sankyo's acquisition of Ranbaxy signals a move on the lines of its global counterparts Novartis and local competitors Astelias Pharma, Eesei and Takeda Pharmaceutical. Post acquisition challenges include managing the different working and business cultures of the two organizations, undertaking minimal and essential integration and retaining the management independence of Ranbaxy without hampering synergies. Ranbaxy and Daiichi Sankyo will also need to consolidate their intellectual capital and acquire an edge over their foreign counterparts.

Integration Issues

- Ranbaxy and Daichii have a completely different employee culture. This will pose some cultural integration issues.
- Though Ranbaxy is an extremely welt managed and process oriented company, it will face problems in matching up with Daichii's relentless focus on quality.
- Considerable Geographical Barriers
- Though there is a strategic alignment between Ranbaxy and Daichii, there might be certain conflict of interest while taking strategic long term decisions.

Post Merger Analysis

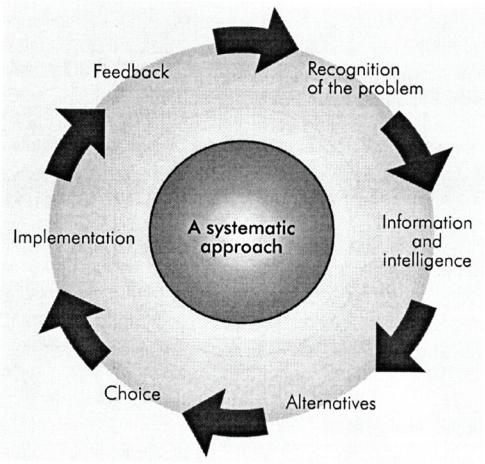
In summary, Daiichi Sankyo's move to acquire Ranbaxy will enable the company to gain the best of both worlds without investing heavily into the generic business. The patent perspective of the merger clearly indicates the intentions of both companies in filling the respective void spaces of the other and emerge as a global leader in the pharmaceutical industry, Furthermore, Daiichi Sankyo's portfolio will be broadened to include steroids and other technologies such as sieving methods, and a host of therapeutic segments such as anti-asthmatics, anti-retrovirals, and impotency and anti-malarial drugs, to name a few. Above all, Daiichi Sankyo will now have access to Ranbaxy's entire range of 153 therapeutic drugs across 17 diverse therapeutic indications.

Strategic Business Decision Making

Financial accountants keep records of business transactions such as sales invoices. They use these records to prepare a firm's accounting statements. Management accountants evaluate and interpret this financial data to advise the senior managers in the business. They play important roles in managing business performance and improving decision making.

The Decision Making Process

Effective strategic business decisions bring together the right resources for the right markets at the right time. Timing is crucial. The quality of a company's decision making helps it gain an advantage over competitors. Business decisions must reflect an organisation's **aims** (its purpose), such as to maximise returns for its shareholders. They should also relate to its **objectives** (its goals), such as to be the market leader in its field. To achieve its aims and objectives, a business puts in place **strategies**. This approach applies regardless of the size of the business.



Levels of decision making

Decisions are made at different levels in an organisation's hierarchy:

- **Strategic decisions** are long-term in their impact. They affect and shape the direction of the whole business. They are generally made by senior managers. The managers of the bakery need to take a strategic decision about whether to remain in the café business. Long-term forecasts of business turnover set against likely market conditions will help to determine if it should close the café business.
- **Tactical decisions** help to implement the strategy. They are usually made by middle management. For the café, a tactical decision would be whether to open earlier in the morning or on Saturday

to attract new customers. Managers would want research data on likely customer numbers to help them decide if opening hours should be extended.

- **Operational decisions** relate to the day-to-day running of the business. They are mainly routine and may be taken by middle or junior managers. For example, a simple operational decision for the café would be whether to order more coffee for next week. Stock and sales data will show when it needs to order more supplies.

Every company (large and small) has a duty to keep accounting records and must prepare annual accounts that report on the performance and activities of the company during the year. Financial accountants must ensure these accounts are accurate and prepared in accordance with accounting rules and conventions.

Management accountants need to understand these formal accounting documents. However, because their role involves the analysis and application of data, they must also be familiar with business strategy and risk management. Management accountants use internal data (like a balance sheet) and external data (such as market information) to assess effects on the business and drive better informed decision making.

12.3 OBJECTIVE-BASED COSTING

Activity Based Costing is old wine in a new bottle. It is no more than good old Strategic Cost Management redefined. It is, essentially, a technical approach which helps convert most common costs into identifiable costs even while bypassing the arbitrary overhead allocation rates used in conventional cost accounting. But there ends the scope of ABC. Identifying costs according to activities and then driving them to the product through an appropriate cost-driver serves a limited purpose of activity-wise overhead cost accounting.

However, certain committed common costs (like risk-coverage costs) cannot be identified by activities even in ABC. Such costs are best treated by identifying their strategic purpose. Many compulsory costs, incurred at various stages of the life-cycle of a product, should, thus, be treated entrepreneurially. They cannot be treated with the theoretical sanctity of ABC. Of course, every division-head would like to know the correct cost of the products in his division.

This correctness of cost would, partially, be established by ABC. But Total's response to the market should depend on what may be called Objective-Based Costing (OBC). At the core of OBC are long-term sustainable corporate objectives and targets. Fixed costs can be altered by re-shaping the company's value-chain. The aim should be to achieve differing rates of return at different stages of the life-cycle of the organisation. You may have Time Return On Investment (ROI), Intellectual ROI, Physical ROI, Product, or Activity-wise ROI-depending on your key business constraints or strengths. These should decide cost-subsidisation between two products, processes, programmes, or places.

The four business divisions of Total Industries will have to define their value-chains, identify their investments, and then establish an equilibrium between profitability and investment. This equilibrium should define the trade-offs between operating and financial costs, and micro- and macro-costs. In a globalised scenario, such a matrix will have to be supported by two more dimensions: brand-building and employee quality.

A 360 degree look at cost performance is essential. A logical extension is that employees would be encouraged to look at costs entrepreneurially. This requires that each product division be treated as an investment centre, and each individual product become a profit-centre. Cost-reduction should also be based on continuous value-analysis.

12.4 VALUE ANALYSIS, VALUE CHAIN ANALYSIS AND VALUE ENGINEERING

Value Analysis

The Value Analysis (VA) technique was developed after the Second World War in America at General Electric during the late 1940s. Since this time the basic VA approach has evolved and been supplemented with new techniques that have become available and have been integrated with the formal VA process. Today, VA is enjoying a renewed popularity as competitive pressures are forcing companies to re-examine their product ranges in an attempt to offer higher levels of customization without incurring high cost penalties. In parallel, many major corporations are using the VA process with their suppliers to extend the benefits of the approach throughout the supply chain. Businesses, big and small, will therefore benefit from understanding and applying the VA process. It is likely that those companies that do not take the time to develop this capability will face an uncertain future as the lessons and problems of the past are redesigned into the products of the future.

Definition of Value Analysis

Value Analysis (VA) or Value Engineering (VE) is a function-oriented, structured, multi-disciplinary team approach to solving problems or identifying improvements. The goal of any VA Study is to:

-Improve value by sustaining or improving performance attributes

(of the project, product, and/or service being studied)

-while at the same time reducing overall cost

(including lifecycle operations and maintenance expenses).

Value Analysis can be defined as a process of systematic review that is applied to existing product designs in order to compare the function of the product required by a customer to meet their requirements at the lowest cost consistent with the specified performance and reliability needed.

This is a rather complicated definition and it is worth reducing the definition to key points and elements:

(i) Value Analysis (and Value Engineering) is a **systematic, formal and organized process of analysis and evaluation**. It is not haphazard or informal and it is a management activity that requires planning, control and co-ordination.

(ii) The analysis concerns the **function of a product** to meet the demands or application needed by a customer. To meet this functional requirement the review process must include an understanding of the purpose to which the product is used.

(iii) Understanding the **use of a product** implies that specifications can be established to assess the level of fit between the product and the value derived by the customer or consumer.

(iv) To succeed, the **formal management process must meet these functional specification** and performance criteria consistently in order to give value to the customer.

(v) In order to yield a benefit to the company, the formal review process must result in a **process of design improvements** that serve to lower the production costs of that product whilst maintaining this level of value through function.

Defining Cost and Value

Any attempt to improve the value of a product must consider two elements, the first concerns the use of the product (known as **Use value**) and the second source of value comes from ownership (**Esteem value**). This can be shown as the difference between a luxury car and a basic small car that each has the same engine. From a use point of view both cars conduct the same function – they both offer safe economical travel (**Use value**) – but the luxury car has a greater **esteem value**. The difference between a gold-plated ball pen and a disposable pen is another example. However, use value and the price

paid for a product are rarely the same, the difference is actually the esteem value, so even though the disposable pen is priced at X the use value may be far less.

It is important for all managers to understand the nature of costs in the factory and for any given product. Whilst there is no direct relationship between 'Cost' (for the factory) and customer 'Value' in use and esteem, this education process is important. A shocking figure, that is often used as a general measure, is that typically 80% of the manufacturing costs of a product will be determined once the design drawing has been released for manufacturing.

The costs of production are therefore 'frozen' and determined at this point. These costs include the materials used, the technology employed, the time required to manufacture the product and such like. Therefore, the design process creates many constraints for the business and fixes a high degree of the total product cost. It is therefore a process that demands periodic review in order to recover any 'avoidable' costs that can be removed throughout the life of the product (by correcting weaknesses or exploiting new processes, materials or methods) and lowering the costs of production whilst maintaining its Use value to the customer.

Basically, there are three key costs of a product:

- **Cost of the parts purchased**: These are costs associated with the supply of parts and materials.
- **Cost of direct labour** used to convert products.
- **Cost of factory overheads** that recover the expenses of production.

