INTERMEDIATE
Paper 12

Management Accounting

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SYLLABUS 2022

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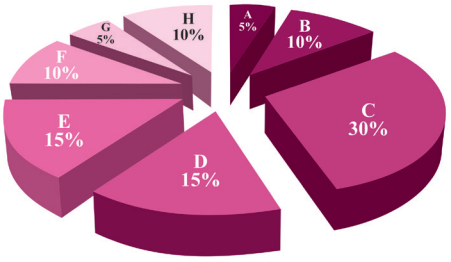
PAPER 12: MANAGEMENT ACCOUNTING

Syllabus Structure:

The syllabus comprises the following topics and study weightage:

Module No.	Module Description	Weight
Section A: Introduction to Management Accounting		**5%**
1	Introduction to Management Accounting	5%
	Section B: Activity Based Costing	**10%**
2	Activity Based Costing	10%
	Section C: Decision Making Tools	**30%**
3	Marginal Costing	30%
4	Applications of Marginal Costing in Short Term Decision Making	
5	Transfer Pricing	
Section D: Standard Costing and Variance Analysis		**15%**
6	Standard Costing and Variance Analysis	15%
Section E: Forecasting, Budgeting and Budgetary Control		**15%**
7	Forecasting, Budgeting and Budgetary Control	15%
Section F: Divisional Performance Measurement		**10%**
8	Divisional Performance Measurement	10%
Section G: Responsibility Accounting		**5%**
9	Responsibility Accounting	5%
Section H: Decision Theory		**10%**
10	Decision Theory	10%



Learning Environment

Subject Title	**MANAGEMENT ACCOUNTING**
Subject Code	**MA**
Paper No.	**12**
Course Description	The subject Management Accounting offers an all-round coverage of important tools for management and control of costs and for decision management. It develops an in-depth understanding of the application of activity-based costing for rational allocation of overhead costs to cost objects. It elucidates important tools for managerial decision making in the sphere of cost optimisation, pricing, use of resources, product mix and profit planning. It also builds up detail understanding of transfer pricing to achieve goal congruence. The subject additionally offers sufficient knowledge on available tools for divisional performance evaluation and responsibility accounting and also offers in-depth coverage of the use of various cost control techniques such as standard costing and budgetary control in an organisation.
CMA Course Learning Objectives (CMLOs)	1. Interpret and appreciate emerging national and global concerns affecting organizations and be in a state of readiness for business management. a. Identify emerging national and global forces responsible for enhanced/varied business challenges. b. Assess how far these forces pose threats to the status-quo and creating new opportunities. c. Find out ways and means to convert challenges into opportunities 2. Acquire skill sets for critical thinking, analyses and evaluations, comprehension, syntheses, and applications for optimization of sustainable goals. a. Be equipped with the appropriate tools for analyses of business risks and hurdles. b. Learn to apply tools and systems for evaluation of decision alternatives with a 360-degree approach. c. Develop solutions through critical thinking to optimize sustainable goals. 3. Develop an understanding of strategic, financial, cost and risk-enabled performance management in a dynamic business environment. a. Study the impacts of dynamic business environment on existing business strategies. b. Learn to adopt, adapt and innovate financial, cost and operating strategies to cope up with the dynamic business environment. c. Come up with strategies and tactics that create sustainable competitive advantages. 4. Learn to design the optimal approach for management of legal, institutional, regulatory and ESG frameworks, stakeholders' dynamics; monitoring, control, and reporting with application-oriented knowledge. a. Develop an understanding of the legal, institutional and regulatory and ESG frameworks within which a firm operates. b. Learn to articulate optimal responses to the changes in the above frameworks. c. Appreciate stakeholders' dynamics and expectations, and develop appropriate reporting mechanisms to address their concerns. 5. Prepare to adopt an integrated cross functional approach for decision management and execution with cost leadership, optimized value creations and deliveries. a. Acquire knowledge of cross functional tools for decision management. b. Take an industry specific approach towards cost optimization, and control to achieve sustainable cost leadership. c. Attain exclusive knowledge of data science and engineering to analyze and create value.

Subject Learning Objectives [SLOB(s)]	1. To appreciate the fundamental concepts of management accounting and its role in a dynamic business environment. (CMLO 1a, b) 2. To develop detail understanding of costing frameworks, tools, and techniques to facilitate managerial decision making for cost control and optimisation, and determination of prices with optimised product mix. (CMLO 2b, 3a, b) 3. To attain detailed knowledge of measures to improve divisional performance and appreciate various methods of transfer pricing to ensure goal congruence and profit optimisation at entity level. (CMLO 3c, 4c) 4. To gather in-depth knowledge of techniques and tools for profit planning, variance analyses, optimal utilization of resources and responsibility accounting. (CMLO 3b, 5a, 5b). 5. To appreciate quantitative tools for decision making in dynamic environment shrouded with risks and uncertainties. (CMLO 2a, 2b)

Subject Learning Outcome (SLOC) and Application Skill (APS)	SLOC(s) 1. Students will be able to assist management in crafting policies, and deciding specific applications of costing frameworks, tools and techniques for rationalisation of activities, determination, optimisation and allocation of costs to products, 2. They will be equipped with requisite knowledge and skills to guide leadership team in decision management and profit planning by providing required and relevant inputs and performing necessary analyses of competitive courses of actions with cost-benefit analyses. 3. They will attain skills to apply appropriate tools and techniques to pinpoint the areas of inefficiencies, adverse variances with causative analyses and guide management to take corrective actions befitting the dynamic business environment shrouded with risks and uncertainties. 4. They will be able to advise management for adopting measures to evaluate divisional performance and identify responsibility lapses for taking appropriate corrective actions. APS 1. Students will apply attained skills for ABC and other costing and controlling tools to determine and allocate overhead costs based on cost pools and identified cost drivers that would help taking appropriate pricing decisions and monitoring performance. 2. They will prepare customised reports through critical analysis of costs and associated issues for evaluation of alternative courses of actions and present the same for decisions by management to handle product specific pricing decisions and external environment driven issues impacting performance 3. They will prepare analytical reports on product costs, divisional and/or product-wise profit, actual performance vs. plans/standards, responsibility accounting for functional managers, etc. to enable leadership team to frame sustainable strategic plans befitting the risky and dynamic business environment.

Module wise Mapping of SLOB(s)			
Module No.	**Topics and Sub-topics**	**Additional Resources (Research articles, case studies, blogs)**	**SLOB Mapped**
Section A: Introduction to Management Accounting			
1	Introduction to Management Accounting	Management Accounting in Support of the Strategic Management Process - CIMA https://www.cimaglobal.com/Documents/Thought_leadership_docs/Management%20and%20financial%20accounting/Academic-Research-Report-Strategic-Management-Process.pdf	To appreciate the fundamental concepts of management accounting and its role in a dynamic business environment.
Section B: Activity Based Costing			
2	Activity Based Costing.	Activity based costing in China: a case study of Xu Ji Electric Co. Ltd. – CIMA https://www.cimaglobal.com/Documents/Thought_leadership_docs/6Activity-based-costing-China.pdf	To develop detail understanding of costing frameworks, tools, and techniques to facilitate managerial decision making for cost control and optimisation, and determination of prices with optimised product mix.
Section C: Decision Making Tools			
3	Marginal Costing	The Strange Career of Marginal Cost Pricing – Fisher https://www.tandfonline.com/doi/abs/10.1080/00213624.1991.11505129?journalCode=mjei20	To develop detail understanding of costing frameworks, tools, and techniques to facilitate managerial decision making for cost control and optimisation, and determination of prices with optimised product mix.
4	Applications of Marginal Costing in Short Term Decision Making		
5	Transfer Pricing	Current Trends and Corporate Cases in Transfer Pricing – Tang https://scholarworks.wmich.edu/books/468/	To attain detailed knowledge of measures to improve divisional performance and appreciate various methods of transfer pricing to ensure goal congruence and profit optimisation at entity level.
Section D: Standard Costing and Variance Analysis			
6	Standard Costing and Variance Analysis	Standard costing Insights from leading companies – CIMA https://www.cimaglobal.com/Documents/Thought_leadership_docs/StandardCosting2010Insightsfromcompanies.pdf	To gather in-depth knowledge of techniques and tools for profit planning, variance analyses, optimal utilization of resources and responsibility accounting.

Section E: Forecasting, Budgeting and Budgetary Control			
7	Forecasting, Budgeting and Budgetary Control	Economic Incentives in Budgetary Control Systems – Demski & Feltham https://www.jstor.org/stable/245898	To gather in-depth knowledge of techniques and tools for profit planning, variance analyses, optimal utilization of resources and responsibility accounting.
Section F: Divisional Performance Measurement			
8	Divisional Performance Measurement	Foundations of Economic Value Added – J. L. Grant https://books.google.co.in/books?hl=en&lr=&id=zQJazXm0HfIC&oi=fnd&pg=PP13&dq=Economic+value+added&ots=_0yBBmNgMZ&sig=-gFGxwKs39QG6FvIFJieJ_--PJ4&redir_esc=y#v=onepage&q=Economic%20value%20added&f=false	To attain detailed knowledge of measures to improve divisional performance and appreciate various methods of transfer pricing to ensure goal congruence and profit optimisation at entity level.
Section G: Responsibility Accounting			
9	Responsibility Accounting	Management and Cost Accounting – C Drury Cengage Publications	To gather in-depth knowledge of techniques and tools for profit planning, variance analyses, optimal utilization of resources and responsibility accounting.
Section H: Decision Theory			
10	Decision Theory	Revisiting Decision Trees - Coles, Rowley https://www.emerald.com/insight/content/doi/10.1108/00251749510093932/full/html	To appreciate quantitative tools for decision making in dynamic environment shrouded with risks and uncertainties.

Contents as per Syllabus

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SECTION - A

INTRODUCTION TO MANAGEMENT ACCOUNTING

Introduction to Management Accounting

1

This Module includes:

1.1. Conceptual Understanding

1.2. Relationship between Management Accounting and Cost Accounting

1.3. Role of a Management Accountant in Modern Business World

Introduction to Management Accounting

SLOB Mapped against the Module

To appreciate the fundamental concepts of management accounting and its role in a dynamic business environment. (CMLO 1a, b)

Module Learning Objectives:

After studying this modume, the students will be able to

- Appreciate the fundamental difference between cost accounting and management accounting.
- Conceptualize the stages of evolution of management accounting.
- Understand the crucial role of the management accountant in the modern day business world.

Conceptual Understanding

1.1

1.1.1 Introduction

Accounting is, primarily, the process of keeping records of financial transactions. It encompasses systematic recording, reporting, and analysis of the financial activity of an organisation. Interested parties can analyse the financial performance of companies using accounting information which is the end product of the process of accounting. Accounting information is used by the stakeholders of the company, namely the employees, shareholders, creditors, banks and other lenders, regulatory agencies and tax authorities, etc. for decision making purpose. It is also the language through which the organizations can communicate with the external world.

In 2014, Warren Buffet[1] gave valuable advice to a 17-year-old intern at an investment firm[2]. Buffet referred to accounting as the language of business, since much like a foreign language it must be learned before understanding. This captures the essence of the function of accounting. Language is the basis of communication between two people. So is accounting. It is the language in which the business communicates with the stakeholders, who are also referred as the users[3]. It is important to note that the users are either internal (managers, shareholders, employees, creditors) or external (potential investors and government).

The user considers the financial information communicated by the business through the language of accounting for purpose of decision making. Various users have various information needs. In the following lines some of the major users along with their financial information needs are given:

- **Owners/investors -** The primary[4] objective of accounting is to provide necessary information to the owners/ investors relating to their business. The shareholders of a company are interested in the accounting information with a view to ascertaining the profitability and financial strength of the company.
- **Management –** Generally, there is a separation of the ownership and management functions. The managements require a different set of financial information which helps them in their internal decision making.
- **Creditors -** Trade creditors, debenture holders, bankers, and other lending institutions are interested in knowing the short-term as well as long-term position of the company. The financial statements provide the required information for ascertaining such position.
- **Regulatory Agencies -** Various governments and other agencies use accounting reports not only as a basis for tax assessment but also in evaluating how well the business are operating under regulatory framework.

1. Warren Edward Buffett is an American business magnate, investor, and philanthropist. He is currently the chairman and CEO of Berkshire Hathaway. He is one of the most successful investors in the world and has a net worth of over $98 billion as of July 2022, making him the world's eighth-wealthiest person (https://en.wikipedia.org/wiki/Warren_Buffett)
2. ttps://www.ageras.com/blog/accounting-the-language-of-business#:~:text=In%202014%2C%20Warren%20Buffet%20gave%20valuable%20advice%20to,in%20this%20comparison%20than%20originally%20meets%20the%20eye.
3. The categorisation and other details of the users is taken up in Module 1 of Paper 8.
4. This depends on the nature of accounting which is discussed in the subsequent paragraph.

- **Government -** Governments use financial statements for compiling statistics concerning business units, which, assist compilation of national accounts.
- **Potential Investors –** potential investors use the information in accounting reports to a greater extent in order to determine the relative merits of various investment opportunities.
- **Employees -** Employees are interested in the earnings of the enterprise because their remuneration depend on the quantum of profits earned.
- **Researchers –** Research scholars in their research in accounting theory as well as business affairs and practices also use accounting data.