Although there are three elements of total cost accumulation it is traditionally the case that cost reduction activities have focused on the labour element of a product. Activities such as work-study, incentive payments and automation have compressed labour costs and as a result there is little to be gained, for most companies, in attempting to reduce this further. Instead, comparatively greater gains and opportunities lie in the redesign and review of the products themselves to remove unnecessary materials and overhead costs. This approach to the 'total costs' of a product involves taking a much broader look at the way costs in the factory accumulate and the relationship between costs and value generation. These new sources of costs and evaluations would therefore include such sources as:

- **Cost of manufacture**
- **Cost of assembly**
- **Cost of poor quality**
- **Cost of warranty**

A detailed understanding of how costs are rapidly accumulated throughout the process of design to the despatch of the product is key to exploiting the process of VA. All VA activities are aimed at the reduction of avoidable and unnecessary costs, without compromising customer value, and therefore the VA process should target the largest sources of potential cost reduction rather being and indiscriminate or unsystematic process (such as focusing on labour alone). It is therefore preferable to take the holistic approach to understanding costs and losses in the 'entire system' of design and conversion of value in order to determine how to achieve customer service 'functionality' at a minimal cost per unit.

The Focus of Value Analysis

The key focus of the VA approach is therefore the management of 'functionality' to yield value for the customer. Let us emphasize this point a little. Not that long ago, consumers of electric kettles were offered a variety of different types of metal-based boiling device. The value of a kettle is derived through heating water and therefore its functionality can be determined (temperature, capacity, reliability, safety etc.). Now faced with the same functionality (to boil water), designers would probably look towards a kettle made of plastic.

Plastic has the same functionality as metal in terms of containing and boiling water. The action to boil water is conducted by the same part - known as the element. However the switch from metal to plastic does not impair this value and functionality with the customer – they still want to boil water - but it does result in a cost saving for the manufacturing company. If a company that traditionally made metal kettles did not review its design process then it would be severely disadvantaged when attempting to compete against the lower cost plastic alternative. This is a simple example used only to provide an illustration of the VA concept but it does demonstrate the point of maintaining value whilst reducing costs.

If a company seeks to reduce the costs of producing a product then it must seek out costs that are unnecessary or items of the product that provide no functional value to the customer. If you adopt this approach then the VA process is concerned with removing a specific type of cost. This cost is one that can be removed without negatively affecting the function, quality, reliability, maintainability or benefit required by the customer. As such, the target for all VA activities is to find these costs as opposed to simply re-engineering a product design with no real purpose to the re-engineering exercise. The VA approach is therefore formal and systematic because it is directed towards highlighting and dealing with these 'recoverable costs' of production. The objective is to create value for money as opposed to creating new products that do not provide customer satisfaction but are relatively inexpensive.

The rules governing the application of the VA approach are therefore simple:

- **No cost can be removed if it compromises the quality of the product or its reliability**, as this would lower customer value, create complaints and inevitably lead to the withdrawal of the product or lost sales.
- **Saleability is another issue that cannot be compromised**, as this is an aspect of the product that makes it attractive to the market and gives it appeal value.
- **Any activity that reduces the maintainability of the product increases the cost of ownership** to the customer and can lower the value attached to the product.

Types of Value Analysis Exercises

VA for Existing Products

One of the best approaches to VA is simply to select an existing product that is sold in relatively large volumes. This product, or product family, will tend to have a great deal of the basic information, and documented history, which can be used quickly as opposed to a newly introduced product where such a history is not available. An existing product unites all the different managers in a business, each with an opinion and list of complaints concerning the ability to convert the design into a 'saleable' product. Therefore any team that is created for the purpose of VA will understand their own problems but not necessarily the cause of these problems across the entire business. These opinions regarding poor performance (and documented evidence of failures) are vital to the discussions and understanding of how the product attracts costs as it is converted from a drawing to a finished product. These discussions therefore allow learning to take place and allow all managers to understand the limitations to the scope of product redesign and re-engineering activities. These issues include:

- The inability to change existing product designs due to the need to redesign tooling and the expense of such an initiative.
- The project team may have a finite duration before the project is concluded and therefore time will dictate what can be achieved.
- The high levels of purchased costs may imply a need to engage with suppliers in the VA process. This initiative will be constrained by a number of issues such as the timing of the project, the availability of resources from the supplier, the location of the suppliers, and other constraints.

VA for New Products – Value Engineering

For new products, the team will need to modify the VA approach and will operate in an environment that is less certain and has poor levels of available information upon which to make decisions. In this case, the analysis and systematic process of review for new products is known as Value Engineering (VE). The VE approach is similar to that of Value Analysis but requires a much greater level of investment by the organization in terms of the skilled, experienced and proficient human resources seconded to the group.

VA for Product Families- Horizontal Deployment

The final form of VA is results when there is scope for the 'horizontal deployment' of the results of a VA exercise with a single product or family of products. Under conditions where the value analysis project team finds commonalties with many products manufactured by the company, then it is possible to extend the benefits to all these other products concurrently. In this manner, all affected products can be changed quickly to bring major commercial benefits and to introduce the improvement on a 'factory-wide basis'. This is particularly the case when supplying companies offer improvements that affect all the products to which their materials or parts are used. The horizontal deployment activity has many advantages both in terms of financial savings and also the relatively short amount of time required to introduce the required changes to the product design.

Competitive VA

VA techniques are not simply the prerogative of the business that designed the product. Instead VA is often used as a competitive weapon and applied to the analysis of competitor products in order to calculate the costs of other company's products. This is often termed 'strip down' but is effectively the reverse value analysis. Here the VA team are applied to understanding the design and conversion costs of a competitor product. The results of the analysis is to understand how competitor products are made, what weaknesses exist, and at what costs of production together with an understanding of what innovations have been incorporated by the competitor company.

It is recommended that the best initial approach, for companies with no real experience of VA, is to select a single product that is currently in production and has a long life ahead. This approach offers the ability to gain experience, to learn as a team, and to test the tools and techniques with a product that has known characteristics and failings. In the short term it is most important to develop the skills of VA, including understanding the right questions to ask, and finally to develop a skeleton but formal process for all VA groups to follow and refine.

How to use Value Analysis

Keys to Success

There are many keys to the success of a VA programme and it is wise to consider these issues before commencing the project, as errors in the project plan are difficult to correct, without causing frustration, once the VA project has started. One of the most important initial steps in developing the VA process is to create a formal team of individuals to conduct the exercise. These individuals must be drawn from different parts of the business that affect the costs associated with design, manufacturing, supply and other relevant functions. In addition, the team must be focused on a product or product family in order to begin the exercise. Further key success factors include:

- **Gain approval of senior management** to conduct a Value Analysis exercise. Senior management support, endorsement and mandate for the VA project provides legitimacy and importance to the project within the business. This approval process also removes many of the obstacles that can prevent progress from being made by the team.
- **Enlist a senior manager as a champion** of the project to report back directly to the board of directors and also to act as the programme leader.
- Once a programme team has been developed it is important to **select an operational leader** to co-ordinate the efforts, monitor progress and to support the project champion.

This leader will remain with the VA team throughout the life of the project and will be the central linking pin between the team and the senior management champion.

- **Establish the reporting procedure** for the team and the timing of the project. This project plan needs to be formal and displayed as a means of controlling and evaluating achievements against time.
- **Present the VA concept and objectives of the team to all the middle and senior managers** in the business. Widespread communication of the VA project is important so that other employees, particularly managers (who may not be involved directly with the process) understand the need to support the project either directly by assigning staff or indirectly through the provision of data.
- Maintain a list of those business functions that should receive a **regular communication of progress** even though they may not be directly involved with the project. This process allows other individuals in the business to be informed about the progress and findings of the group. This form of promotion is important as it maintains a momentum and communicates the findings of the team as widely as possible.
- **Provide an office space and co-locate the team members** where practical and possible to do so. The ability to locate a VA improvement group in one area of the business is important and assists the communication within the group. A convenient area can also be used to dismantle the product and also the walls of the area can be used to record, on paper charts, the issues that have been discovered by the team (and the associated actions that must be undertaken).
- **Select the product** for the first study. Ideally the existing product, or family of products, will be one that is established, sells in volume and has a relatively long life expectancy.

  As such any improvement in the cost performance of the product will provide a large financial saving to the business.
- Write down the **objectives of the project** and the key project review points. Estimate the targets to be achieved by the project. These objectives provide a reference point and framework for the exercise. The objectives also focus attention on the outputs and achievements required by the company.
- **Select and inform any personnel** who will act in a part time or temporary role during the project. This process is used to schedule the availability of key specialist human resources to support the team throughout the duration of the project.
- **Train the team** in both the process of VA and also in basic team building activities. It is important that all members understand the nature of the project and its importance. The initial team building exercises are also a good way of understanding the attitude of all members to the project – especially those with reservations or a negative attitude to what can be achieved. As with most team exercises there is a requirement to allow the team to build and bond as a unit. It is often difficult for individuals, drawn from throughout the factory, to understand the language that is used throughout the business and also to understand the 'design to market' process when their own role impacts on a small section of this large and complex process.

Value Engineering

Value Engineering is an organized/systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. Society of Japanese Value Engineering defines VE as:

"A systematic approach to analyzing functional requirements of products or services for the purposes of achieving the essential functions at the lowest total cost".

Value Engineering is an effective problem solving technique. Value engineering is essentially a process

which uses function analysis, team- work and creativity to improve value. Value Engineering is not just "good engineering." It is not a suggestion program and it is not routine project or plan review. It is not typical cost reduction in that it doesn't "cheapen" the product or service, nor does it "cut corners."

Value Engineering simply answers the question "what else will accomplish the purpose of the product, service, or process we are studying?". VE technique is applicable to all type of sectors. Initially, VE technique was introduced in manufacturing industries. This technique is then expanded to all type of business or economic sector, which includes construction, service, government, agriculture, education and healthcare.

Using LIfe-Cycle Costing with Value Engineering

The concept of economic analysis, which is used in lifecycle costing, requires that comparisons be made between things similar in nature. In value engineering all alternatives can be compared using life-cycle costing because the alternatives for each project component are defined to satisfy the same basic function or set of functions. When the alternatives all satisfy the required function, then the best value alternative can be identified by comparing the first costs and life-cycle costs of each alternative.

For many projects there is a viable sustainable development alternative or enhancement. Sustainable development may include more recycled material contents, require less energy or water usage, reduce construction waste, increase natural lighting, or include other opportunities that contribute to an optimal facility. The value engineering methodology can provide for the identification of alternatives, sustainable or eco-efficient design features, and traditional design features, on an equal playing field for comparison.