The above list is not exhaustive and there are various other stakeholders whose financial information need is varied. Thus, the list of actual and potential users of accounting information is exhaustive.

From the above, it is obvious that the accounting information need of the management is different from the others. The term management encompass the entire range of activities involved in running an organisation. There are basically three levels of the management; top level, middle level and lower level. Though the financial information need of the three levels varies but their essence is similar: decision making. The top level management is entrusted with the critical task of making effective and efficient decisions which is reflected in company performance measured in terms of profit and market share.

There are, as such, three branches of accounting:

- Financial Accounting
- Cost accounting
- Management Accounting.

The above categorisation is on the basis of the presentation, legal requirements and the financial information each of them generate. Though the aspect is taken up in details in the next section of this module, in a nutshell it may be noted that the management accounting is concerned with the provision of accounting information to people within the organisation (internal users) to help them make better decisions and improve the efficiency and effectiveness of existing operations, whereas financial accounting is concerned with the provision of accounting information to external users. Thus, management accounting is often related to internal reporting[5] while financial accounting is related to external reporting. Though the scope of cost accounting is narrow, it is important as it discusses the nuances of the process of cost accumulation for fixation of sale price and valuation of inventory which are the most important aspects of management decision making.

1.1.2 What is Management Accounting?

Management Accounting comprise of two terms 'management' and 'accounting'. While management is all about running an organisation in consonance with the strategic goal, accounting may be seen to encompass any of the activities that attempt to gauge the performance of an organisation. It includes the traditional 'accounting' roles of stewardship, control and audit. In a nutshell, management accounting is accounting (i.e. producing useful information) for management (people with the task of running the business). In this sense, management accounting includes the production of all information useful in running the organisation. Information, as such, may be[6]:

- financial or non-financial;

5. Though absorption costing, a technique of the cost accumulation process, and as such an aspect of cost accounting is used for external reporting purpose, as and when required.

6. The classification of 'information' is adopted from Management Accounting Principles and Applications by Hugh Coombs, David Hobbs and Ellis Jenkins, SAGE Publications Ltd.

- accurate, or broadly correct;
- actual (certain) or estimated (uncertain);
- based in the past or the future;
- detailed, or in a highly aggregated form;
- presented in any of a variety of spoken or written forms, such as numbers, tables, and graphs;
- related to profits/losses, costs/incomes, volumes, quality indicators, trends, etc.

On the other, 'management' may include the activities of individuals in a number of positions, for example:

- senior managers;
- mid-level managers;
- lower-level managers;
- executive directors with management responsibilities;

Chartered Institute of Management Accounting (CIMA) have taken a more wide-ranging view of the scope of management accounting and have tended to take a broader 'management consultancy' view of the work of their members. CIMA provides a comprehensive definition of the term. CIMA official terminology[7] states that management accounting is the application of the principles of accounting and financial management to create, protect, preserve and increase value for the stakeholders of for-profit and not-for-profit enterprises in the public and private sectors. The document further states that management accounting is an integral part of management. The discipline requires the identification, generation, presentation, interpretation and use of relevant information to:

1) Inform strategic decisions and formulate business strategy
2) Plan long, medium and short-run operations
3) Determine capital structure
4) Design reward strategies for executives and shareholders
5) Inform operational decisions
6) Control operations and ensure the efficient use of resources
7) Measure and report financial and non-financial performance to management and other stakeholders
8) Safeguard tangible and intangible assets
9) Implement corporate governance procedures, risk management and internal controls.

The above nine points, thus, encompasses the scope and significance of management accounting.

Colin Drury[8] states that management accounting combines accounting, finance and management with the leading edge techniques needed to drive successful businesses. Professionals, in this discipline are functionaries who:

- Advise managers about the financial implications of projects.
- Explain the financial consequences of business decisions.
- Formulate business strategy.

7. CIMA Official Terminology, 2005, The Chartered Institute of Management Accountants (CIMA Publishing, an imprint of Elsevier).

8. Management and Cost Accounting, Eighth Edition, by Colin Drury.

- Monitor spending and financial control.
- Conduct internal business audits.
- Explain the impact of the competitive landscape and
- Bring a high level of professionalism and integrity to business

From the above definition provided by CIMA it is obvious that Management Accounting refers to presentation of accounting information to management by the Management Accountant, in such a way as to assist them in their managerial functions of decision-making, planning and control. Thus, Management Accounting deals with creation and presentation of accounting information for managerial or other decision making purposes. The purpose of management accounting is to assist management in running the business in ways that will improve the performance of the business. Various authors have provided insights about what management accounting comprises of. The following four conceptualisation are noteworthy:

1) Garrison and Noreen (2000)[9] state that managerial accounting[10] is 'concerned with providing information to managers – that is, people inside an organisation who direct and control its operations'. The authors further states that it 'provides the essential data with which organisations are actually run' and that it is 'concerned with providing information to managers for use in planning and controlling operations and in decision making'.

2) Wilson and Way (1993)[11] state that 'managerial accounting encompasses techniques and processes that are intended to provide financial and non-financial information to people with an organisation to make better decisions and thereby achieve organisational control and enhance organisational effectiveness'.

3) Johnson and Kaplan (1987)[9] explain that management accounting theory arises from the needs of manufacturing companies. They also explain that the development of management accounting happened mainly because of the need to measure and value the work-in-progress and inventory for financial statements and tax purposes which therefore raised a few issues to the service sector due to the absence of inventory.

4) Horngren, Datter and Rajan[12] (2015) argues that management accounting is the process of measuring, analyzing, and reporting financial and nonfinancial information that helps managers make decisions to fulfill the goals of an organization. Managers use management accounting information to:

   (i) Develop, communicate, and implement strategies and

   (ii) Coordinate product design, production, and marketing decisions and evaluate a company's performance

The above mentioned definitions put forward by the authors sums up the discussion of what management accounting is.

There have been some significant changes during the last few decades, like enhanced global competition, deregulation, growth in the service industries, decline in product life cycles, advances in manufacturing and information technologies, changing dimension of the environmental issues and companies becoming more customer driven to sustain in the competitive environment these issues have changed the fundamental nature of the business environment. These changes have significantly altered the ways in which firms operate, which in turn, have resulted in changes in management accounting practices. In order to survive in today's competitive environment, companies have had to become more customer driven and have started recognizing that customers are crucial to the success of the companies. This has resulted in companies making customer satisfaction an overriding priority and to focus on identifying and achieving the

9. Garrison, Noreen and Brewer: Managerial Accounting, 11th Edition, The McGraw−Hill Companies, 2006

10. This term is synonymously used for management accounting, but some authors offer a distinction between the two terms. For the purpose of this study note the two terms are used interchangeably.

11. https://www.studocu.com/in/document/university-of-hull/management-accounting/management-accounting-essay/1530206.

12. Horngren, Charles T, Srikant M. Datar and Madhav V. Rajan (2015). Cost accounting: a managerial emphasis, Fifteenth edition.

key success factors that are necessary to be successful in today's competitive environment. Management accounting, which focuses on decision making, is becoming increasingly important as efficient and effective decision making is key to realizing strategic goal which is all important in the new VUCA[13] environment.

1.1.3 Scope of Management Accounting

In the previous section it is reiterated that there is no single definition of management accounting. Therefore, the work of a management accountant cannot be listed exhaustively. It is also important to note that the scope of management accounting is evolving with the advent of time and business environment and thus some traditional areas may have become obsolete and are to be discarded while some new areas may gradually become accepted as mainstream management accounting activities. Based on coverage of contemporary management accounting textbooks, some of the broad areas considered to be part of 'management accounting' is summarised in the following lines:

- Budgeting, planning and forecasting
- Measuring organisational, divisional and departmental performance
- Comparing results and performance within and between organisations
- Assisting in the process of increasing effectiveness and efficiency
- Assessing the performance of past and future capital investments
- Advising on decisions about product mix, markets to be served and selling prices
- Advising on decisions on whether to outsource products, components, activities and services
- Advising on decisions involving the investment of scarce funds between a range of possible alternatives
- Assisting in the making of a wide range of strategic decisions

The above mentioned are some of the relatively precarious activities of the higher level management. While the fundamental activities of management accounting would include:

- calculating the profitability of products, services and operations,
- allocating costs to products,
- setting inter-divisional transfer prices.

There are also some functions of the management accountant which are focussed on delivering critical information to the top level management for initiating the process of increasing effectiveness and efficiency. Techniques such as activity-based cost management and theory of constraints are examples of such specialised activities.

A moot question arises as to whether capital investment appraisal[14] would be included in the discipline of management accounting or in the discipline of financial management. Some authors prefer to include this within the scope of management accounting while others prefer this to be included within the scope of financial management. Possible reason for this dual coverage is that capital investment appraisal deals with investment decisions that have a

[13] VUCA is the abbreviation for volatility, uncertainty, complexity and ambiguity. For details readers may refer to https://digitalleadership.com/blog/vuca-world/#VUCA_stands_for%E2%80%A6.

[14] The appraisal of proposed investments of an organisation and their implication for the value of the firm is referred as capital investment decision.

strategically important effect upon the organisation. Thus, when the strategic aspects of management accounting are considered, investment decisions are part of the work of management accountants. Whereas when the strategic financing decisions related to such investments are made, these decisions form part of financial management[15].

It is obvious from the above discussion that decisions relating to capital investment appraisal cannot be made in a one-dimensional way as financial managers, management accountants, cost accountant and financial accountants are all related to various facets of investment decision.

1.1.4 Evolution of Management Accounting

Management accounting is an offshoot of financial accounting and has specific linkages with cost accounting. With advent of time the discipline of Management accounting developed as a faculty and it has evolved as a profession. Financial literature suggest that the beginning of management accounting is linked with the requirement for accounting information to optimize economic resources during the Industrial Revolution in the United Kingdom. Creation of large corporations and increased competition put pressure on corporations to internalize transactions that were previously priced by the market. This is yet another reason for the development of the discipline of management accounting. The International Accounting Federation (IFAC, 1998) has described the evolution of managerial accounting through four phases.

a) First stage (prior to 1950s)

b) Second stage (1950s – 1965)

c) Third stage (1965 – 1985)

d) Fourth stage (1985 – till date[16])

- The **first stage** (prior to 1950) which is also referred as the 'classical era' is the period where the focus was on cost determination and financial control. At this stage, the development of managerial accounting was oriented to determining costs and financial control of business processes. IFAC describes this period of Management accounting as 'the technical activity needed to achieve organizational objectives. Managerial accounting before the 1950s was mainly focused on determining the cost of the product. Production technology was relatively simple, with products passing through a number of distinct processes. Societies produced relatively homogeneous products that consumed the same amount of resources and identifying the cost of work and material was easy and the processes were driven by the speed of manual operations.

- The **second stage** (1950-1965) is referred as the age of information for management planning and control. During this period the main focus of managerial accounting was to provide information on planning and control issues. This phase is characterized by the use of traditional accounting management techniques that support decision making and responsibility accounting. Management accounting techniques such as: Standard Costs and Profitability Analysis were introduced during this period. The second phase is described as 'management activity, but in the role of staff[17]. During this period, the management was focused on the company's production process and internal analysis and paid less attention to external business environment.

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15. For the purpose of this course, capital investment appraisal which is also referred as capital budgeting is included in Strategic Financial Management (Paper 14).

16. Since the stage wise categorisation was published by International Accounting Federation in the year 1998, the fourth stage extended till 2000 in the original document, but in the research paper titled The Development of Cost and Management Accounting: A Historical Perspective, published in European Journal of Humanities and Social Sciences. 34(1), the argument is furthered and the period is given as 2015 which is the year of publication of the paper.

17. IFAC. (1998). Management accounting concepts: International Management Accounting Practice Statement. New York.

- During the **third stage** (1965 - 1985), management accounting focussed on reduction of waste of resources in production processes by eliminating 'no-value activities[17]. During this period, Japan's economic progress and rapid technological developments contributed to the growth of global competition. The priority for the companies was to adapt to the new business environment. Companies began to seek both cost reduction and quality improvement at the same time. The use of robotics and computer-controlled processes enabled companies to improve their quality and in many cases impact on cost reduction.

- Creation of value through effective resource use is the epitome of the **Fourth Stage** (1985-2000). During this period, technological innovations were at the forefront and competition was intensified. Companies, as they were faced with major business uncertainties were made to focus on value creation through effective use of resources, which could be achieved 'with the use of technology that drives companies to create costumer value, shareholder value, and organizational innovations[17]. The managerial accounting techniques that dominated this period are: Activity-based Cost (ABC); Production just in time (JIT); Target cost; balanced scorecard; Value chain analysis and strategic management accounting.