Comparison of alternatives, or the process for identifying the best value alternative, is accomplished using life-cycle costing along with first-cost estimates. Life-cycle costing will in most cases be able to accurately estimate the first-cost and the full life-cycle cost differentials of each alternative.

At this point tradeoffs and decisions can be made to balance environmental performance with total cost (i.e., initial, recurring, and nonrecurring) reliability, safety, and functionality. When all alternatives are compared equally (i.e., "apples to apples"), sustainable development technology and integration can then be fully evaluated for performance in the acquisition process.

Roadblocks to Cost Effectiveness

The practice of VE doesn't imply that there may be intentional "gold plating," conscious neglect of responsibility, or unjustifiable error or oversight by the design team. VE simply recognizes that social, psychological, and economic conditions exist that may inhibit good value.

The following are some of the more common reasons for poor value:

(i) Lack of information, usually caused by a shortage of time. Too many decisions are based on feelings rather than facts.

(ii) Wrong beliefs, insensitivity to public needs or unfortunate experience with products or processes used in unrelated prior applications.

(iii) Habitual thinking, rigid application of standards, customs, and tradition without consideration of changing function, technology, and value.

(iv) Risk of personal loss, the ease and safety experienced in adherence to established procedures and policy.

(v) Reluctance to seek advice, failure to admit ignorance of certain specialized aspects of project development.

(vi) Negative attitudes, failure to recognize creativity or innovativeness.

(vii) Over specifying, costs increase as close tolerances and finer finishes are specified. Many of these are unnecessary.

(viii) Poor human relations, lack of good communication, misunderstanding, jealousy, and normal friction between people are usually a source of unnecessary cost. In complex projects, requiring the talents of many people, costs may sometimes be duplicated and redundant functions may be provided.

VE Job Plan

The Job Plan consists of the following sequential phases

A. Orientation Phase

In the orientation phase, the project is selected and those who are going to work the problem are familiarized with it.

B. Information Phase

The team is made familiar with the present state of the project. All team members participated in a functional analysis of the project as a whole, and then of its component parts, to determine the true needs of the project. Areas of high cost or low worth are identified.

C. Functional Phase

'Function' can be defined, as the use demanded of a part of a product and the esteem value that it provides. These functions therefore make the product work effectively or contribute to the 'salability' of the product. Functional analysis outlines the basic function of a product using a verb and a noun such as 'boil water' as in the case of our kettle.

D. Creative Phase

This step requires a certain amount of creative thinking by the team. A technique that is useful for this type of analysis is brainstorming. This stage is concerned with developing alternative, more cost effective ways of achieving the basic function. All rules of brainstorming are allowed, and criticism needs to be avoided as it could cease the flow of ideas. Simply list down all ideas, not regarding whether they sound apparently ridiculous.

E. Evaluation Phase

In this phase of the workshop, the VA team judges the ideas developed during the creative phase. The VA team ranks the ideas. Ideas found to be irrelevant or not worthy of additional study are disregarded; those ideas that represent the greatest potential for cost savings and improvements are selected for development. A weighted evaluation is applied in some cases to account for project impacts other than costs (both capital and life cycle). Ideally, the VA team would like to evaluate all attractive ideas but time constraints often limit the number of ideas that can be developed during the workshop. As a result, the team focuses on the higher ranked ideas. This phase is designed so that the most significant ideas are isolated and prioritized.

F. Development Phase

In the development phase, final recommendations are developed from the alternatives selected during the analysis phase. Detailed technical and economic testing is conducted and the probability of successful implementation is assessed.

G. Presentation Phase

The presentation phase is actually presenting the best alternative (or alternatives) to those who have the authority to implement the proposed solutions that are acceptable. It includes preparing a formal value engineering proposal (VEP) that contains the information needed to reach a decision and implement the proposal.

H. Implementation And Follow Up

During the implementation and follow-up phase, management must assure that approved recommendations are converted into actions. Until this is done, savings to offset the cost of the study will not be realized.

Case Study

Here we considered a medical instrument manufacturing company, Aadarsh Instruments, located in Ambala, for analysis which runs export business of medical microscope. This firm is producing different types of microscopes which they export to various countries around the globe. All of the products manufactured here are conforming to the international standards. It is an ISO certified company. One of their model SL250 have a component named Focus Adjustment Knob for Slit Lamp in microscope. This microscope has found application in the field of eye inspection.

Value Engineering is applied to the Focus Adjustment Knob. The steps used for this purpose are as follows:-

1. Product selection plan
2. Gather information of product
3. Functional analysis
4. Creativity Worksheet
5. Evaluation sheet
6. Cost analysis
7. Result

Steps followed during the analysis are given below:

1. Plan For Product Selection

Product selected is Focus Adjustment Knob for Slit Lamp in microscope which is used to adjust the focus of lens for magnification purpose. The present specifications of this part and its material used are costlier than the average industry cost. Value of this product can be increased by maintaining its functions and reducing its cost or keeping the cost constant and increasing the functionality of the product.

2. Obtain Product Information

Product specifications are:

(i) Material – Aluminum Bronze Alloy

(ii) Diameter of base plate –30 mm

(iii) Thickness of plate--3 mm

(iv) Cost of the scrap is – ₹ 293/Kg

(v) Pieces Produced annually – 8000

(vi) Process used – C.N.C. indexing milling

(vii) Cycle time—2.5 min

(viii) Anodizing—2/min

(ix) Material—65 gm

(x) Total Present cost – ₹ 29.99/piece

{Note: $(USD) 1 = ₹ (INR) 56}

3. Functional Analysis of Present Functions

Table I

Name	Basic Function Verb	Basic Function Noun	Secondary Function Verb	Secondary Function Noun
Focus Adjustment Knob	Index	Lens	Fix	Gear tooth

4. Develop Alternate Design or Methods

During brainstorming these ideas were listed:-

(i) Change design

(ii) Change material

(iii) Use plastic

(iv) Make it lighter

(v) Change the production process

(vi) Use nylon indexing unit

5. Evaluation Phase

For judging the ideas, the following designs were considered:

A. Function

B. Cost

C. Maintainability

D. Quality

E. Space

Each of these design criteria was given a weightage factor. This was carried out as follows: each of the above criteria was compared with others, and depending on their relative importance, three categories were formed, viz. major, medium, and minor. A score of 3, 2 and 1 respectively was assigned to each of the levels. The details are as given in the Table II:

Table II – Weightage Analysis

Weightage analysis	Points
Major difference	3
Medium difference	2
Minor difference	1

Table III – Paired Comparison

A	B	C	D	E	Score
	B2	A2	A1	A3	6
	B	B2	B1	B3	8
		C	D2	C2	2
			D	D3	5
				E	0

From the above paired comparison we get the following result

Table IV – Attributes

Symbol	Attributes	Score
A	Function	6
B	Cost	8
C	Maintainability	2
D	Quality	5
E	Space	0

The above ideas were discussed and the best feasible ideas were separated which were:-

(a) Change the material to steel

(b) Use Nylon unit

(c) Use existing material

Table V – Feasibility Ranking

	A	B	C	D	E	Score	Rank
Ideas	6	8	2	5	1		
a	1/6	2/16	½	1/5	3/3	32	III
b	3/18	2/16	2/4	2/10	1/1	49	I
c	1/6	2/16	2/4	1/5	2/2	33	II

6. Cost Analysis

Table VI – Cost Evaluation

Item	Material cost (₹)	Machining cost (₹)	Anodizing cost (₹)	Total cost/ pc (₹)
Focus Adjustment Knob	19.04	7.30	3.65	29.99
Nylon Index Unit	11.60	6.80	-	18.40
Part Eliminated	-	-	-	-
Difference/part	9.44	12.72	6	11.59

7. Result

The total savings after the implementation of value engineering are given below:

- Cost before analysis – ₹ 29.99/-
- Total Cost of nylon knob – ₹ 18.40/-
- Saving per product – ₹ 11.59/-
- Percentage saving per product – 38.64 %
- Annual Demand of the product – 8000
- Total Annual Saving – ₹ 92,720/-
- Value Improvement - 62.98 %

Conclusion

Value engineering methodology is a powerful tool for resolving system failures and designing improvements in performance of any process, product, service or organization. Its application results in significant improvements to quality and reliability by focusing the team's attention on the functions that are contributing most to the problems, and the most likely causes of these problems. Then, the team develops ways to improve these root causes of the problems, and ways to fix the problems that have occurred along with means to prevent their reoccurrence.

In the Case Study discussed above we have used the concept of Value Engineering to analysis the focus adjustment knob of microscope and with the critical evaluation of it we were able to increase the value of the product by substituting another material in place of the one that is currently in use.

The various advantages have been observed in terms of cost reduction, increase in overall production, reduction in manpower, and reduction in scrap. In future we can alter the design of the product and integrate this technique with various other prevailing industrial engineering tools which will bring down the cost by substantial margin and thereby increasing the value of the product.

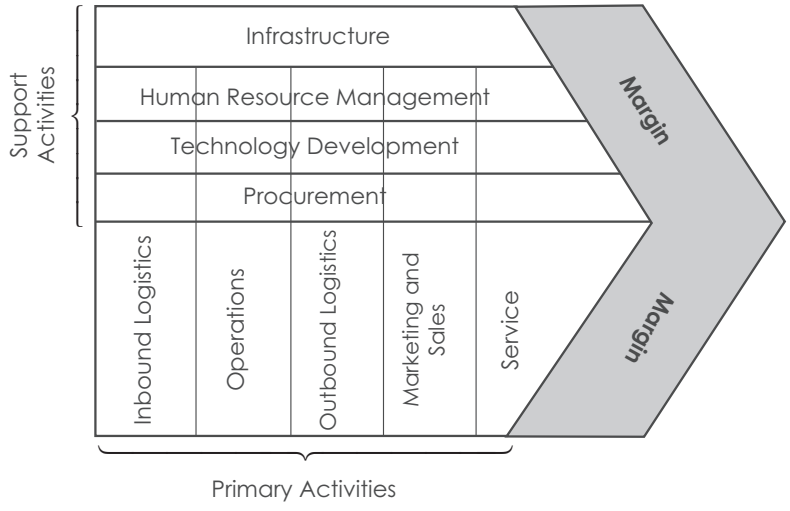
The Value Chain

The term 'Value Chain' was used by Michael Porter in his book "Competitive Advantage: Creating and Sustaining Superior Performance" (1985). The value chain analysis describes the activities the organization performs and links them to the organizations competitive position.