The evolution of management accounting as discussed in the previous lines may be pictorially represented as follows:

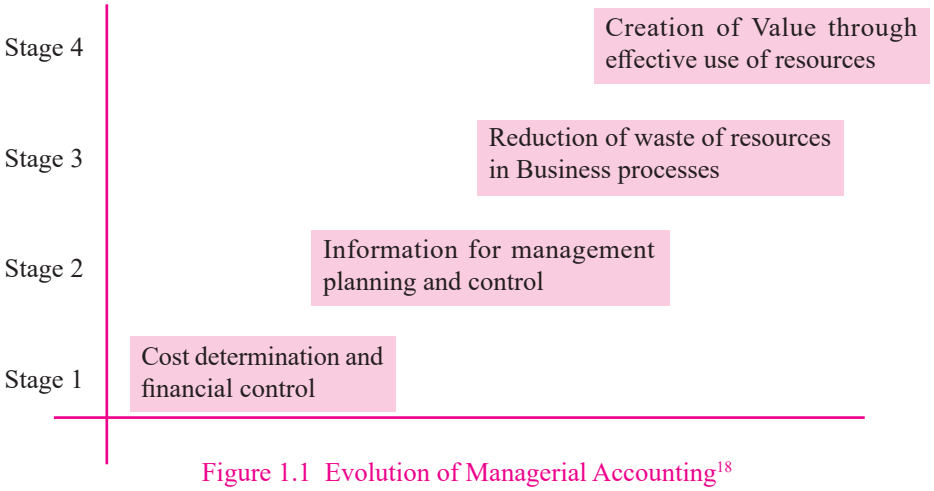


Figure 1.1 Evolution of Managerial Accounting[18]

The distinction between Stage 2, Stage 3 and Stage 4 is the shift of focus from providing information to management in the form of loss reduction to and value creation. The focus on providing information in Stage 2, however, did not disappear, but is refreshed in Stage 3 and 4. Information becomes a resource, along with other organizational resources. Management Accounting in Stage 3 and 4 is seen as, 'An integral part of the management process because timely information is directly attributed to management and the distinction between staff and management of the first line becomes invisible[17] (IFAC, 1998). The use of resources to create value today is an essential part of the management process in contemporary organisations.

One very conceptual summarization of the evolution of the various tools and techniques of management accounting is found in the study of Gliaubicas (2012)[19]. The various tools and techniques developed in various stages is being contextualised in the study. In the following lines a pictorial representation is presented which is self-explanatory.

18. Adopted from Historical Evolution of Managerial Accounting by Vlora Berisha available at https://www.researchgate.net/publication/344106466.

19. Gliaubicas, D. (2012). The Research of Management Accounting Evolution in The Context 0f Economic Changes. Economics and Management, 17(1), 22–29. Available at https://doi.org/10.5755/j01.em.17.1.2247

Focus	Cost determination and financial control	Information for planning and control	Reduction of waste of resource in Business operation	Creation of Value through effective resource use
Stages →	**1760 -1950**	**1950 -1965**	**1965 -1985**	**1985 - till date**
Methods ↓				
Cost determination and accounting	Cost determination	Standard cost accounting - developments		
	Standard costing	Marginal costing		
	Direct Costing	Target costing		
	Records of cost accounting		Activity based costing	
	allocation of indirect cost		Activity based management	
	Uniform costing			
	Absorption costing			
Planning	Budgeting	Application of discounted cash flow		
		Transfer costing		
Controlling	Return on investments (ROI)	Responsibility accounting	Application of Kaizen	
	ton -mile ratio	Gentani system	Just in time system	
		Kaizen costing		
Strategic analysis			Life Cycle costing	Value chain analysis
				Five Forces Model
				PEST, SWOT analysis
				Customer profitability analysis
				Competitors analysis
				Balanced scorecard

Table 1.1 Results of the evolution of management accounting [adopted from Gliaubicas (2012)[19]]

It is evident from the above table that till the second stage, more or less traditional management accounting techniques were prevalent but with the advent of the 3rd stage and especially in the 4th stage the focus shifted to strategic analysis and various contemporary tools and techniques were adopted into the management accounting discipline which primarily focussed on strategic analysis. In the following lines a classification of some of the traditional and contemporary accounting management techniques is presented, which is derived from the discussion.

Traditional Techniques	Contemporary Techniques
Financial statement analysis	Target Cost
Cash Flow analysis	Just in time
Marginal Costing	Total Quality Management
Absorption Costing	Theory of Constraints
Standard Costing	Value chain analysis
Opportunity Cost	Benchmarking
Budgeting	SWOT analysis
Cost-volume-profit (CVP) analysis	Balanced scorecard
Activity based costing (ABC)	Kaizen (continuous improvement)

1.1.5 The Management Accountant and Strategic Decisions[20]

Strategies are long term plans which help organisations to realise its goal. Strategy is defined as a general direction set for the company and its various components to achieve a desired state in the future. A company's strategy specifies how the organisation matches its own capabilities with the opportunities in the marketplace.

Basically businesses follow one of two broad strategies. Some companies follow a cost leadership strategy. These companies, for long term sustenance, choose to provide quality products or services at low prices and by cautiously managing their costs.

Other companies follow a product differentiation strategy. These companies offer differentiated or unique products or services that appeal to their customers. The products are often priced higher than the products or services of their competitors.

Mangers are faced with various challenges. One such is to decide between the two strategies discussed above. The crucial issue is that this have long term impact on profitability and growth of the company. Management accountants work closely with managers in various departments to formulate strategies by providing information about the sources of competitive advantage, such as:

- the company's cost, productivity, or efficiency advantage relative to competitors or
- the superior prices the company can charge relative to the costs of adding features that make its products or services distinctive.

Strategic cost management describes cost management that specifically focuses on strategic issues.

Management accounting information helps managers formulate strategy by answering the following questions:

a) Who are the most important customers, and how can the company deliver value to the customers?

b) What substitute products exist in the marketplace, and how do they differ from products of the company in terms of features, price, cost, and quality?

c) What is most critical capability of the company which may be technology, production, or marketing?

d) How can we leverage it for new strategic initiatives?

e) Will adequate cash be available to fund the strategy, or will additional funds need to be raised?

The best-designed strategies and the best-developed capabilities are useless unless they are effectively executed which depends primarily on the information generated and provided by the management accountant. This linkage between successful implementation of strategy and the accounting information generated by management accounting is the subject matter of strategic cost management.

[20] Gliaubicas, D. (2012). The Research of Management Accounting Evolution in The Context 0f Economic Changes. Economics and Management, 17(1), 22–29. Available at https://doi.org/10.5755/j01.em.17.1.2247

Relationship between Management Accounting and Cost Accounting

1.2

Financial accounting, cost accounting and management accounting are branches of the discipline of Accounting. Any discussion on management accounting and cost accounting is incomplete if the broader aspect of accounting and the important classification of it, namely financial accounting, is set aside. In the below mentioned lines a comparative analysis of the three branches of accounting is considered. The focus being on Management Accounting and Cost Accounting[21].

Financial accounting, generally, provides information on financial transactions that have occurred in the past, while management accounting provides financial and non-financial information that influences future decision making. Management accounting is not subject to externally-imposed reporting rules (e.g., provisions of Companies Act, 2013 regarding preparation and presentation of financial statements and Ind AS).

Information provided by management accounting is much more detailed and multidisciplinary than the information generated by financial accounting. Both are part of the overall accounting information system. Financial accounting and management accounting cannot exist independently though they make up two different areas of study. Both the areas of study provide useful accounting information. Financial accounting aids recording of countless transactions, and compare an entity's performance between two or more periods or performance comparison between two entities. In contrast, management accounting helps analyse and evaluate performance, which enables management to make effective judgments regarding the establishment of strategy, plans, and policies for the future.

From the above analysis, the difference between financial accounting and management accounting is obvious as the disciplines are well demarcated. Though the difference between financial accounting and management accounting has been discussed in module 1 of paper 8, it is reiterated below for easy referencing.

The key difference between financial accounting and management accounting is that financial accounting is the preparation of financial reports for the analysis by the external users interested in knowing the company's financial position. In contrast, management accounting is the preparation of financial and non-financial information, which helps managers (internal user) make policies and strategies for the company. The distinguishing features of the two are presented in a tabular format in the next few line.

Basis for Comparison	Financial Accounting	Management Accounting
Purpose	Financial Accounting classifies, analyses, records, and summarizes the financial transactions of a particular period of the company.	Management accounting helps management make effective decisions about the business.

[21] For an introductory but comprehensive discussion on the issue, students are advised to recapitulate Module 1 of Paper 8.

Basis for Comparison	Financial Accounting	Management Accounting
Application	Financial accounting is prepared to reflect true and fair picture of financial affairs.	Management accounting helps management to take meaningful steps and strategize.
Scope	The scope is pervasive, but not as much as the management accounting.	The scope is much broader.
Information type	Quantitative.	Quantitative and qualitative.
Inter dependence	It is not dependent on management accounting.	Management accounting is basically decision making accounting and depends on information created by Financial Accounting as well as Cost Accounting.
Statutory requirement	It is legally mandatory to prepare financial accounts of all companies. (for example in the Indian Context Companies Act 2013, relevant rules of Accounting standards furnishes the statutory requirements)	Management accounting has no statutory requirement.
Format	Financial accounting has specific formats for presenting and recording information.	There's no set format for presenting information in management accounting.
Users	Mainly for potential investors as well as all stakeholders.	Only for management.
Verifiable	The information presented is verifiable.	The information presented is predictive and not immediately verifiable.

1.2.1 Cost Accounting and Management Accounting – a comparative analysis

The difference between cost accounting and management accounting are not so well defined and the demarcation line is not clearly drawn. Management accounting is very closely linked to cost accounting; so closely, in fact, that it is difficult to say where cost accounting ends and where management accounting begins. They overlap with each other. A study of the literature reveals that the distinction between cost accounting and management accounting is not clear cut and the two terms are often used synonymously. But it is apparent that cost accounting deals with the process of cost accumulation for inventory valuation to meet the requirements of external reporting and to some extent, profit measurement as computation of cost and sale price fixation are integral aspects of cost accounting. Whereas management accounting relates to the provision of suitable information for decision-making, planning, control and performance evaluation[22]. Point wise comparison of the cost accounting and management accounting is presented below:

[22] For the purpose of this course, the discipline of cost accounting and the discipline of management accounting is clearly demarcated. Students are introduced to the nuances of cost accounting in Paper 8. While various issues of management accounting are the topic of this paper (Paper 12). The strategic aspects of cost and management accounting is dealt in Paper 16.

Cost Accounting and Management Accounting – A comparison:

(i) The scope of management accounting is broader than that of cost accounting.

(ii) It is not legally binding to have cost and management accounting systems installed in the organisations as the information generated by both cost accounting and management accounting are for the use of the internal users only.

(iii) Cost accounting provides only cost information for managerial use whereas management accounting provides all types of accounting information i.e., cost accounting as well as financial accounting information.

(iv) In Cost accounting, the main emphasis is on cost ascertainment and cost control whereas in management accounting the main emphasis is on decision-making.

(v) Cost Accounting is a part of Management Accounting whereas Management accounting is an extension of managerial aspects of cost accounting with the ultimate intention to protect the interests of the business.

(vi) The tools and techniques of cost accounting and management accounting differs.

A comparative analysis between the two is presented in tabular format in the below mentioned lines:

The basis for Comparison	Cost Accounting	Management Accounting
Meaning	Cost accounting revolves around cost computation, cost control, and cost reduction.	Management accounting helps management make effective decisions about operations of the business.
Application	Cost accounting prevents a business from incurring costs beyond budget.	Management accounting offers a big picture of how management should strategize.
Scope	The scope is much narrower.	The scope is much broader.
Measuring grid	Quantitative.	Quantitative and qualitative.
Sub-set	Cost accounting is one of the many sub-sets of management accounting.	Management accounting is the universal set.
Basis of decision making	The task of decision making very less. Even if there is some, it is based on historic information	Historic and predictive information is the basis of decision-making.
Statutory requirement	Statutory audit of cost accounting is a requirement in some specified industries[23]	The audit of management accounting has no statutory requirement.
Dependence	Cost accounting isn't dependent on management accounting to be successfully implemented.	Management accounting is dependent on both cost & financial accounting for successful implementation.
Used for	Management, shareholders, and vendors.	Only for management.

Thus, it may be inferred that management accounting greatly assists the management in achieving better results by making a clear shift in emphasis from mere recording of transactions to an analysis and interpretation of the transactions which provide a new dimension to the management in their decision making efforts. The tools and

[23] In the Indian context, Section 148 (1) of the Companies Act 2013, read with Rule 3 Companies (Cost Records and Audit) Rules, 2014, prescribes maintenance of cost records and statutory cost audit for certain companies engaged in the production of goods or production of services.

techniques of management accounting focuses primarily on formulation of budgets and pre-setting of standards as well as evaluation of deviations in actual performance and also implementation of prompt remedial measures. Management Accounting involves the interpretation of accounting information intended specifically to aid management in running the business. It is concerned with the presentation of accounting information and not with its preparations. Managers use this information in setting the company's overall goals, evaluating the performance of departments and individuals, deciding whether to introduce a new line of products etc. Much of the management accounting information is financial in nature and is prepared in a manner suitable to the making of the decision on the table. Financial information, as such, comprises the largest component of every management information system. The simple reason is that every economic decision involves financial consideration.

Role of a Management Accountant in Modern Business World

1.3

The business world has radically changed from what it used to be a few decades ago and accordingly the role of the management accountant has evolved substantially. The functions of management accountants are dictated by their job positions, agreement with the organisation, knowledge, and capabilities. Before sketching the role of the management accountant in the modern business world, it is pertinent to look into the traditional function of the management accountant which are given in the below mentioned lines.