Value chain analysis describes the activities within and around an organization, and relates them to an analysis of the competitive strength of the organization. Therefore, it evaluates which value each particular activity adds to the organizations products or services. This idea was built upon the insight that an organization is more than a random compilation of machinery, equipment, people and money. Only if these things are arranged into systems and systematic activates it will become possible to produce something for which customers are willing to pay a price. Porter argues that the ability to perform particular activities and to manage the linkages between these activities is a source of competitive advantage.

Porter distinguishes between primary activities and support activities. Primary activities are directly concerned with the creation or delivery of a product or service. They can be grouped into five main areas: inbound logistics, operations, outbound logistics, marketing and sales, and service. Each of these primary activities is linked to support activities which help to improve their effectiveness or efficiency. There are four main areas of support activities: procurement, technology development (including R&D), human resource management, and infrastructure (systems for planning, finance, quality, information management etc.).

The basic model of Porters Value Chain is as follows:



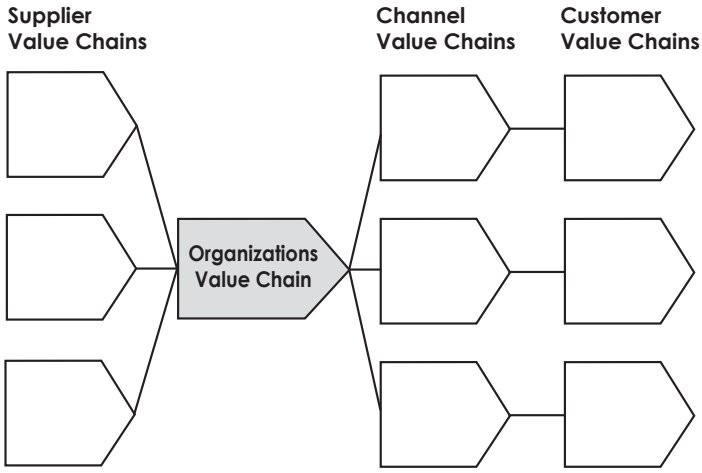
The term 'Margin' implies that organizations realize a profit margin that depends on their ability to manage the linkages between all activities in the value chain. In other words, the organization is able to deliver a product / service for which the customer is willing to pay more than the sum of the costs of all activities in the value chain.

Some thought about the linkages between activities: These linkages are crucial for corporate success. The linkages are flows of information, goods and services, as well as systems and processes for adjusting activities. Their importance is best illustrated with some simple examples:

Only if the Marketing & Sales function delivers sales forecasts for the next period to all other departments in time and in reliable accuracy, procurement will be able to order the necessary material for the correct date. And only if procurement does a good job and forwards order information to inbound logistics, only then operations will be able to schedule production in a way that guarantees the delivery of products in a timely and effective manner – as pre-determined by marketing.

In the result, the linkages are about seamless cooperation and information flow between the value chain activities.

In most industries, it is rather unusual that a single company performs all activities from product design, production of components, and final assembly to delivery to the final user by itself. Most often, organizations are elements of a value system or supply chain. Hence, value chain analysis should cover the whole value system in which the organization operates.



Within the whole value system, there is only a certain value of profit margin available. This is the difference of the final price the customer pays and the sum of all costs incurred with the production and delivery of the product/service (e.g. raw material, energy etc.). It depends on the structure of the value system, how this margin spreads across the suppliers, producers, distributors, customers, and other elements of the value system. Each member of the system will use its market position and negotiating power to get a higher proportion of this margin. Nevertheless, members of a value system can cooperate to improve their efficiency and to reduce their costs in order to achieve a higher total margin to the benefit of all of them (e.g. by reducing stocks in a Just-In-Time system).

A typical value chain analysis can be performed in the following steps:

- Analysis of own value chain – which costs are related to every single activity
- Analysis of customers value chains – how does our product fit into their value chain
- Identification of potential cost advantages in comparison with competitors
- Identification of potential value added for the customer – how can our product add value to the customers value chain (e.g. lower costs or higher performance) – where does the customer see such potential

Achieving Excellence in the Things That Really Matter

Value Chain Analysis is a useful tool for working out how you can create the greatest possible value for your customers. In business, we're paid to take raw inputs, and to "add value" to them by turning them into something of worth to other people. This is easy to see in manufacturing, where the manufacturer "adds value" by taking a raw material of little use to the end-user (for example, wood pulp) and converting it into something that people are prepared to pay money for (e.g. paper). But this idea is just as important in service industries, where people use inputs of time, knowledge, equipment and systems to create services of real value to the person being served – the customer. And remember that your customers aren't necessarily outside your organization: they can be your bosses, your co-workers, or the people who depend on you for what you do.

Now, this is really important: In most cases, the more value you create, the more people will be prepared to pay a good price for your product or service, and the more they will they keep on buying from you. On a personal level, if you add a lot of value to your team, you will excel in what you do. You should then expect to be rewarded in line with your contribution. So how do you find out where you, your team or your company can create value?

This is where the "Value Chain Analysis" tool is useful. Value Chain Analysis helps you identify the ways in which you create value for your customers, and then helps you think through what you can maximize this value: whether through superb products, great services, or jobs well done.

How to Use the Tool:

Value Chain Analysis is a three-step process:

1. Activity Analysis: First, you identify the activities you undertake to deliver your product or service;
2. Value Analysis: Second, for each activity, you think through what you would do to add the greatest value for your customer; and
3. Evaluation and Planning: Thirdly, you evaluate whether it is worth making changes, and then plan for action.

We follow these through one-by-one:

Step 1 – Activity Analysis

The first step to take is to brainstorm the activities that you, your team or your company undertakes that in some way contribute towards your customer's experience. At an organizational level, this will include the step-by-step business processes that you use to serve the customer. These will include marketing of your products or services; sales and order-taking; operational processes; delivery; support; and so on (this may also involve many other steps or processes specific to your industry).

At a personal or team level, it will involve the step-by-step flow of work that you carry out. But this will also involve other things as well. For example:

- How you recruit people with the skills to give the best service.
- How you motivate yourself or your team to perform well.
- How you keep up-to-date with the most efficient and effective techniques.
- How you select and develop the technologies that give you the edge.
- How you get feedback from your customer on how you're doing, and how you can improve further.

Step 2 – Value Analysis

Now, for each activity you've identified, list the "Value Factors" – the things that your customers' value in the way that each activity is conducted. For example, if you're thinking about a telephone order-

taking process, your customer will value a quick answer to his or her call; a polite manner; efficient taking of order details; fast and knowledgeable answering of questions; and an efficient and quick resolution to any problems that arise.

If you're thinking about delivery of a professional service, your customer will most likely value an accurate and correct solution; a solution based on completely up-to-date information; a solution that is clearly expressed and easily actionable; and so on.

Next to each activity you've identified, write down these Value Factors. And next to these, write down what needs to be done or changed to provide great value for each Value Factor.

Step 3 – Evaluate Changes and Plan for Action

By the time you've completed your Value Analysis, you'll probably be fired up for action: you'll have generated plenty of ideas for increasing the value you deliver to customers. And if you could deliver all of these, your service could be fabulous!

Now be a bit careful at this stage: you could easily fritter your energy away on a hundred different jobs, and never really complete any of them. So first, pick out the quick, easy, cheap wins – go for some of these, as this will improve your team's spirits no end. Then screen the more difficult changes. Some may be impractical. Others will deliver only marginal improvements, but at great cost. Drop these. And then prioritize the remaining tasks and plan to tackle them in an achievable, step-by-step way that delivers steady improvement at the same time that it keeps your team's enthusiasm going.

Tip: If you have a strong enough relationship with one or more of your customers, it may be worth presenting your conclusions to them and getting their feedback – this is a good way of either confirming that you're right or of getting a better understanding of what they really want.

Example:

Lakshmi is a software development manager for a software house. She and her team handle short software enhancements for many clients. As part of a team development day, she and her team use Value Chain Analysis to think about how they can deliver excellent service to their clients.

During the Activity Analysis part of the session, they identify the following activities that create value for clients:

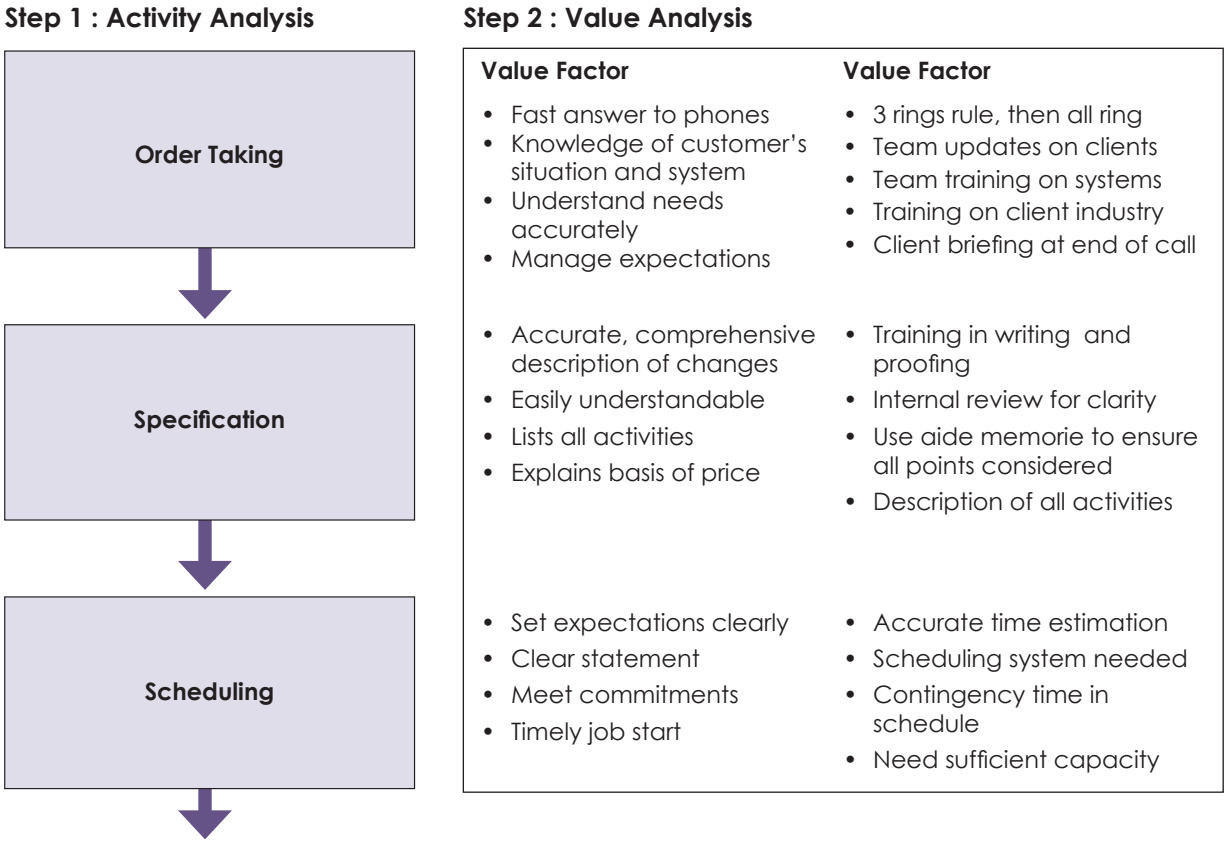
- Order taking
- Enhancement specification
- Scheduling
- Software development
- Programmer testing
- Secondary testing
- Delivery
- Support

Lakshmi also identifies the following non-client-facing activities as being important:

- Recruitment: Choosing people who will work well with the team.
- Training: Helping new team members become effective as quickly as possible, and helping team members learn about new software, techniques and technologies as they are developed.

Lakshmi marks these out in a vertical value chain on her whiteboard (you can see the first three client-facing activities shown in the "Step 1: Activity Analysis" box in below):

Figure 1. Value Change Analysis Example



Next, she and her team focus on the Order Taking process, and identify the factors that will give the greatest value to customers as part of this process. They identify the following Value Factors:

- Giving a quick answer to incoming phone calls.
- Having a good knowledge of the customer's business, situation and system, so that they do not waste the customer's time with unnecessary explanation.
- Asking all the right questions, and getting a full and accurate understanding of the customer's needs.
- Explaining the development process to the customer and managing his or her expectations as to the likely timetable for delivery.

12.5 VALUE MANAGEMENT

Value is performance characteristics, features, and attributes, and any other aspects of goods and services for which customers are willing to give up resources. Organizations must provide value to attract and keep customers. Value provided through the transformation of raw materials into some product or service that end-users need where, when, and how they want it.

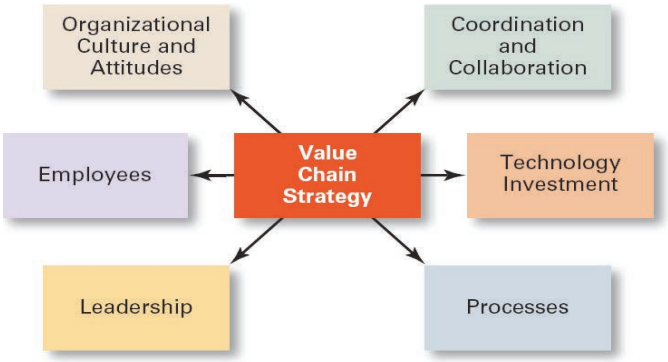
Value chain is the entire series of work activities that add value at each step of the transformation process.

Value Chain Management is the process of managing the entire sequence of integrated activities and information about product flows along the entire value chain.

Goal of Value Chain Management

To create a value chain strategy that fully integrates all members into a seamless chain that meets and exceeds customers' needs and creates the highest value for the customer.

Requirements for Value Chain Management



Business model – Strategic design for how a company intends to profit from its broad array of strategies, processes, and activities.

Coordination and Collaboration – Comprehensive and seamless integration among all members of the chain –

- Each partner must identify things that customers value
- Requires sharing of information and being flexible

Technology Investment – Information technology can be used to restructure the value chain to serve end-users.

- Enterprise resource planning software – Links all of an organization's activities with trading network partners.

Organizational processes – The way that organizational work is done.

- Must examine core competencies to determine where value is being added
- Non-value-adding activities should be eliminated
- Processes must change in the following ways :
  - Better demand forecasting is necessary
  - Selected functions may need to be done collaboratively
  - New metrics required for evaluating performance along the chain

Leadership – Outlines expectations for organizations' pursuit of value chain management.

Employees/ Human Resources –

- Flexibility in the design of jobs
  - Jobs should be designed around work processes that link functions involved in creating value

- Hiring of workers who have the ability to learn and adapt
- Significant investments in continual and ongoing employee training

Organizational Culture and Attitudes – Important for employees to have favourable attitudes regarding sharing collaborating, openness, flexibility, mutual respect and trust. These attitudes must characterize internal and external partners.

VCM Architecture

VCM is a layer, between core company with its systems and knowledge and its end users viz., suppliers, dealers, transporters, service providers etc. which acts as a complete repository of application and data of the company and their partners. The architecture of the front end solution should be such that it should be in a position to give the required information almost instantaneously.

VCM structure and design should be such that data follows one after another in the required sequence. The MIS structure will bring the core company and its value chain partners to interact through internet platform.

Methodology :

The VCM methodology consists of the following steps :

- Identify the industry's value chain and then assign costs, revenue and assets to value activities
- Diagnose the cost drivers regulating each value activity
- Develop sustainable competitive advantage, either through controlling cost drivers better than competitors or by reconfiguring the value chain.

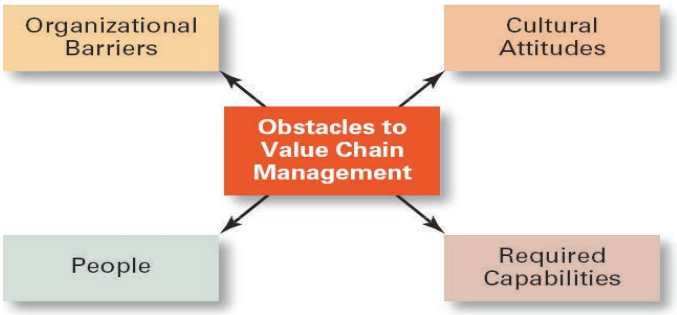
Benefits of Value Chain Management

- Improved customer service – the major benefit
- Cost savings
- Accelerated delivery times
- Improved quality

Obstacles to Value Chain Management

- Organizational barriers
  - Refusal or reluctance to share information
  - Reluctance to shake up the status quo
  - Security issues
- Cultural attitudes
  - Lack of trust and too much trust
  - Fear of loss of decision-making power
- Required capabilities
  - Lacking or failing to develop the requisite value chain management skills
- People
  - Lacking commitment to do whatever it takes
  - Refusing to be flexible in meeting the demands of a changing situation

- Not being motivated to perform at a high level
- Lack of trained managers to lead value chain initiatives



12.6 PROFITABILITY ANALYSIS, PROCESS VALUE ANALYSIS ACTIVITY ANALYSIS, LINKAGE ANALYSIS, APPLICATION OF LINKAGE ANALYSIS IN COST REDUCTION AND VALUE ADDITION

Profitability Analysis

Profit is an excess of revenues over associated expenses for an activity over a period of time. Terms with similar meanings include 'earnings', 'income', and 'margin'. Lord Keynes remarked that 'Profit is the engine that drives the business enterprise'. Every business should earn sufficient profits to survive and grow over a long period of time. It is the index to the economic progress, improved national income and rising standard of living. No doubt, profit is the legitimate object, but it should not be over emphasised. Management should try to maximise its profit keeping in mind the welfare of the society. Thus, profit is not just the reward to owners but it is also related with the interest of other segments of the society. Profit is the yardstick for judging not just the economic, but the managerial efficiency and social objectives also.

Concept of Profitability

Profitability means ability to make profit from all the business activities of an organization, company, firm, or an enterprise. It shows how efficiently the management can make profit by using all the resources available in the market. According to Harward & Upton, "profitability is the 'the ability of a given investment to earn a return from its use."

However, the term 'Profitability' is not synonymous to the term 'Efficiency'. Profitability is an index of efficiency; and is regarded as a measure of efficiency and management guide to greater efficiency. Though, profitability is an important yardstick for measuring the efficiency, the extent of profitability cannot be taken as a final proof of efficiency. Sometimes satisfactory profits can mark inefficiency and conversely, a proper degree of efficiency can be accompanied by an absence of profit. The net profit figure simply reveals a satisfactory balance between the values receive and value given. The change in operational efficiency is merely one of the factors on which profitability of an enterprise largely depends. Moreover, there are many other factors besides efficiency, which affect the profitability.

Profit & Profitability

Sometimes, the terms 'Profit' and 'Profitability' are used interchangeably. But in real sense, there is a difference between the two. Profit is an absolute term, whereas, the profitability is a relative concept. However, they are closely related and mutually interdependent, having distinct roles in business. Profit refers to the total income earned by the enterprise during the specified period of time, while profitability refers to the operating efficiency of the enterprise. It is the ability of the enterprise to make profit on sales. It is the ability of enterprise to get sufficient return on the capital and employees used in the business operation.

As Weston and Brigham rightly notes "to the financial management profit is the test of efficiency and a measure of control, to the owners a measure of the worth of their investment, to the creditors the margin of safety, to the government a measure of taxable capacity and a basis of legislative action and to the country profit is an index of economic progress, national income generated and the rise in the standard of living", while profitability is an outcome of profit. In other words, no profit drives towards profitability.

Firms having same amount of profit may vary in terms of profitability. That is why R. S. Kulshrestha has rightly stated, "Profit in two separate business concern may be identical, yet, many a times, it usually happens that their profitability varies when measured in terms of size of investment".