1.3.1 Functions of the Management Accountant

The management accountant is responsible for the installation, development and efficient functioning of the management accounting system. They are an important part of an organisation's decision-making process. They are responsible for ensuring that managers on behalf of the businesses make well-informed decisions. Financial analysis of management information is provided by management accountants. This is accomplished through preparing, developing, and analyzing financial data which enables strategic and operational decisions to be made by the organization. The functions of a management accountant can be categorized as below:

a) **Planning and Accounting -** Management accountants prepare an accounting system covering costs, sales forecasts, profit planning, production planning, and allocation of resources. It should also include capital budgeting, short-term and long-term financial planning. They also prepare the procedures necessary to implement the plan effectively.

b) **Controlling -** Management accountants assist in the control of an organisation's performance through the use of standard costing, budget control, accounting ratios, funds flow statements, cost-cutting initiatives, and assessing capital expenditure proposals and returns on investment.

c) **Reporting -** Management accountants assist the top management in finding out the root cause of an unfavorable operation or event by identifying the real reasons for the adverse events as well as the responsible parties and comprehensively reporting them.

d) **Coordinating -** Management accountants improve an organisation's efficiency and profits by providing various coordination tools such as budgeting, financial reporting, financial analysis and interpretation, and so on. These tools aid management by comparing cost and financial records, preparing financial budgets and establishing standard costs, and analyzing cost deviations to enable management by exception.

e) **Communication -** Management accountants create a wide range of reports to communicate results to the superiors. Through published financial statements and returns, they also inform the outside world about their company's success.

f) **Financial evaluation and Interpretation -** Management accountants analyze the data and present it to the management in a non-technical approach, together with their comments and ideas, so that the shareholders and senior management can understand it and make informed decisions.

g) **Tax Administration -** Management accountants are in charge of tax policies and processes. They make the reports that are required by various authorities. Further, they ensure that quarterly tax payments are made in advance, as required by the relevant Act, to prevent the payment of penal interest on late tax payments.

h) **Evaluation of external effects -** There may be changes in government policy and existing laws. These amendments and policy changes can affect business goals. Management accountants assess the extent of any impact of these external factors on the business and report it to the stakeholder to take necessary precautionary measures.

i) **Economic appraisal -** When the government makes regular announcements about the country's economic situation, management accountants is entrusted with making the economic study and determine the influence of current economic conditions on the company's operations. They compile a report containing their observations and present it to high management.

j) **Asset Protection -** Management accountants separate fixed asset registers for each type and provide internal checks and controls to protect the company's assets. They also create the rules and regulations for each type of fixed asset and get insurance coverage for all types of fixed assets.

On the basis of the above discussion it is evident that the role of the management accountant is broad and includes identifying and managing risk, analyzing information, and using it to make plans, and budgets which are cordial to making informed business decisions. The roles of management accountants can be classified as:

a) To consult with the segments of management responsible for policies and procedures and look into the effectiveness of those policies and procedures.

b) To make comparisons to the operational plan and standards, as well as to report and evaluate operational outcomes to all levels of management and the business owners.

c) Establish, coordinate, and execute an adequate plan of operation and control as an inherent aspect of management. Such a plan would include spending budgets, profit planning, sales forecasts, and capital investment and financing program, as well as the procedures necessary to carry out the plan.

d) To ensure the financial security of the company's assets through effective internal controls and adequate insurance coverages.

1.3.2 The Management Accountant and the Modern Business World

The word 'modern' is a misnomer and cannot be defined precisely. So is the concept of 'modern business world'. It is ever changing and cannot be precisely set within a time frame. As such, the era of globalization may be considered as a not –so –precise definition of the 'modern business world'. The term 'globalization' was proposed for the first time in 1983, by Theodore Levitt[24], when he talked about the convergence of the markets around the world. The International Monetary Fund defined globalization as the 'growing economic interdependence of countries worldwide through increasing volume and variety of cross-border transactions in goods and services, free international capital flows and also more rapid and widespread diffusion of technology[25]. Thus, cross border transaction of goods and services or free trade, free international capital flows and diffusion of technology may be considered as the three pillars of globalisation. With the emergence of globalization, more and more companies started going global by undertaking business activities across their national frontiers.

Under the circumstances there has been a paradigm shift in the role of the management accountant in the era of globalisation. The focus shifted to strategic analysis. This ushered in the fourth stage of the evolution of management accounting (this is discussed in previous section of this module). It is observed that conventional management

[24] Professor Theodore Levitt was a former professor at the Harvard Business School is credited with coining the term 'globalization'. (https://www.nytimes.com/2006/07/06/business/06levitt.html)

[25] Ayuba, A. (2012) The Roles and Responsibilities of Management Accountants in the Era of Globalization.

accounting of the earlier stages did not provide the financial information required to monitor existing strategies or support strategy formulation. Strategic management accounting seeks to remedy this situation by providing the financial analysis to support the formulation of successful competitive strategies. On the basis of this there was severe criticism regarding the use of management accounting in the business. Authors have opined that most of the management accounting practices used, were actually developed by 1925, and for the next 60 years there was a slowdown, or even a halt, in management accounting innovation. Thus, the third stage is often referred as the period of lost relevance[8]. In repose to the criticisms, the CIMA Report[26] identified strategic management accounting as a potential area of development that would enhance the future contribution of management accounting. They identified the need for management accounting to adopt a more strategic perspective by reporting information relating to a firm's markets and its competitors.

Globalisation brought about significant changes in the business environment. Along with the changes the roles of the management accountant had to be redefined. In the following lines some of the impacts of the new business environment on management accounting is discussed:

1. **Global competition -** Prior to the era of globalisation, many organizations operated in a protected competitive environment. Globalisation ushered in changes where there have been reductions in tariffs and duties on imports and exports as well as dramatic improvements in transportation and communication systems. This has facilitated firms to operate globally and resulted in stiff competition from the very best organisations worldwide. Business operations also changed significantly. The new competitive environment has increased the demand for information relating to quality and customer satisfaction. Customer profitability analysis and value analysis are important issues being incorporated in the arena of management accounting.

2. **Changing product life cycles –** Changing profile of the customer along with behavioural issues have contributed to drastically reduce the product life cycle. First mover advantage is critical and every organisation is desperately seeking the advantage by increasing their investment in research and development. In this respect, the management accountant plays a crucial role as in order to compete successfully, companies must be able to manage their costs effectively at the design stage, have the capability to adapt to new environment, different and changing customer requirements and reduce the time to market of new and modified products.

3. **Advances in manufacturing technology -** In order to compete effectively, companies must be able to manufacture high quality innovative products at a low cost, and also provide a first-class customer service. Flexibility to cope with short product life cycles, demands for greater variety of product, more discriminating customers and increasing international competition has created enormous pressure on the operational activities of the business. Some internationally reputed manufacturing companies have responded to these by replacing traditional production systems with lean manufacturing systems that seek to reduce waste by implementing just-in-time (JIT) production systems, focusing on quality, simplifying processes and focussing on advanced manufacturing technologies (AMTs).

4. **The impact of information technology -** The use of information technology (IT) to support business activities has increased dramatically. Along with electronic business communication technologies known as e-business, e-commerce or internet commerce have also developed significantly. Consumers have become more discerning in their purchases as in online transactions it is relatively easy to compare the merits of different products and services. This have a significant impact on the work of management accountants. The role of the management accountant as a gatherer and processor of information is lost as the managers can directly access the management accounting system on their personal computers to derive the information they require for decision making. Management accountants have now become more involved in interpreting the information generated from the accounting system and providing business support for managers.

[26] Authored by Bromwich and Bhimani (1989)

5. **Environmental and sustainability issues –** In recent times, ESG[27] has become the focal point in the operations of the company. Along with this, ethical issues have also come to the forefront as the business has to deal with customers who are more aware of this issues then they were a decade back. Thus, there is desperate need for organisations to be run in a suitable way. Sustainable development, where it is acknowledged that environmental resources are limited and should be preserved for future generations, is the order of the day. Management accounting with specific focus on environmental issues is becoming increasingly important in organizations as environmental costs are large in many organisations. There are three specific reasons for this:

   - Environmental costs are often high in the many manufacturing organisations.
   - Regulatory requirements often impose huge fines for non-compliance.
   - Companies are increasingly realizing that being socially and environmentally responsible improves their image and this has positive impact on their bottom line.

   The above mentioned changes impacted the management of the companies and the managers have realized that they need to develop system for measuring and reporting environmental costs along with preparation of detailed report on the consumption of scarce environmental resources, hazardous materials used and pollutants emitted to the environment.

6. **Deregulation and privatization –** Prior to the era of globalization, companies in many industrial sectors were government –owned monopolies and operated in a highly regulated, protected and non-competitive environment. Thus the organisations, especially those incurring losses, were not under any pressure to improve the quality and efficiency of their operations and to improve profitability by adding or dropping particular products or services from their array of product or service. Thus trivial attention was given to developing management accounting systems that accurately measured the costs and profitability of individual products or services. Globalization ushered in the privatization and deregulation which resulted in the elimination of pricing and competitive restrictions. Thus, companies were compelled to design an elaborate management accounting system that made them to realize their cost base and determine the source of profitability for their products, customers and markets.

7. **Focus on value creation –** The scope of management accounting is enormous. Managers who are in charge of the operations of the organisations depends on the management accountants in realisation of the strategic goal of the organisations. With the advent of time, the role of the management accountant has changed from merely interpreting, managing and recording costs to creating value. Though cost reduction still remains as the basic function of the management accountant as it has specific impact on selling price fixation which impacts customer value. The new business environment resulted in management accounting distinguishing between value-added and non-value-added activities.

   There is another aspect of new business paradigm which the management accountant has to consider as they develop the company's management accounting system. Intangibles[28] have increased manifold. This presents a challenge to management accountants as to how to identify, measure and report on the value of intangibles.

8. **Customer orientation –** In the new business environment, gaining competitive advantage[29] has become the

[27] Environmental, social, and governance (ESG) criteria are a set of standards for a company's behaviour used by socially conscious investors to screen potential investments. Environmental criteria consider how a company safeguards the environment, including corporate policies addressing climate change.

[28] Resources at the disposal of an enterprise are either tangible or intangible. With the advent of time, the proportion of intangible resources has increased manifold. According to a report in the past few years due to rapid change in the technology, intangible resources have become more important and the ratio has increased from 37% to 63% whereas for tangible assets it has decreased from 67% to 34%. (https://www.ukessays.com/essays/marketing/intangible-resources-are-important-marketing-essay.php)

[29] A competitive advantage is an attribute that enables a company to outperform its competitors. This allows a company to achieve superior margins compared to its competition and generates value for the company and its shareholders. (https://corporatefinanceinstitute.com/resources/knowledge/strategy/competitive-advantage/)

singular goal of every business organisation. Companies have realized that in order to sustain in today's competitive environment they need to become more customer driven and recognize that customers are crucial to their future success. This has made the companies realize that customer satisfaction is one of the most important critical success factor (CSF) which helps companies realize their strategic goal. Customer satisfaction is relational to cost, quality, reliability, delivery and the choice of innovative new products.

Discussion made in this section regarding the role of the management accountant in the new business world is reflected in the developments in the arena of management accounting during the fourth stage in the evolution of management accounting (Creation of Value through effective resource use**)** which ushered in after 1985. This is discussed at length in the previous section of this module. The focus has shifted to strategic analysis. Thus the two collides and the newer tools and techniques which are aligned to the value chain and are thus relational to the attainment of the strategic goal of the organisation have changed the focus of management accounting to strategic management accounting.

EXERCISE

Theoretical Questions

Multiple Choice Questions

1) Management Accounting
   A. Accumulates, summarizes and analyses the available data.
   B. Is primarily concerned with the requirements of the management.
   C. Makes Corporate Planning and Strategy effective.
   D. All of the above
2) Management accounting can be viewed as _____.
   A. Marketing-oriented Accounting
   B. Management-oriented Accounting
   C. Accounting-oriented Management
   D. Manager-oriented Accounting
3) The main objective of management accounting is _____
   A. To maintain the accounting records
   B. To know the amount due from customers and suppliers
   C. To ascertain analyse and interpret the results of business operations
   D. To record all the business transactions
4) _____ is the study of managerial aspects of financial accounting
   A. Cost accounting
   B. Financial accounting
   C. Management accounting
   D. Business accounting
5) The purpose of management accounting is to help _____ make decisions
   A. Managers
   B. Investors
   C. Marketers
   D. Banks
6) Management accounting assists the management in_____
   A. Planning
   B. Directing
   C. Controlling
   D. All of the above

7) 'Period of lost relevance' is the _____ of the evolution of management accounting.

   A. 1st stage

   B. 2nd stage

   C. 3rd stage

   D. 4th stage

8) Creation of value through effective use of resources is the focus area of the _____

   A. 1st stage

   B. 2nd stage

   C. 3rd stage

   D. 4th stage

9) Just in time management and Activity based costing developed during the _____

   A. 1st stage

   B. 2nd stage

   C. 3rd stage

   D. 4th stage

10) Management accounting deals with _____ data

   A. Qualitative

   B. Quantitative

   C. Both qualitative and quantitative

   D. Non-financial

Answer:

1-D; 2-B; 3-C; 4-C; 5-A; 6-D; 7-C; 8-D; 9-C; 10-C;

State True or False

1) Management Accounting is primarily not concerned with the requirements of the management.
2) One of the main characteristic of Management Accounting is cause and effect analysis
3) Management accounting is mainly past oriented.
4) The primary objective of management accounting is to manage company account and improves sales.
5) Key success factors- also known as competitive emphasis.
6) Benchmarking is a process of measuring the performance of a company's products, services, or processes against those of another business considered to be the best in the industry.
7) In organizations, there are typically three levels of management: top-level, middle-level, and first-level.
8) Management accounting concentrates on post-mortem analysis.