Analysis of Profitability

Apart from the short term and long term creditors, owners and management or a company itself also interests in the soundness of a firm which can be measured by profitability ratios. Profitability ratios are of two types those showing profitability in relation to sales (revenue in case of GSRTC) and those showing profitability in relation to investment. Together, these ratios indicate firm's overall effectiveness of operation. The management of the firm is naturally eager to measure its operating efficiency. Similarly, the owners invest their funds in the expectation of reasonable returns. The operating efficiency of a firm and its ability to ensure adequate returns to its shareholders depends ultimately on the profits earned by it. The analysis throws the light on the following questions:

(i) Is the profit earned by the firm adequate?

(ii) What rate of return does it represent?

(iii) What is the rate of profit for various segments of the firm?

(iv) What is the rate of return to equity holders?

To answer above questions, two fold analysis is undertaken as shown under:

A. Profitability Analysis from the View Point of Management

In order to pin-point the causes which are responsible for low / high profitability, a financial manger should continuously evaluate the efficiency of a firm in terms of profit. The study of increase or decrease in retained earnings, various reserve and surplus will enable the financial manger to see whether the profitability has improved or not. An increase in the balance of these items is an indication of improvement in profitability, where as a decrease indicates a decline in profitability.

Gross Profit Ratio

Gross profit ratio is important for management because it highlights the efficiency of operation and also indicates the average spread between the operating cost and revenue. The main objective of computing this ratio is to determine the efficiency with which operations are carried on.

The Gross Profit Ratio expresses the relationship between gross profit and net sales. It is figured as shown below:

$$\textbf{Gross Profit Ratio} = \frac{\text{Gross Profit}}{\text{Net Revenue}} \times 100$$

Gross Profit = Total Revenue – Operating Expenses

A high ratio of gross profit to revenue is a sign of good management as it implies that (i) the operating cost is relatively low; (ii) increase revenue income, operating cost remains constant; (iii) operating cost decline, revenue income remains the same.

On the contrary, a low gross profit to revenue is definitely a danger signal. It implies that (i) the profit is relatively low; (ii) the operating cost is relatively high (due to purchase of inputs on unfavourable

terms, inefficient utilisation of current as well as fixed assets and so on); (iii) low revenue income (due to sever competition, inferior quality of services, lack of demand and so on). There is no standard showing reasonableness of gross profit ratio. However, it must be enough to cover its operating expenses.

Net Operating Profit Ratio

The Net Operating Profit Ratio expresses the relationship between net operating profit and net sales. As GSRTC is a service sector, net sales is replaced by net revenue. Moreover, in the present study, Net Operating profit is taken as the excess of gross profit over non operating expenses and depreciation. In other words we can say profit before interest and taxes (EBIT). This ratio helps to find out the profit arising out of the main business.

In other words this ratio helps to determine the efficiency with which affairs of business are being managed. A high ratio indicates the improvement in the operational efficiency of the business and vice versa. It is figured as shown below:

$$\textbf{Net Operating Profit Ratio} = \frac{\text{Net Operating Profit}}{\text{Net Revenue}} \times 100$$

Net Operating Profit = Gross Profit - (Non Operating Expenses + Depreciation)

Return on Net Capital Employed Ratio

This is the most important ratio for testing profitability of a business. It measures satisfactorily the overall performance of a business in terms of profitability. This Ratio expresses the relationship between profit earned and capital employed to earn it. The term 'capital employed' refers to long-term funds supplied by the creditors and owners of the firm. The term 'return' signifies operating profit before interest and taxes (EBIT).

This ratio is more appropriate for evaluating the efficiency of internal management. It indicates how well the management has utilised the funds supplied by the owners and creditors. In other words, this ratio intends to measure the earning power of the net assets of the business. It is figured as shown below:

$$\textbf{Return on Capital Employed} = \frac{\text{EBIT}}{\text{Net Capital Employeed}} \times 100$$

Net Capital Employed = Share Capital + Reserves + Long Term Loan - Losses

A high ratio is a test of better performance and a low ratio is an indication of poor performance. Higher the ratio, more efficient the management is considered to have been using the funds available.

B. Profitability from the View Point of Shareholders

Being the real owners of the business, the shareholders should continuously evaluate the efficiency of a firm in terms of profit because they have permanent stake in business. So, they are directly affected by the prosperity of higher profit and adversity of losses suffered by the business.

An increase in the net profit after tax is an indication of improvement in profitability and in turn improved financial welfare of the owners and larger the share of dividend to them and vice versa. Following ratios are calculated to analyse the profitability from the shareholders point of view:

- Net Profit Ratio
- Return on Owner' Equity Ratio

Net Profit Ratio

The net profit ratio indicates the ability of management to operate the business with sufficient success not only to recover from revenues of the period, all the expenses including depreciation and interest, but also to leave a margin of reasonable compensation to the owners for providing their capital at risk. In other words, this ratio is the overall measure of the firm's ability to turn each rupee of revenue into profit.

The Net Profit Ratio expresses the relationship between net profit and net sales.

It is the reserve of the operating Expenses ratio. It is figured as shown below:

$$\textbf{Net Profit Ratio} = \frac{\text{Net Profit}}{\text{Net Revenue}} \times 100$$

Net Profit (EBT) = Net Operating Profit – Interest Charges

A high ratio of net profit to revenue is a sign of good management as it ensures adequate return to the owners as well as enables a firm to withstand adverse economic conditions.

On the contrary, a low net profit to revenue is definitely a danger signal. It has the opposite implications. If this ratio is not adequate, the firm will fail to achieve satisfactory return on shareholder's funds.

In order to have a better idea of profitability, the gross profit ratio and net profit ratio may be simultaneously considered. If the Gross profit is increasing over last five years, but the net profit is declining, it indicates that administrative expenses are slowly rising.

Return on Owner's Equity (Proprietary Ratio)

The ordinary shareholders, who bear all risks, participate in management and are entitled to all the profits remaining after outside claims, are the real owners of the business. Therefore, the profitability of a firm, from the owner's point of view should be assessed in terms of the return to the ordinary shareholders.

Return on Owner's Equity Ratio is a single most important ratio for judging the profitability of an organization in terms of return to the owners. This ratio reflects that how much the firm has earned on the funds invested by the shareholders (Either directly or through retained earnings). This ratio is expressed in the percentage form of net profit earned to the owner's equity. It is figured as shown below:

$$\textbf{Return on Owner's Equity} = \frac{\text{Net Profit}}{\text{Owner's Equity}} \times 100$$

Process Value Analysis (PVA)

Process value analysis looks at what the customer wants and then asks if each aspect of operations is necessary to achieve that result. The goal of process value analysis is to eliminate unnecessary expenses incurred in the process of creating a product or service without sacrificing customer satisfaction. In conducting PVA, managers must look at whether any activities could be eliminated or streamlined to decrease operational costs while still delivering what customers want without sacrificing quality. Managers will consider whether any new technologies could be profitably implemented, whether errors are being made that could be avoided, whether there are extra steps in the process that are unnecessary and so on. Any steps in the value chain process that are identified as not adding economic value may be changed or thrown out.

Business processes are the heart of your organization. They are the collections of activities that create value for your customers. According to strategy authority Michael Porter, these activities are the ultimate source of competitive advantage.

"There are just two types of competitive advantage...Cost advantage arises because a firm can cumulatively perform the discrete activities in a business more efficiently. Differentiation depend instead on a firm's ability to perform particular activities in unique ways that create buyer value."

Process Value Analysis enables you to pursue both paths.

Increasing Customer Value

The business process (or value chain) is the engine that produces value in the form of products or services a customer will pay for. Effective process improvement must begin with a thorough understanding of who the customer is and how he or she defines value, lest we create a more efficient system for "garbage in, garbage out".

- Define and manage customer expectations
- Understand how value accumulates in your value chain
- Determine which process improvement investments will maximize the value produced

Increasing Process Efficiency

On average 20% of all manufacturing process costs and 30% of all service process costs are attributable to non-value-added activities. Process Value Analysis will help you find, quantify and eliminate those wasteful activities.

- Reduce costs without sacrificing customer satisfaction
- Establish an activity costing system to manage process costs
- Increase capacity by improving utilization of existing resources

Activity Analysis

Activity analysis provides the core data that are essential to activity accounting. Activity analysis represents a methodology to analyze an organization's outputs and identify those processes that generate the output. The purpose of activity analysis is to identify the significant activities of an organization so that a specific basis for describing business processes and determining their cost and performance can be established.

Activity analysis provides a great deal of information about an organization, including:

- what work is done
- how much work is done (e.g., workload)
- how the work is done
- cost of doing the work
- quality of the work
- time to perform the work
- output of the work
- patient and/or supplier relationships
- service relationships

In other words, activity analysis quantifies significant activities within the organization.

An activity analysis is an assessment of a company or workplace which is designed to gather information about the activities engaged in there and ways in which they can potentially be made more efficient or valuable. The term "activity analysis" is also used in occupational therapy to describe an evaluation of a patient who is getting ready to start therapy, in which case the purpose is to identify activities performed by an individual for the purpose of directing therapy more effectively. In this type of analysis,

the occupational therapist looks at activities the patient engages in or wants to resume after an injury, breaks them into their component parts, and determines the best way to help the patient on the basis of activity-based needs.

In the business world, an activity analysis starts with identifying activities which take place in a given company, office, or environment. For example, if a company sells widgets, a number of activities related to widget sales are going to be identified, including marketing widgets, taking orders, packaging orders for shipment, working with suppliers of raw materials, and managing human resources to ensure that personnel are available to perform all of these tasks. The analysis may also include a specific detailed breakdown of each identified activity.

With activities laid out, the activity analysis moves on to who engages in which activities, how the activities are performed, and why they are performed in a particular way. The analysis looks specifically at how resources are utilized to complete activities successfully, looking at people, time, money, and supplies involved in each activity. The activities are also evaluated in terms of the value they add to the business.

An analysis of activities can usually reveal weak points and areas in which improvement is needed. These can include activities which are not being completed as well as activities which are being performed in an inefficient manner. The preparation of the analysis includes a discussion of areas in which improvement is possible and how to approach that improvement. For example, the activity analysis might point out that widgets could be better packaged by robotic equipment than human workers.

Businesses use the results of an activity analysis to improve their operations with the goal of streamlining and making sure that they accomplish specific goals. Such analysis can also be useful when businesses are preparing to restructure, sell, or make major changes in their operations. For employees, there are advantages to cooperating with the analysis, including opportunities to offer input about areas for potential improvement.

Activity analysis, lying at the heart of any ABC/ABM effort, is the second major part of an ABM implementation. It comprises several key steps, including cataloguing of specific activities and business processes, definition of outputs and output measures, value-added analysis, identification of cost drivers, and detailed specification of activity performance. As this list suggests, activity analysis normally consumes the major part (50 to 55 percent) of the time and resources allocated to implementation.

Costing Activities, Products, and Services

Activity analysis provides basic information for constructing the ABC cost system. Developing the ABC estimates is the most mechanical part of any ABM implementation. Focused on identifying and documenting cost tracing methodologies and core assumptions, the costing phase ties the financial reporting system to the newly developed activity and process structures of the ABM system.

The development or choice of a specific software system to export, import, and accept the data used to generate the activity-based estimates and to apply these estimates to create product and service costs makes up the bulk of the work completed during this stage. Since the software systems selected or developed as part of this step are often used for the ongoing reporting of activity information and performance, it is important that they be relatively simple to update and maintain.

Defining Activities and Processes

In the cost model conceptual design step, activities and activity drivers must be identified. Regardless of an organization's size or number of employees, an almost unlimited set of activities

might be selected. Driven by defined goals and required information, the choice and number of activities will vary based on the use of the information. For instance, detailed definitions of activities are often not necessary to improve product cost accuracy or decision making. More detailed activity cost data is necessary for operation managers who want to use this information to manage their workload. How detailed should the ultimate activity list and definition be? The trade-off faced in each situation

is the benefit of the added detail versus the added cost to collect and maintain more data. A good rule of thumb is to define an activity as the work that would typically make up 5 percent or more of someone's effort and to define tasks as those elements of work needed to do an activity. A process is then defined as a collection of related activities. The objectives served by activity and process analysis include the following:

- identifying activities and business processes;
- defining inputs and output measures;
- defining activity attributes; and
- identifying activity cost drivers.

Several core tools and techniques are typically used in this effort including:

- universal classification scheme;
- activity dictionary;
- activity effort analysis worksheet;
- activity attribute analysis;
- process mapping; and
- process overview form.

Linkage Analysis

Linkage analysis measures the impact of customer satisfaction on the bottom line. By linking satisfaction survey information with customer behavior, it is possible to validate the benefits of measuring and managing satisfaction. Linkage analysis also guides the allocation of resources.

The cornerstone of a successful business (or non-profit) is customer loyalty. Loyalty can be defined by many factors, all measurable in a survey, including: satisfaction, perceived value, future purchase/ renewal intent, and advocacy (e.g., net promoter score).

As management invests in surveying customers and acting on the information, questions arise as to the economic benefits to the organization. Questions management may ask include:

- Does satisfying customer needs really matter?
- What is the return on investment (ROI) of making improvements that increase customer satisfaction?
- In what areas should investments be made?
- What is the impact of reducing service or value?

Linkage analysis answers these questions by correlating customer satisfaction survey data with customer behavior. It involves a form of "quasi-experiment" that tracks customer behavior into the future after satisfaction is measured. This kind of analysis involves a series of steps:

1. When customers are surveyed regarding their satisfaction, information is retained so their behavior can be tracked in the future (note that this is done anonymously to ensure adherence to confidentiality guidelines).
2. After a certain period of time has elapsed, usually 6 to 12 months, customer information is obtained from the CRM system and merged with the satisfaction data – information can include: did the customer renew or cancel a relationship/membership? Did the customer make additional purchases or stop purchasing? How much did the customer purchase? How did purchases compare with past purchases?
3. A statistical model is created that predicts and explains behavior with the customer satisfaction information. The modeling phase may explore the behavioral impact of individual quality dimensions as well as overall satisfaction/loyalty.

4. A financial model is created to identify the ROI of improvements in quality. This model includes parameters input by our client, such as: profit margins, number of customers, planned investments, and planning horizons. A more sophisticated model will include information on a "discount rate" that takes into account the opportunity costs of investment in measuring the ROI.

A linkage analysis is used to answer key questions that management has about their efforts to improve customer satisfaction. The most profound finding is whether a statistically significant linkage actually exists. Showing that there is a positive relationship is critical in building support for efforts to improve quality. Another finding is the actual dollar gain in profit from improving quality. By comparing this with investments made to improve quality, management can gauge whether it is worthwhile to invest in the customer experience or to use the investments elsewhere.

A linkage analysis also helps identify the kinds of investments to make. A common output for a linkage analysis is a planning spreadsheet that allows managers to input hypothetical assumptions about investment costs and improvements in specific areas to determine the ROI. If the investments are high and the returns minimal, the model will show that it is better to invest in a different area of customer satisfaction or in a different part of the organization altogether.

Linkage analysis may also be used to assess the impact of reductions in satisfaction. To illustrate, one client was in the habit of offering continuous promotions to drive business, but decided to abandon the practice. The Return-on-Quality simulator made it possible to compare the reduction in sales with the increase in profit margin, showing the decision was a wise one. Another example is weighing cost savings from reduced variety of options or less comprehensive service with the impact on sales.

Linkage analysis is a valuable task that brings reality into the satisfaction measurement process. It provides reassurance to the organization that its emphasis on the customer contributes positively to the bottom line. And, it provides the basis for making smarter decisions about investments in quality improvement.

12.7 BUSINESS PROCESS OUTSOURCING (BPO)

BPO stands for **Business Process Outsourcing.** Outsourcing is a system whereby an organisation can sub-contract certain areas of work or processes to a specialist third party organisation.

BPO or outsourcing is often referred to as 'off-shoring' because these companies have facilities and resources outside of the country. This is so that they can employ highly educated personnel with lower social costs. As a result the services can be delivered at a much lower price than is possible in the country.

BPO can be applied to most sizes of companies and many outsource some key services without actually realising it. An example of this is where a small company may retain the services of an accountant or book-keeper in order to keep financial records, VAT returns and payroll,may be outsourced, simply because it is more cost effective to do so than to do it 'in house'. Furthermore, it is useful to trust in the expertise of others rather than having to worry about the time and complexity of the finances. For an organisation this might include contracting out the finance, customer services and HR (Human Resources).

Most companies adopt outsourcing of various processes as one of the key strategies to accomplish a wide range of objectives including to remain :

- Cost competitive
- Flexible organisation
- Less capital intensive
- Focused attention in the core area

There are many benefits and reasons for BPO. One example would be how a small company, unable to justify a Human Resources professional, would benefit from outsourcing to a specialist contractor who could give advice and guidance as and when required. This means that the company has the expertise of a professional but not the overhead of a full-time resource.

The key vendors who provide business process outsourcing [BPO] tend to be offshore companies like Zensar, Tata Consulting, Computer Science Corporation, Infosys, Atos Origin, Fujitsu Services and Capgemini. Indian based companies are always at the forefront of keeping costs down and represent good value for money. Companies like Zensar support both large Enterprise and SME organisations alike and provide a valuable service for First Time Outsourcing companies.

Major Areas - The non-core business process areas are the core areas of BPO. Simply speaking, outsourcing of non-core business processes is popular among the corporate today. These non-core business process areas may inter alia include IT enabled services, e- logistics, management of facility and operations, legal services etc.

IT enabled services would include:

- Back office operations
- Call centres
- Content development or Animations
- Data processing
- Engineering and design services
- Geographic information system services
- Human Resource services
- Insurance claim processing
- Legal Database
- Medical transcription
- Payroll
- Remote Maintenance
- Support centres
- Website services etc.

The Future of Business Process Outsourcing

The future is set for continued positive growth within the field of business process outsourcing (BPO). This is driven generally (but there are other reasons) by cost reduction.

Forrester Research estimate that Europe, by 2015 will be a major user of BPO and the market is expected to reach nearly 25% of total global BPO spending.McKinsey suggest that the total potential market for BPO is worth $122-$154 billion so the market is set for continued to growth.

Why Business Process Outsourcing?

The main centres for business process outsourcing are India and the Far East, as well as Eastern Europe. In these regions there are pools of low cost and highly educated labour providing savings of around 20-50% on certain business operations. While there are many countries that are part of this growing market, India has by far the biggest share.

Types of Outsourcing- The main types of outsourcing that are currently practiced by organisations are as follows:

- Contracting out the activities: This can take place when an organisation is delegating to another organisation the element of the demand chain in question. Typically, contracting out is used for

fairly low level ancillary services such as cleaning and managing washroom hygiene. This is a short term, tactical solution to urgently find means of dealing with a problem.

- Outsourcing the services: It involves carefully selecting and then engaging specialised external service providers who will allow the organisation to redefine, refocus and energise in order to tap into the expertise that the service provider has accumulated. If properly managed, this enables the organisation to benefit from the service provider's contribution as a deep and strategic level. This may ultimately enable it to focus more and more on what it does best and on where it has a real edge over other companies.
- In-sourcing. This is an alternative approach of securing productivity gains by improving the operation of an area so that work from other businesses can be undertaken. In this way skills can be retained and assets exploited, resulting in low unit cost for the in-sourcing business.
- Co-sourcing. This is a relationship where the interaction between the supplier and the host organisation is even more intimate than in normal outsourcing. This usually means that the host organisation supplies staff or managers to the outsourcing deal, not as transferred staff but because of their specialist knowledge, which the host organisation cannot afford to lose permanently.
- Benefit-based relationships: This is a long term relationship based on both parties making an upfront investment in the relationship and sharing the benefits as they accrue according to some pre-agreed formula.

Benefits of Business Process Outsourcing

Organisations can gain a number of benefits by outsourcing or using a business process outsourcing company.