9) Evaluation and control of performance is not a limitation of Management accounting.

10) Deregulation- the act or process of removing legislative controls or restrictions from an industry, commodity, etc.

Answer:

1-False; 2-True; 3-False; 4-False; 5-True; 6-True; 7-True; 8-False; 9-True; 10-True;

⊙ Fill in the blanks

1) Lean manufacturing systems that seek to reduce waste by implementing _____ production systems and focussing on _____

2) There has been a paradigm shift in the role of the management accountant in the era of globalisation. The focus shifted to _____

3) Management accounting ensued with the simple aspect of _____

4) Strategic management accounting provides the financial analysis to support the formulation of successful _____.

5) _____ criteria are a set of standards for a company's behaviour used by socially conscious investors to screen potential investments

Answer:

1) just-in-time (JIT) production systems, advanced manufacturing technologies (AMTs)., 2) strategic analysis 3) Cost determination and financial control, 4) competitive strategies, 5) Environmental, social, and governance (ESG)

⊙ Short Essay Type Questions

1) Mention two point of difference between cost accounting and management accounting

2) identify and describe the elements involved in the decision-making, planning and control process.

3) Justify the view that a major objective of commercial organizations is to broadly seek to maximize future profits.

4) Explain the important changes that have taken place in the business environment that have influenced management accounting practice.

5) Outline the key success factors that directly affect customer satisfaction.

6) Identify and describe the functions of a cost and management accounting system.

⊙ Essay Type Questions

1) Identify and describe the different users of accounting information.

2) Describe the differences between management accounting and financial accounting.

3) Though management accounting is very closely linked to cost accounting, there is clear demarcation between the two – elucidate.

4) Explain each of the elements of the decision-making, planning and control process.

5) Explain how the business environment that businesses face has changed over the past decades and discuss.

6) Elucidate the various functions of management accounting.

7) Do you think management accounting help in planning and forecasting?

8) Management accounting is the accounting system for making decisions of the business enterprise – Discuss.

9) Management accounting serves as a tool to management – elucidate.

10) Write note on the four stages of evolution of management accounting.

11) Compare and contrast between the tools and techniques used in traditional and contemporary management accounting.

12) Identify current trends in management accounting.

⊙ Unsolved Case[30]

Medical devices are normally associated with use by hospitals and medical practices. Some devices are used by normal consumers and, according to an article on the Medical Device and Diagnostic Industry website are proliferating[31]. The market for devices such as insulin pumps and blood pressure monitors has become more consumer-driven and is putting pressure on manufacturers to design better products and get them to the market faster. According to the article, 'patients want their medical devices to have the same kind of design and appeals as iPods'. This convergence of medical and mass consumer electronics is creating many challenges for medical device manufacturers. These challenges include widely divergent product life cycles, varying scenarios of use and safety, and efficacy concerns. The typical life cycle of a consumer device is likely to be measured more in months than years. Compare this to the long approval cycles of drug and medical device regulatory authorities – which, according to the article[32], can be anything from 27 to 36 months in the USA depending on the type of medical device. During this timeframe, an iPod/iPad has probably gone through at least two generations, and smart devices are now the norm. It may be that medical devices will never get as savvy as a consumer iPad due to regulatory concerns and device efficacy. However, increasing consumer-driven requirements are likely to shorten the product life cycle over coming years as devices move further towards personal smart devices. As of April 2016, for example, a Financial Times[31] article notes there are more than 1,65,000 health and fitness apps available at the Apple App Store. While Apple's devices are not medical devices they do pose a competitive threat.

Questions

a) Do you think the costs of the electronic components in a smart device such as an iPod/iPad are more or less than those in a medical device like a blood pressure monitor?

b) Would decreasing the product life cycle of medical devices, or medical devices being more like consumer electronics, pose any risks for manufacturers?

30. The case is adopted from Management and Cost Accounting, 10th Edition by Colin Drury.

31. mddiadmin (2009) Developing medical devices in a consumer-driven market, MDDI, 1 February. Available at www.mddionline.com/article /developing-medical-devices-consumer-driven -market

32. Financial Times (2016) Healthcare apps battle to be taken seriously. Available at www.ft.com /content/ed3268f2-e620-11e5-a09b -1f8b0d268c39

SECTION - B

ACTIVITY BASED COSTING

Activity Based Costing 2

This Module includes:

2.1 Traditional Cost System

2.2. Definition and Meaning of Activity Based Costing (ABC)

2.3. Steps in ABC System

2.4. Cost Pools and Cost Drivers

2.5. Merits and Demerits of ABC System

2.6. Activity Based Information and Decision Making

Activity Based Costing

SLOB Mapped against the Module

To appreciate the fundamental concepts of management accounting and its role in a dynamic business environment. (CMLO 1a, b) and to develop understanding of costing frameworks (CMLO 3a)

Module Learning Objectives:

After studying this module, the students will be able to

- Understand the fundamental problem in absorption costing system and how that paves way for the Activity Based Costing system.
- Conceptualise the nuances of the Activity Based Costing system.
- Comprehend impact of the Activity Based Information on the decision making process.

Traditional Cost System

2.1

Under traditional cost system, overheads costs are first allocated and apportioned to various production and service departments and after that the overheads costs of service departments are re-apportioned to various production departments and once the same are done then finally overheads costs of production departments are absorbed to the cost objects (products, customer) on the basis of labour hours, machine hours, prime cost, direct materials costs and direct wages costs, etc. The principle involved is that the finished products consume the resources in proportion to production volume.

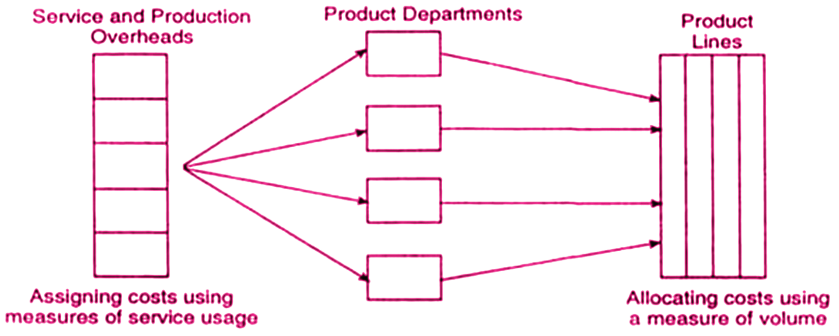


Figure 2.1: Application of Traditional Costing

The traditional cost accumulation system of absorption costing was developed at a time when most organisations produced only a narrow range of products (so that products underwent similar operations and consumed similar proportions of overheads). The overhead costs were only a very small fraction of total costs.

The benefits of more accurate systems for overhead allocation would probably have been relatively small. In addition, information processing costs were high.

In recent years, however, there has been a dramatic fall in the costs of processing information, and with the advent of advanced manufacturing technology (AMT), overheads are likely to be far more important and in fact direct labour may account for as little as 5% of a product's cost. Therefore, now it appears difficult to justify the use of direct labour or direct material as the basis for absorbing overheads or to believe that errors made in attributing overheads will not be significant.

Many resources are used in non-volume related support activities, (which have increased due to AMT) such as setting-up, production scheduling, inspection and data processing. These support activities assist the efficient manufacture of a wide range of products and are not, in general, affected by changes in production volume. They tend to vary in the long term according to the range and complexity of the products manufactured rather than the volume of output.

The wider the range and the more complex the products, the more support services will be required. Consider, for example, factory X which produces 10,000 units of one product, the Gama, and factory Y which produces 1,000 units each of 10 slightly different versions of the Gama. Support activity costs in the factory Y are likely to be a lot higher than in factory X, but the factories produce an identical number of units. For example, factory X will only need to set-up once, whereas Factory Y will have to set-up the production run at least ten times for the ten different products. Factory Y will therefore incur more set-up costs for the same volume of production.

Traditional costing systems, which assume that all products consume all resources in proportion to their production volumes, tend to allocate too great a proportion of overheads to high volume products (which cause relatively little diversity and hence use fewer support services) and too small a proportion of overheads to low volume products (which cause greater diversity and therefore use more support services).

Activity based costing (ABC) attempts to overcome this problem.

Overhead rate based on volume and its limitations:

Volume-Based Overhead Rate

The factory overhead rate in a volume-based costing system is either a single over-head rate for the entire operation (plant wide rate) or a set of overhead rates with various rates for different departments or divisions (department rates). These overhead rates use an output-volume-based activity or activities to assign (or to spread) factory overhead costs to products or services. An output-volume-based costing system spreads costs evenly so that each cost object (product or service) receives the same amount.

Illustration 1 (Applying the overhead absorption rate)

Let us now recap the various overheads rates that are used in the context of absorption of overheads costs to the products/ jobs/ customer/ work-order, etc.

There are several different methods which can be used to absorb overheads. The following data to determine the total production cost of job number M 626:

Total cost centre overhead	₹62,100
Production output	13,800 units
Direct labour hours	27,000 hours
Machine hours	34,500 hours
Direct wages cost	₹17,250
Direct materials cost	₹49,680
Prime Cost	₹66,930

Solution:

The overhead absorption rates under various methods are as under:

- Rate per unit produced = ₹62,100 ÷13,800 units = ₹ 4.5
- Direct hour labour rate = ₹62,100 ÷ 27,000 hours = ₹ 2.3
- Machine hour rate = ₹62,100 ÷34,500 hours = ₹1.8
- Percentage cost of direct wages cost = ₹62,100 ÷₹17,250 × 100 =360% of direct wages
- Percentage of direct materials cost = ₹62,100 ÷₹49,680 × 100 = 125% of direct materials cost

- Percentage of Prime Cost = ₹62,100÷₹ 66,930 x 100 = 93% of prime cost

Drawback of Traditional Costing System:

a. Different products utilize different amount of resources, which is not recognized in traditional costing system.

b. Overheads now constitute the largest share of cost, often greater than 50% and are typically applied to products as percentage of the smallest cost (direct labour) leading to serious distortion of product cost.

c. By relying on volume-related measures to determine product costs, traditional costing system do poor job in reflecting supporting costs for manufacturing and distribution of products or services. More and more factory overheads, such as set-up cost, materials handling cost, and product design and research and development costs, are unrelated to the number of units produced.

d. Traditional costing system tends to overcast standard, high volume products and undercost low-volume products, leading to incorrect pricing and product-mix decisions.

e. It creates a bias toward direct labour reduction as a cost reduction rather than overall productivity improvement.

f. It provides no information useful in either identifying productivity improvement opportunities or determining if productivity improvement efforts have yielded significant results. Indeed, often traditional costing system indicates higher cost in the presence of known productivity improvement or vice versa.

Thus, companies that apply plant wide and departmental overhead rates to assign costs to products often do not produce reliable cost data. Conventional product costing system follows a cost smoothening or peanut-butter costing which describes a costing approach that uses broad averages for distributing the costs of resources uniformly to cost objects (such as product or services) when the individual products or services, in fact, use those resources in a non-uniform way. For some companies, product cost distortions can be damaging, particularly for those characterized by intense or increasing competitive pressures, continuous improvement, total quality management, total customer satisfaction and sophisticated technology. As firms operating in this competitive environment adopt new strategies to achieve competitive excellence, their cost accounting systems often must change to keep pace. Cost accounting systems that worked reasonably well in the past may no longer be acceptable. The traditional product cost model distorts product cost for several reasons:

a. Factory overhead costs are allocated rather than traced to products.

b. The total overhead component of product cost has historically grown faster than direct costs. As overhead becomes a larger percentage of product cost, the distortion inherent in the allocation process causes the total product cost to increase.

c. Generally Accepted Accounting Principles (GAAP) often dictate or influence cost accounting practices. One of these principles — the conservatism principle — is inconsistent with accurate product cost determination in two important ways:

   (i) The conservatism principle requires that reported cost be based on precise and easily verifiable data, whereas management often needs costs that are based on forecasts and plans.

   (ii) The conservatism principle encourages expensing many costs in the current period that should be capitalized. This practice distorts life-cycle costs.

d. Many activities included in selling, general and administration are traceable to specific products.

In order to understand the concept, let us take an example:

Illustration 2

A Company is manufacturing two products, Product A and Product B and the annual outputs of the two products are 10,000 units and 20,000 units respectively. Total annual overheads of the company is ₹3,00,000. The machine hours

required for Product A are 20,000 hours and that of Product B are 10,000 hours, respectively. Then the overhead absorption rates under traditional costing system, using machine hours as the basis can be computed, as under:

Particulars	Product A	Product B
1. Annual Outputs (units)	₹10,000	₹20,000
2. Total Machine Hours	₹20,000	₹10,000
3. Overhead Absorption Rate on the basis of Machine Hours (Total Overheads/ Total Machine Hours) = (₹3,00,000/30,000) = ₹10 per hour		
4. Total Overheads Costs on the basis of machine hours (No. of machine hours × Rate per machine hour)	₹2,00,000	₹1,00,000
5. Overheads Cost per unit (4 ÷ 1)	₹20	₹5

From the above, the following inferences can be made for the Traditional Cost System:

a. The finished products consume resources in proportion to the production volume.

b. The proper identification of value added and non-value added activities cannot be made.

c. It does not facilitate the control over those activities, which cause fixed overhead costs.

d. A Single/ Blanket rate is used to absorbs the overheads costs to the cost objects, causing cost distortion.

e. It is a subjective approach, since this system uses arbitrary bases for apportionment of overheads costs over the cost objects.