- Saving money. Most companies that provide BPO services are able to carry out the work for considerably less. This is generally achieved through having lower operational costs themselves because labour is less expensive, social costs are lower and they don't have to provide benefits to their workers. Typically, BPO should save companies in the region of 40-50%.
- Quality of service. It is also possible in some instances to improve the quality of service through being able to have more resources and better qualified personnel.
- Productivity improvements. It allows executives and management to focus on critical functions of the business. For example, it will allow expensive and skilled personnel to focus on sales and marketing strategy rather than operational issues such as preparing a VAT return or payroll. You normally find that executives spend 80% of their time in management of day-to-day issues and only 20% on strategy. Outsourcing certain processes can in many instances reverse this statistic. Giving management time to carry out other functions can enable an organisation to become more profitable and find other ways of generating income.
- Access to a wider array of skills. BPO enables an organisation to access different skills sets and expertise that their company would not normally have access to. Many BPO companies have skills and intellectual assets that take many, many years to generate.
- Allocation of resources. Organisations that use BPO can effectively reallocate personnel into areas that will have a positive impact upon other projects, such as expansion or opening offices in new territories.
- Operational expertise. BPO companies are able to provide the relevant expertise that most companies don't have access to or would be difficult and expensive to develop in-house.
- Flexibility. BPO can help organisations become more flexible, for example by speeding up key business processes such as purchasing, and thereby ensuring that not too much or indeed too little stock is held at any one time.

- By allowing organisations to retain flexibility and agility. BPO also ensures that companies do not become too bureaucratic. This is a feature of smaller and younger companies but as they grow, more processes and procedures are put in place which while allowing for control, can stifle a company and the people working for it.

What type of companies would benefit from Business Process Outsourcing?

Most companies can benefit from some form of outsourcing but many are not inclined to do so because they feel uncomfortable with contracting key functions to a third party.

The key to understanding business process outsourcing is to ask these questions:

- What business processes are critical to the business?
- What are the areas or processes that do not work very well in-house?
- Would using a business process outsourcing company improve or resolve any of these issues?
- How?
- What are the risks?

Pitfalls of Business Process Outsourcing

Although the benefits can be extensive, there are many risks associated with business process outsourcing.

- Risk is seen as the biggest potential issue with BPO. Risk can be reflected in security issues in relation to sensitive data and privacy, risk of losing independence and potentially losing control.
- Loss of flexibility in reacting to changes in business conditions. It is important that communications continue throughout the life cycle of any BPO agreement. This means informing the BPO provider of any change of strategy or conditions that might impact their ability to function properly.
- Potential threat to security or access to confidential information. There are many examples where confidential data has gone 'astray' or been sold. Processes and procedures must be put in place to ensure that only certain personnel can access specific information, especially with payroll systems, HR and client records.
- Staff turnover. It is expected that within call centres, for example there may be a fairly high turnover of staff, typically some 30%, but typically within BPO companies this can be up to 50%. This can be critical because losing key people can have a serious impact operationally, e.g. having to retrain people on a particular system or product within a call centre if people are leaving. Also, if absenteeism is high within a call centre environment, this will naturally badly impact customer service and call waiting times.
- Cultural differences. If a BPO company's staff is based abroad, for example in India, there can be potential problems. This can be anything from communications difficulties to not totally understanding what perhaps a British customer expects. Many BPO off-shoring companies train their staff in order to resolve this.
- Job losses. People often believe that BPO only leads to staff losing their jobs. This could be true to a certain extent, but while there might be a perceived threat to staff's finances, generally the roles that are outsourced are those which typically a company can have difficulty fulfilling anyhow.
- Potential loss of managerial control. Naturally it can be easier to manage your own personnel than relying upon a third party, but again, this can be resolved with good communication and regular update meetings.
- BPO can badly impact customer relationships as it may eliminate direct communication between a company and its' customers.
- Failure to meet service levels. This can be caused by changing needs, unclear objectives or through incompetence.

12.8 IGPG (INTERNATIONAL GOOD PRACTICES & GOVERNANCE) - PUBLIC ACCOUNTANTS

Objectives

In pursuit of its goals of serving the public interest, strengthening the accountancy profession worldwide, and contributing to the development of strong international economies, the International Federation of Accountants (IFAC) develops standards, statements, information papers, guidance, and special reports. This Preface sets out the scope, purpose, and due process of International Good Practice Guidance (IGPG) published by IFAC's Professional Accountants in Business (PAIB) Committee (the Committee). IGPG, which starts by clearly identifying **principles,** (a) is generally accepted internationally, and (b) applies to organizations of all sizes in commerce, industry, the public sector, education, and the not-for-profit sector.

Scope and Purpose

IGPG covers management accounting and financial management, as well as broader topics in which professional accountants in business, sometimes in conjunction with professionals from other disciplines, are likely to engage. IFAC's prime **purpose** in issuing guidance in these areas is to foster a common and consistent approach to those aspects of the work of professional accountants in business that are not already covered by international standards. A secondary purpose is to help professional accountants in business to explain their work to non-accountants. By setting out principles for each topic, the documents create a contextual background for the more detailed methods and techniques used by professional accountants in business.

The Importance of Principles

A significant feature of IGPG is its explicit grounding in principles. The Committee reviews available guidance in a topic area, applying the extensive expertise and experience of its members and IFAC member bodies to draw out a set of globally applicable statements of principles. These principles should (a) guide the thought processes of professional accountants in business when they tackle the relevant topic, and (b) underpin the exercise of the professional judgment that is important in their roles. They provide the professional accountant in business (and those served by them) with a common frame of reference when deciding how to address issues encountered within a range of individual organizational situations. General guidance supports the consistent implementation of the principles and, where appropriate, provides signposts to sources of greater detail.

Due Process

Although IGPG does not impose an obligation on professional accountants in business, it does represent IFAC's recommended practice in the areas it covers. Therefore, each proposed guidance document is subject to a formal **due** process, whose key component is wide consultation including public exposure. The due process for IGPG is appended and is derived from the due process used by IFAC's public interest activity committees, but also reflects the Committee's meeting and operational procedures. Following due process is intended to ensure both the quality and global applicability of the final document, attributes that lend the document its authority.

Getting the Most Out of International Good Practice Guidance

Professional accountants in business should consider the relevance of IGPG documents to their organizational roles. The extensive and vital range of roles they perform is featured in the Committee's 2005 publication The Roles and Domain of the Professional Accountant in Business [web link]. Their roles include understanding and driving the creation of value; provision of information for decision-making, accountability and control; performance measurement and communication to stakeholders; financial control; improving efficiency; and managing risk. IGPG documents help professional accountants in business to select and apply the appropriate tools for analyzing and managing organizations in performing these critical tasks. This will encourage professional accountants in business, irrespective of

geographical location or size or type of employer, to adopt broadly consistent approaches to their work. Some organizations might find it useful to distribute the content to subsidiaries, or to stakeholders in their value chain.

The Committee recommends that professional accountants in business (a) use the principles in IGPG to guide their decision-making, and (b) use the application guidance and signposting to other resources to consider how to implement guidance in practice. Good practice is always evolving. Therefore, over time newer and better techniques and approaches to the work of the accountant will inevitably emerge. Although the Committee periodically reviews its IGPG, it is the personal responsibility of the professional accountant to keep abreast of developments that may affect their work. IGPG also builds on the fundamental principles of integrity; objectivity; professional competence and due care; confidentiality; and professional behavior already required of professional accountants in business by IFAC's Code of Ethics for Professional Accountants.

Content

An IGPG document will typically include the following content:

- **General overview of why the topic is important,** including:
  - Topic introduction and objective of the guidance
  - Typical roles of the professional accountant in business in relation to the topic
- **Principles that are widely accepted features of good practice,** including:
  - Definitions of key terms
  - Key concepts and frameworks (where they exist)
- **Practical application guidance to support implementation of the principles,** including:
  - Recognition of challenges and issues and sector-specific issues
  - Practical examples of practice in the topic area
- **Signposting to other key sources of information (resources).**

Principles represent fundamental generalizations that professional accountants in business should use as the basis of their reasoning and conduct. Principles typically provide a broad frame of reference, and stress starting points and boundaries rather than prescriptive rules. Principles, therefore, encourage the appropriate exercise of sound professional judgment by professional accountants in business.

Guidance (application) supports the consistent implementation of principles, and recognizes issues and challenges in implementing good practice. Guidance also helps to clarify special issues in particular contexts, for example highlighting special considerations for public sector or small- and medium-sized entities.

Signposting will ensure access to other key sources of information, including additional guidance, books, articles, websites, surveys, interviews, case studies, or critical analysis. Some of this information will be accessible via the IFAC KnowledgeNet, accessible at www.ifacnet.com.

DUE PROCESS FOR IFAC'S INTERNATIONAL GOOD PRACTICE GUIDANCE

In order to assure itself that IGPG is authoritative and relevant, the Committee adopts the following due process and working procedures.

Project Identification, Prioritization and Approval

The Committee builds upon the work and input of various national professional accountancy bodies and others (through consultation and exposure) to select, develop and maintain IGPG. Comments and suggestions from those who have an interest in the development of international pronouncements for professional accountants in business also feed into the Committee's decision process.

In the context of the IFAC strategic plan and already published IGPG, the Committee identifies potential topics for IGPG based in part on review of national and international developments, consultation with member bodies and current guidance in the topic area under consideration.

For each proposed pronouncement, a project proposal establishes the rationale, objective(s) and scope, and identifies already available material, working procedures, responsibilities and resources required. It also considers whether specific individuals or organizations have relevant expertise in the topic. Project proposals are circulated to all other IFAC boards and committees to identify matters of possible relevance to the project.

A periodic review of IGPG will help to ensure that they remain current. The Committee will also consider comments submitted on published IGPG and include these in its discussions on prioritization.

The Committee considers and prioritizes project proposals and approves, amends, or rejects the project proposals in a meeting.

Development of International Good Practice Guidance

The Committee assigns responsibility for the development of IGPG to a task force within the guidelines established by the Committee. The composition of the task force will take into account specific areas of expertise or geographical representation that may be needed. External experts in the topic who are not committee members could be invited to participate.

When the task force is satisfied that it has a proposed exposure draft that is ready for consideration, it is presented to the Committee for approval.

Note

Note

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