Definition and Meaning of Activity Based Costing (ABC)

2.2

Activity-based costing is an effective costing system that focuses on activities. ABC is a refined costing system, or a more specific way to assign costs to cost objects. The system avoids using big, generic categories, such as splitting a cost evenly between divisions. Instead, it allocates indirect costs to the activities that generate those costs. The result is likely to be more accurate costing and product pricing.

ABC Basic Premises:

- Cost objects consume activities.
- Activities consume resources.
- This consumption of resources is what derives costs.

ABC emphasizes the importance of linking indirect costs to activity in the cost allocation exercise. It argues that cost is derived from activities. When there are more activities, more costs will be incurred. Based on this logic, cost should be allocated according to the activities that drive costs to the cost object. Cost objects are the defined objects for allocation of indirect costs, e.g., product portfolio, customers, or business units. Cost pools are the costs gathered to serve similar functions, e.g., production, marketing units, and finance department. Cost drivers are the key attributes or proxies which are the causes of spending, e.g., no. of purchase orders for purchase department, service hours for engineering department, and no. of employees for human resource units. Cost drivers serve as allocation base for allocation of cost to cost objects, and the degree of costs allocated rests with the level of activity (in terms of the consumption base). Using this allocation method, cost can be more accurately allocated to the cost object.

Activity-based costing plays an important role in companies' strategies and long-range plans to develop a competitive cost advantage. While activity - based costing focuses attention on activities in allocating overhead costs to products, activity-based management focuses on managing activities to reduce costs. Cost reduction generally requires a change in activities. Top management can send notices to company employees to reduce costs, but the implementation requires a change in activities. An entity cannot know the effect of a change in activities on costs without the type of cost information provided by activity-based costing.

Activity-Based Costing (ABC) is that costing in which costs begin with tracing of activities and then to producing the product. In other words, it is the process of costing system which focuses on activities performed to produce products. This system assumes that activities are responsible for the incurrence of costs and products creates the demand for activities. Costs are charged to products based on individual product's use of each activity.

ABC aims at identifying as many costs as possible to be subsequently accounted as direct cost of production. Any cost that is traced to a particular product via its consumption of activity becomes direct of the product. For instance, in conventional costing system, cost of setup and adjustment time is considered as factory overhead and subsequently assigned to different products on the basis of direct labour hours, but in Activity-Based Costing, set-up and adjustment time is determined for each product and its costs are directly charged to each product. Thus, by emphasizing activities, ABC tries to ascertain the factors that cause each major activity, cost of such activities and the relationship between activities and products produced.

Activity-Based Costing had its genesis in the increasing importance of indirect costs in the manufacturing operations. The direct processing costs which are easier to handle are being relegated to the background with each passing day due to automation. In this changing scenario where indirect costs outweigh the direct processing costs in many a situation, one cannot be content with rough and ready methods of dealing with indirect costs.

The concept of ABC was first defined in the late 1980s by Robert Kaplan and William Burns. Initially ABC focused on manufacturing industry where technological developments and productivity improvements had reduced the proportion of direct labour and material costs, but increased the proportion of indirect or overhead costs. ABC is generally used as a tool for understanding cost and profitability of individual products.

ABC costing will enable management to better understand the cause of costs, and from here action can be taken to control and reduce costs through controlling and reducing the demand for cost causing activities.

According to CIMA Official Terminology, Activity Based Costing is 'An approach to the costing and monitoring of activities which involves tracing resource consumption and costing final outputs. Resources are assigned to activities, and activities to cost objects based on consumption estimates. The latter utilize cost drivers to attach activity costs to outputs.'

An ABC system assigns overheads to each major activity (rather than departments). With ABC systems, many activity-based cost centres (alternatively known as activity cost pools) are established, whereas with traditional systems overheads tend to be pooled by departments, although they are normally described as cost centres.

Activities consist of the aggregation of many different tasks, events or units of work that cause the consumption of resources. Typical support activities include: schedule production, set-up machines, move materials, purchase materials, inspect items, process supplier records, expedite and process customer orders. Production process activities include machine products and assemble products. Within the production process, activity cost centres are sometimes identical to the cost centres used by traditional cost systems. Support activities are also sometimes identical to cost centres used by traditional systems, such as when the purchasing department and activity are both treated as cost centres. Overall, however, ABC systems will normally have a greater number of cost centres compared with traditional systems.

The second stage of the two-stage allocation process allocates costs from cost centres (pools) to products or other chosen cost objects. Traditional costing systems trace overheads to products using a small number of second stage allocation bases (normally described as overhead allocation rates), which vary directly with the volume produced. Instead of using the terms 'allocation bases' or 'overhead allocation rates' the term 'cost driver' is used by ABC systems. Direct labour and machine hours are the allocation bases that are normally used by traditional costing systems. In contrast, ABC systems use many different types of second-stage cost drivers, including non-volume-based drivers, such as the number of production runs for production scheduling and the number of purchase orders for the purchasing activity.

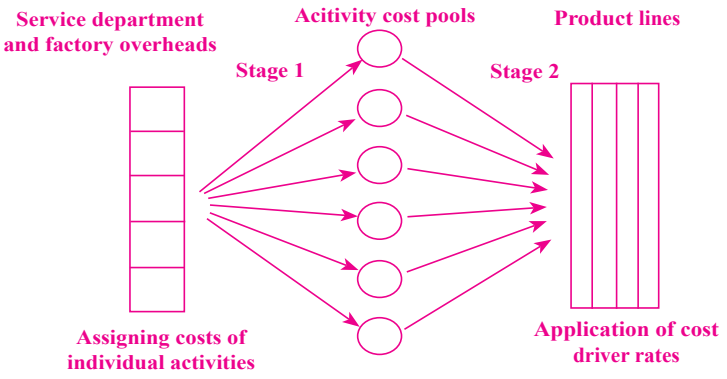


Figure 2.2: Application of ABC System

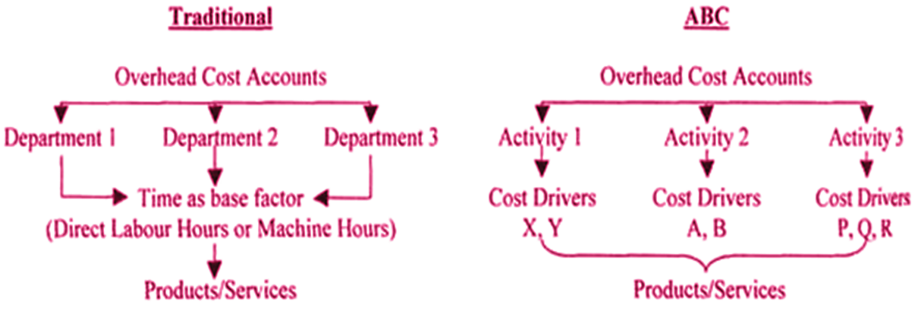


Figure 2.3: Traditional vs. ABC Costing System

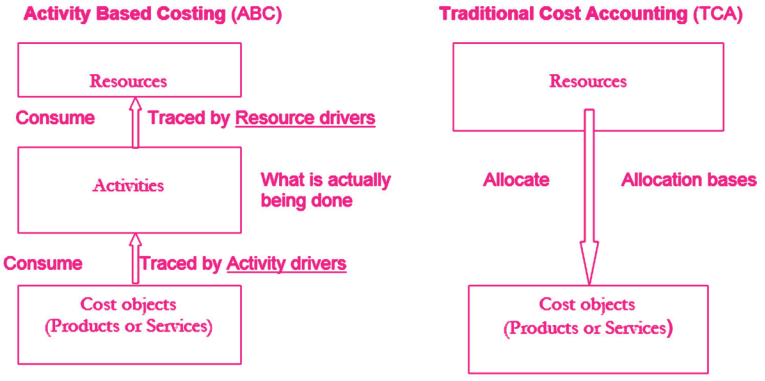


Figure 2.4: How ABC and Traditional Costing allocate Costs to Cost Objects

Emergence of Activity-based Costing

The purpose of moving from a traditional costing system to an ABC system must be based on the premise that the new information provided will lead to action that will increase the overall profitability of the business. This is most likely to occur when the analysis provided under the ABC system differs significantly from that which was provided under the traditional system, which is most likely to occur under the following conditions:

(i) When production overheads are high relative to direct costs, particularly direct labour.

(ii) Where there is great diversity in the product range.

(iii) Where there is considerable diversity of overhead resource input to products.

(iv) When consumption of overhead resources is not driven primarily by volume.

Information from an ABC analysis may indicate opportunities to increase profitability in a variety of ways, many of which are long term. For example, an activity-based analysis often reveals that small-batch items are relatively expensive to produce, and are therefore unprofitable at current prices. A number of responses to this information could be adopted. The first response might be to consider stopping production of such items, and concentrate on the apparently more profitable high-volume lines. Another approach would be to investigate how the production process could be organized in such a way as to bring the cost of producing small-batch items closer to that of producing high-volume goods. By identifying the cost of carrying out particular activities, the new approach provides opportunities for directing attention to matters of cost control. It can therefore be viewed as a much longer-term technique then

the word 'costing' in the title suggests. The establishment of an ABC product cost may thus be considered to be merely the beginning of a process, rather than an end in itself. The recent use of the term activity-based management suggests this forward-looking orientation, which is assuming increasing importance.

Traditional product costing systems were designed when most of the companies manufactured a narrow range of products. Direct materials and direct labour were the dominant factors of production then. Companies were in the sellers' market. Overheads were relatively small and distortions due to inappropriate treatment were not significant. Cost of processing information was high.

Today, companies produce a wide range of products. Overheads are of considerable importance Simple methods of apportioning overheads based on direct labour are not justified. Intense global competition calls for correct costing of products to avoid errors in decision-making. Traditional systems can measure volume related costs. Non-volume related activities like material handling, set-up etc. are important and their costs cannot be apportioned on volume basis. Hence, the need for emergence of activity based costing arises.

Steps in ABC System

2.3

Steps in ABC System

1. To identify the different activities within the organisation. Usually the number of cost centres that a traditional overhead system uses is quite small, say up to 15. In ABC the number of activities will be much more, say 200; the number will depend on how the management subdivides the organisation's activities. It is possible to break the organisation down into many very small activities, but if ABC is to be an acceptable and practical system it is necessary to use larger groupings, so that, say, 40 activities may be used in practice. The additional number of activities over cost centres means that ABC should be more accurate than the traditional method.
2. To determine what causes the cost of each activity – the cost driver (e.g. machine hours; number of dispatch orders).
3. To calculate the total cost for each activity – the cost pool (e.g. total machining costs; total costs of dispatch department).
4. To calculate an overhead absorption rate for each cost driver.
5. Activity Cost Driver Rate = $\frac{\text{Total Cost of an Activity}}{\text{Cost Driver}}$
6. To calculate the total overhead cost for each product manufactured.
7. To calculate the overhead cost per unit for each product.

Meaning of Activities

Activities comprise of units of work or tasks. For example, purchase of materials is an activity consisting a series of tasks like purchase requisition, advertisement inviting quotations, identification of suppliers, placement of purchase order, follow - up, etc.

Value Added Activities (VA)

- These are activities necessary for the performance of the process.
- These represent work that is valued by the external or internal customer.
- They improve the quality or function of a product. Hence, the customers are usually willing to pay for the service. VA activities result in 'Cost' and not in losses.

  Example: Making product more versatile for certain other uses.

Non-Value Added Activities (NVA)

- These are additional and extraneous activities, not fully necessary for the performance of the process.
- These represent work that is not valued by the external or internal customer.

  NVA activities do not improve the quality or function of a product or service but they can adversely affect costs

and prices. NVA activities create waste, result in delay of some sort, add cost to the products or services for which the customer is not willing to pay.

Example: Moving materials and machine set up for a production run.

Manufacturing activities can be classified along a cost hierarchy dimension consisting of:

a. Unit-level activities;

b. Batch-level activities;

c. Product-sustaining activities;

d. Facility-sustaining activities.

In the following lines the above mentioned activities are discussed:

a. Unit-level activities (also known as volume-related activities) are performed each time a unit of the product or service is produced. Expenses in this category include direct labour, direct materials, energy costs and expenses that are consumed in proportion to machine processing time (such as maintenance). Unit-level activities consume resources in proportion to the number of units of production and sales volume. For example, if a firm produces 10 per cent more units it will consume 10 per cent more labour cost, 10 per cent more machine hours and 10 per cent more energy costs.

   Typical cost drivers for unit level activities include labour hours, machine hours and the quantity of materials processed. These cost drivers are also used by traditional costing systems. Traditional systems are therefore also appropriate for assigning the costs of unit-level activities to cost objects.

b. Batch-related activities, such as setting up a machine or processing a purchase order, are performed each time a batch of goods is produced. The cost of batch-related activities varies with the number of batches made, but is common (or fixed) for all units within the batch. For example, set-up resources are consumed when a machine is changed from one product to another. As more batches are produced, more set-up resources are consumed. It costs the same to set-up a machine for 10 or 5000 items. Thus, the demands for the set-up resources are independent of the number of units produced after completing the set-up. Similarly, purchasing resources are consumed each time a purchasing order is processed, but the resources consumed are independent of the number of units included in the purchase order. Other examples of batch-related costs include resources devoted to production scheduling, first-item inspection and materials movement. Traditional costing systems treat batch-related expenses as fixed costs, whereas ABC systems assume that batch-related expenses vary with the number of batches processed.

c. Product-sustaining activities or service-sustaining activities are performed to enable the production and sale of individual products (or services). These activities are performed to support the production of each different type of product. Maintenance of equipment, engineering charges, testing routines, maintaining bills of materials etc. are the few examples of product level activities.

d. The final activity category is facility-sustaining (or business-sustaining) activities. They are performed to support the facility's general manufacturing process and include general administrative staff, plant management and property costs. They are incurred to support the organisation as a whole and are common and joint to all products manufactured in the plant. There would have to be a dramatic change in activity, resulting in an expansion or contraction in the size of the plant, for facility-sustaining costs to change. Such events are most unlikely in most organisations. Therefore, these costs should not be assigned to products since they are unavoidable and irrelevant for most decisions. Instead, they are regarded as common costs to all products made in the plant and deducted as a lump sum from the total of the operating margins from all products.

Cost Object:

It is an item for which cost measurement is required e.g. a product or a customer.

Illustration 3 (Traditional vs. Activity Based Costing)

ABC Company manufactures three products: A, B, and C. Data for the period just ended is as follows:

Particulars	A	B	C
Production (units)	20,000	25,000	2,000
Sales price (per unit)	₹20	₹20	₹20
Material cost (per unit)	₹5	₹10	₹10
Labour hours (per unit)	2 hours	1 hour	1 hour

(Labour is paid at the rate of ₹5 per hour)

Overheads for the period were as follows: Amount (₹)

Set-up costs	90,000
Receiving	30,000
Despatch	15,000
Machining	55,000
	1,90,000

Cost driver data	A	B	C
Machine hours per unit	2	2	2
Number of set-up	10	13	2
Number of deliveries received	10	10	2
Number of orders dispatched	20	20	20

a. Calculate the cost and profit per unit, absorbing all the overheads on the basis of labour hours.

b. Calculate the cost and profit per unit absorbing the overheads using an Activity Based Costing approach.

Solution:

(a) Total overheads ₹1,90,000

Total labour hours:

A = (20,000 × 2) = 40,000

B = (25,000 × 1) = 25,000

C = (2,000 × 1) = 2,000

67,000

Overhead Absorption Rate = ₹1,90,000 ÷67,000 hours = ₹2.836 per hour = ₹2.84 per hour

Statement of Cost and Profit **(Amount in ₹)**

Particulars		A	B	C
Materials		5	10	10
Labour		10	5	5
Overheads (at ₹2.84 per hr)		5.68	2.84	2.84
		20.68	17.84	17.84
Selling price		20	20	20
Profit / Loss		(0.68)	2.16	2.16
(b)	Total	A	B	C
Set-up costs	₹90,000	36,000	46,800	7,200
(Cost per set up= ₹90,000÷25)				
Receiving	₹30,000	13,636	13,636	2,728
(Cost per delivery = ₹30,000÷22)				
Dispatch				
(Cost per order = ₹ 15,000÷60)	₹ 15,000	5,000	5,000	5,000
Machining	₹ 55,000	23,404	29,256	2,340
(Cost per machine hour =₹ 55,000÷ 94,000)				
Total	₹1,90,000	78,040	94,692	17,268
Number of units		20,000	25,000	2,000
Overheads p.u.		₹3.90	₹3.79	₹8.63

Statement of Cost and Profit **(Amount in ₹)**

Particulars	A	B	C
Materials	5	10	10
Labour	10	5	5
Overheads	3.90	3.79	8.63
	18.90	18.79	23.63
Selling price	20.00	20.00	20.00
Profit /(Loss)	**₹1.10**	**₹1.21**	**(₹3.63)**

Cost Pools and Cost Drivers

2.4

Cost Pool:

The term cost pools are used to describe a location to which overhead costs are initially assigned. Normally cost centres consist of departments, but in some cases they consist of smaller segments such as separate work centres within a department. A cost pool is a grouping of individual costs, typically by department or service center. Cost allocations are then made from the cost pool. For example, the cost of the maintenance department is accumulated in a cost pool and then allocated to those departments using its services.

Cost pools are commonly used for the allocation of factory overhead to units of production, as required by several accounting frameworks. They are also used in activity-based costing to allocate costs to activities. A business that wants to allocate costs at a highly-refined level may choose to do so using a number of cost pools.

The various Cost Pools may be as under in a manufacturing company:

a. Purchasing Department

b. Receiving Department

c. Material Handling

d. Set-up of Machines

e. Inspection and Quality Control

f. Research and Developments

g. Customer Service

h. Production Control

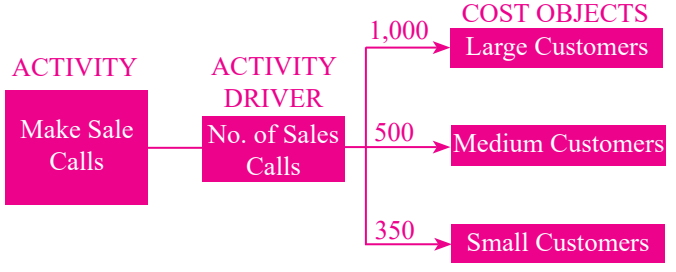


Figure 2.5 : Allocation of Cost to Cost Objects in ABC

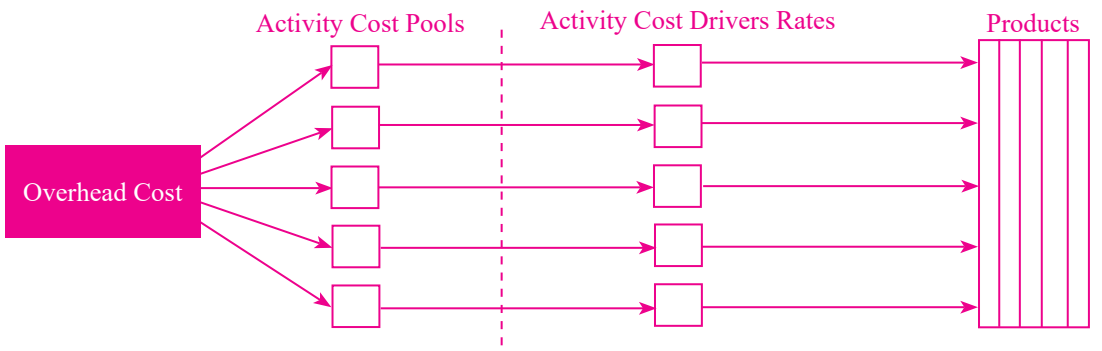


Figure 2.6 : Allocation of overhead cost to products through Activity Cost Pools and Cost Drivers under ABC

Cost Driver:

It is a factor that causes a change in the cost of an activity.

Categories of cost driver:

- **Resource Cost Driver**

It is a measure of the quantity of resources consumed by an activity. It is used to assign the cost of a resource to an activity or cost pool. For example, number of purchase orders placed will influence the cost of materials to be purchased.

- **Activity Cost Driver:**

It is a measure of the frequency and intensity of demand, placed on activities by cost objects. It is used to assign activity costs to cost objects. Activity cost drivers can be transaction drivers (e.g. No. of purchase orders processed, no. of customer orders processed, etc.) as well as duration drivers (it represent amount of time required to perform an activity e.g. Setup hours, inspection hours, etc.)

- **Volume Based Cost Drivers**

They assume that a product's consumption of overhead is directly related to units produced i.e. in case of Machine hours, if volume is increased by 10%, machine hours will increase by 10% hence energy cost will increase by 10%.

- **Non-Volume Based Cost Drivers**

They are in contrast of volume based cost drivers. Non-volume based activities are not performed each time a unit of the product or service is produced e.g. number of production runs for production scheduling & the number of purchase orders for the purchasing activity.

Some Cost Drivers that are used in the context of Activity Based Costing:

- Number of requisitions rose
- Number of machine set-up
- Number of machine hours
- Number of production runs
- Number of processed orders

- Number of purchase orders
- Number of orders completed
- Number of labour hours
- Number of orders packed and delivered
- Number of inspections
- Number of customers visit, etc.

Cost object:

It is an item for which cost ascertainment is required. For example, a product, a service, a job, a work order no, or a customer, etc.

Applications of ABC:

The numbers of uses to which an ABC system can be put are only limited by the imagination of the user. Here are some of its more common applications:

- When an ABC analysis is combined with a review of investment costs for various tactical or strategic options, one can determine the return on investment to be expected for each of the investment options.
- An ABC system can accumulate all of the costs associated with a particular distribution method, which allows managers to compare this cost to the profit margins earned on sales of products that are sold through it. One can then determine if the distribution channel should be reconfigured or eliminated in order to improve overall levels of profitability.
- An ABC analysis will itemize the costs of each plant, and correctly allocate these costs to the activities conducted within them, which allows a company to determine which plants are more efficient than others.
- An ABC analysis includes all activity costs associated with a manufactured item, which yields a comprehensive view of all costs associated with it, and which can then be more easily compared with the cost of a similar item that is purchased.
- By using internal ABC analyses to determine the cost of various activities, a company can create a benchmark for what these costs should be in potential acquisition targets. If the targets have higher costs than the benchmark levels, then the acquiring company knows that it can strip out costs from the acquisition candidate by improving its processes, which may justify the cost of the acquisition.
- An ABC analysis can reveal the cost of each activity within an organisation. The system is really designed to trace the costs of only the most significant activities, but its design can be altered to itemize the costs of many more activities. This information can then be used to determine which activities are so expensive that they will be the main focus of management attention, or which can be profitably combined with other activities through process centering. This is a primary cost-reduction activity.
- An ABC analysis reveals all of the costs associated with a product, and so is useful for determining the minimum price that should be charged. However, the actual price charged may be much higher, since this may be driven by the ability of the market to absorb a higher price, rather than the underlying cost of a product.
- An ABC analysis can be combined with product prices to yield a list of margins for each product sold. When sorted by market, product line, or customer, it is easy to see which products have low or negative returns, or which yield such low margin volume that they are not worth keeping.

- An ABC analysis can reveal which activities contribute to the completion of products, and which do not. Then, by focusing on non-value-added activities, a company can create significant improvements in its profitability.
- An ABC analysis reveals the cost of anything that a management team needs to know about—activities, products, or customers—which can then be sorted to see where the highest-cost items are located. When combined with a value analysis, one can determine what costs return the lowest values, and structure a cost-reduction effort accordingly.
- An ABC analysis can itemize the costs that are specific to each customer, such as special customer service or packaging issues, as well as increased levels of warranty claims or product returns. When added to the margins on products sold to customers, this reveals which customers are the most profitable after all costs are considered.

Merits and Demerits of ABC System

2.5

Merits of ABC:

a. ABC recognizes the increased complexity of modern businesses with its multiple cost drivers, many of which are transaction based rather than volume based.

b. ABC is concerned with all overhead costs, including such 'non-factory floor' costs as quality control and customer service, and so it takes cost accounting beyond its 'traditional' factory floor boundaries.

c. ABC gives a meaningful analysis of costs which should provide a suitable basis for decisions about pricing, product mix, design and production.

d. ABC helps with cost reduction because it provides an insight into causal activities and allows organisations to consider the possibility of outsourcing particular activities, or even of moving to different areas in the industry value chain.

e. ABC can be used in conjunction with customer profitability analysis (CPA) to determine more accurately the profit earned by serving particular customers.

f. ABC can be used by service and retail organisations. Many service and retail businesses have characteristics very similar to those required for the successful application of ABC in modern manufacturing industry.

The main advantages of ABC can further be summarized under the following points:

a. To link the cost to its causal factor – i.e. the Cost Driver

b. To identify costs of activities rather than cost centres

c. To ascertain product costs with greater accuracy by relating overheads to activities

d. To overcome the inherent limitations of traditional absorption costing and use of blanket overhead rates

e. To assist managers in budgeting and performance measurement

f. To provide the links between the activities, the organizational acts and the resources consumed, and illustrate the differences between resource consumption and resource provision

g. To help in cost control and cost reduction, as well as improved profitability.

h. To provide valuable economic information to support a company's operational improvement and customer satisfaction programs.

i. To furnish many significant benefits over traditional costing techniques:

   (i) most accurate data about product cost;

   (ii) more comprehensive cost information for performance measurement;

(iii) relevant data for management's decision-making;

(iv) more potential for sensitivity analysis;

(v) providing a model prospect on value-adding organizational transactions and activities.

ABC can be applied most effectively in the following situations:

(i) A highly competitive market

(ii) Diversity of products, processes and customers

(iii) Significant overhead costs which are not easily assigned to individual products

(iv) Demands placed on overhead resources by individual products and customers, which are not proportional to volume.

Demerits of ABC:

The demerits of ABC are as follows:

a. The cost of obtaining and interpreting the new information may be considerable. ABC should not be introduced unless it can provide additional information for management to use in planning or control decisions.

b. Some arbitrary cost apportionment may still be required at the cost pooling stage for items like rent, rates and building depreciation. If an ABC system has many cost pools, the amount of apportionment needed may be greater than ever.

c. Many overheads relate neither to volume nor to complexity. The ability of a single cost driver to fully explain the cost behaviour of all items in its associated pool is questionable.

d. There will have to be a trade-off between accuracy, the number of cost drivers and complexity.

e. ABC tends to burden low-volume (new) products with a punitive level of overhead costs and hence threatens opportunities for successful innovation if it is used without due care.

f. Some people have questioned the fundamental assumption that activities cause cost; they suggest that decisions cause cost or the passage of time causes cost or that there may be no clear cause of cost.

The main drawbacks of ABC can also be summarized under the following points:

a. Implementing an ABC system requires substantial resources, which is costly to maintain.

b. Activity Based Costing is a complex system which needs lot of record for calculations.

c. In small organisation mangers are accustomed to use traditional costing systems to run their operations and traditional costing systems are often used in performance evaluations.

d. Activity based costing data can be easily misinterpreted and must be used with care when used in decision making. Managers must identify which costs are really relevant for the decisions at hand.

e. Reports generated by these systems do not conform to generally accepted accounting principles (GAAP). Consequently, an organisation involved in activity based costing should have two cost systems - one for internal use and one for preparing external reports.

Activity Based Information and Decision Making

2.6

Use of ABC in Decision Making

a. For decisions like relocation or opening of a new distribution center, reduction in freight or other logistics costs can offset the expense of a new facility, staff or equipment. ABC system can identify the specific cost elements being targeted, providing a much clearer picture according to which management can decide and act accordingly.

b. ABC is a complement to Total Quality Management (TQM) and it provides quantitative data that can track the financial impact of improvements implemented as part of the TQM initiative.

c. Using traditional absorption system, overheads may get distributed equally across all product lines. ABC system traces the costs back to the activity and the consumption of resources by each product. This helps in analyzing the costs and profits of existing and new products in a more realistic manner.

d. ABC can augment decision support for human resources. ABC can present a number of options, including outsourcing, productivity improvements through automation and determination of employee/revenue ratios.

Further the areas in which Activity based information is used for decision making are as under:

- Product line profitability
- Capital Investment decisions
- Transfer Pricing
- Pricing of products
- Market Segmentation and Distribution Channels
- Make-or-Buy decisions and outsourcing
- Plant shut-down decisions
- Evaluation of off-shore production, etc.

ABC supports corporate strategy in the following manner:

- Accurate information on product costs enables better decisions to be made on pricing, marketing, product design, product mix etc.
- Performance based accurate feedback can be provided to cost center managers.
- ABC system can effectively support the management by furnishing data, at the operational and as well as strategic level.
- ABC system can change the method of evaluation of new process technologies, to reduce setup times, proved plant layout and thereby lowering material handling costs, quality improvement.

ABC supports corporate strategy in many ways such as:

- ABC system can effectively help the management by furnishing data at the operational level and strategic level. Accurate product costing will help the management to compare the profits that various customers, product lines, brands or regions generate and to decide on pricing strategy, dropping unprofitable products, lines etc.
- Information generated by ABC system can also encourage management to re-design the products for improving their quality.
- ABC systems can change the system of evaluation of new process technologies, to reduce setup times, rationalization of plant layout in order to reduce or lower material handling cost, improve quality etc.
- ABC analysis helps managers focus their attention and energy on improving activities.
- The cost driver rates established by ABC system can be used to measure activity performance and efficiency and provide a more suitable basis for budgeting.
- The accurate feedback can be provided to cost center managers on their performance based on their consumption of resources during a period rather than the allocations of cost over which they have no control.
- ABC system provide accurate information on product costs which enables better decisions to be made on pricing, marketing, product design and product mix.

When to use ABC?

In discussing the question 'Does your company need a new cost system?' Cooper suggested that the managers should ask themselves 'Do I really know what my products cost?' If the answer to this question is 'no', he urged that managers should consider whether it is necessary to undertake a detailed analysis of their cost accounting system, but rather than undertaking a major and costly analysis in every case, he suggested that managers look for the following symptoms which are indicative of a need for ABC:

- Products that are very difficult to produce are reported to be very profitable, even though they are not premium-priced. Cooper argues that products are difficult to produce should be expected to cost more and, therefore, to be profitable only if they are priced at a premium.
- Profit margins cannot be easily explained. If managers believe certain products to be more profitable than the accounting system suggest, it may be necessary to analyze costs using ABC.
- Some products, not sold by competitors, have high reported margins. Competitors would normally be expected to produce products, which are more profitable. Why are they not producing these products? They may consider the cost to be too high. It calls for examining of the costing system.
- Competitors' high volume products are priced at apparently unrealistically low levels. If competitors are able to price their products at levels, which appear unrealistically low, it may be that the firm's costing system needs examining.
- Suppliers offer to produce parts at prices considerably lower than expected.
- Managers considering buying in parts currently produced internally who find that suppliers offer them at unexpectedly low prices should examine their costing systems.
- Cost pools are too large and contain machines that have very difficult overhead structures. This creates considerable complexity and could mean that the procedures for allocating the overheads will be too simplistic.
- The cost of marketing and delivering the products varies dramatically by distribution channel, and yet the cost accounting system effectively ignores marketing costs.

Managers should look for these symptoms and ask themselves whether they have confidence in their product cost information. As symptoms may have other explanations, it is important to consider: the range of possibilities and

to evaluate which is more likely. However, even if it appears that, existing product costs are misleading it may not always be necessary to incorporate ABC into the accounting system. It must be remembered that the introduction of the ABC system involves major expense and thus managers must ask themselves whether the benefits to be derived from the superior information exceed the cost of the new accounting system.

In the present industrial scenario, it becomes difficult in the industry to survive unless the overhear costs are correctly accounted for, controlled and reduced so as to sustain, remain and grow in the industry. We cannot reduce the direct cost of the product, (unless materials of cheaper value are used) but we can control very much the overheads. This can be done only when one has the information of the cost centers with respect to function or activity. The overhead costs involved, for a product do not usually give a clear picture so as to control and reduce these costs. Therefore, it becomes necessary to have a costing system based on activity done, because of this need for ABC arises. Thus ABC has a wide scope in the context of cost reduction and cost control.

It may be made clear that ABC cannot be applied where a distinction cannot be made for the costs attached to various activities or functions. Implementation of ABC should be made from shop floor to managerial level. If ABC is applied correctly at the correct place and time, the company can attain more profits than before.

Although the activity based approach looks attractive, it is unlikely to be practical to relate all overheads to specific activities. Moreover, the approach implicitly assumes a sense co-operative behaviour among operating units and between operating units and service functions. It does not acknowledge the possibility of conflict over the allocation process of overheads. Apart from their narrow concern over efficiency and optimal profitability, the advocates of activity based approach have not attempted to explain why firms insist on using simple methods of allocation of overheads.

However, ABC system has been widely implemented in large organisations in US and Europe. ABC system can be successfully used in other segments of the organisation i.e., administration, selling, distribution etc. It can equally be applied in service sectors like banks, insurance, hospitals and other institutions providing services.

ABC has the same objectives in service firms as in manufacturing organisations. ABC can prove very useful to many service organizations such as airlines, insurance companies, banks, hospitals, hotels, railways, financial service firms. In these service organisations, managers need accurate information about the cost of services being provided by them. Further, such service firms require using this information to improve their operations and to fulfill the needs of their customers in a more cost effective manner.

Large-scale service organizations have a number of features that have been identified as being necessary to derive significant benefits from the introduction of ABC:

(i) They operate in a highly competitive environment;

(ii) They incur a large proportion of indirect costs that cannot be directly assigned to specific cost objects;

(iii) Products and customers differ significantly in terms of consuming overhead resources;

(iv) They market many different products and services.

The uses for ABC information for service industries are similar to those for manufacturing organisations:

(i) It leads to more accurate product costs as a basis for pricing decisions when cost-plus pricing methods are used;

(ii) It results in more accurate product and customer profitability analysis statements that provide a more appropriate basis for decision-making;

(iii) ABC attaches costs to activities and identifies the cost drivers that cause the costs. Thus, ABC provides a better understanding of what causes costs and highlights ways of performing activities more effectively by reducing cost driver transactions. Costs can therefore be managed more effectively in the long term. Activities can also be analyzed into value added and non-value added activities and by highlighting the costs of non-value added activities attention is drawn to areas where there is a potential for cost reduction without reducing the products' service potentials to customers.

Illustration 4 (Traditional Method of Overhead Allocation vs. ABC)

A company manufactures the following two products:

X - A standard product

Y - A low volume complex product requiring specialized skills and activities

Cost of production is as under (₹ 000):

Materials (equal for both)	300
Labour (5000 hrs. @ ₹10/hr.)	50
Overheads	100
Total	450

To apply ABC, the following information was collected after detailed analysis of operation:

Activities	Prod-X	Prod-Y	Cost
Set-ups	5 Times	10 Times	20.00
Material Handling	30%	70%	15.00
Inspection	45%	55%	35.00
Maintenance Requests	15 Times	20 Times	30.00
Total cost ('000)			100.00

Activities	Prod-X	Prod-Y
Materials	150.00	150.00
Labour	30.00	20.00
Overheads		
Set Ups	6.60	13.40
Material Handling	4.50	10.50
Inspection	15.75	19.25
Maintenance Requests	12.90	17.10
Total Cost as - ABC System	219.75	230.25
Total Cost - Traditional System	240.00*	210.00*
Percentage (Decrease)/Increase	(8.44%)	9.64%

As a Management Accountant of the Company, you are required to comment on the impact of pricing of the two products. Overheads are recovered under Traditional system on the basis of labour hour rate.

* Notes:

Activities	X	Y
Materials	150	150
Labour @ 0.01 × hours X 0.01 × 3000 Y 0.01 × 2000	30	20
Overheads X 0.02 × 3000 Y 0.02 × 2000	60	40
Total	240	210

Solution:

From the above computation, it is evident that, when the Company uses Traditional Costing Method, the Product- X is over-cost and Product- Y is under-cost, as compared to ABC System. This is mainly because of using a Single/ Blanket Rate of Labour, for absorbing overheads to the products.

Product X requires more labour hours and overheads are absorbed on the basis of volume only, without considering the activities and the costs of Product X is more as compared to ABC System.

On the other side, since Product Y - a low volume complex product requiring specialized skills and activities, the Costs are more as per ABC System.

So, it can be said that since, ABC System recognises the use of multiple overheads rates, based on Cost Drivers and hence distortion of costs can be avoided and pricing of the products can be done on a more rational way and thereby reflecting the true profitability of the products and also the overall profitability of the Organization.

Decision Making: Using ABC Product Cost Information to Reduce Cost

ABC Ltd. assembles and sells a Product. Activity-based product in formation for each treadmill is as follows:

Activity	Activity-Base Usage (hrs. per unit) × Activity Rate per Hour = Activity Cost		
Motor assembly	1.50	20	30.00
Final assembly	1.00	18	18.00
Testing	0.25	22	5.50
Rework	0.40	22	8.80
Moving	0.20	15	3.00
Activity cost per unit			65.30

All of the activity costs are related to labour. Management must remove 2.00 of activity cost from the product in order to remain competitive.

Rework involves disassembling and repairing a unit that fails testing. Not all units require rework, but the average is 0.40 hours per unit. Presently, that testing is done on the completed assembly but much of the rework has been related to motors to test the motor independently, prior to assembling it into the final product. Thus, motor assembly issues can be diagnosed and solved without having to disassemble the completed product. This change will reduce the average rework per unit by one quarter.

As a Management Accountant of the company, determine the new activity cost per unit under the rework improvement scenario.

The average rework per unit will be improved by one-quarter, or 25%. Thus, the new average rework time will be reduced from 0.40 to 0.30 hours [0.40 × (1 – 0.25)].

Activity	Activity-Base Usage (hrs. per unit) × Activity Rate per Hour = Activity Cost		
Motor assembly	1.50	20	30.00
Final Assembly	1.00	18	18.00
Testing	0.25	22	5.50
Rework	0.30	22	6.60
Moving	0.20	15	3.00
			63.10

Remark:

From the above calculations, it is evident that, the Company is able to reduce that cost by ₹ 2.20, with application of ABC System and this will improve that overall profitablity of the Company.

Solved Illustrations & Cases

Illustration 5

You are the Cost Controller of ABC Company Limited. You are vouching for the introduction of Activity Based Costing in the Company and in the meeting with other executives of the Company, you said 'Why is using a single plant wide allocation rate not always accurate?'

You are required to give your view, in support of the above statement.

Solution:

As a Cost Controller of ABC Company Limited, the following points are to be noted, in favour of implementation of Activity Based Costing, in the Company:

1. Using a single plant wide allocation rate is not always accurate because it is based on only one allocation base and uses that same allocation base to allocate overhead to all products.
2. The allocation base selected might not accurately reflect the way products actually use a company's resources (there might not be a direct cause-and-effect relationship with overhead costs).
3. In contrast, activity-based costing (ABC) identifies multiple activities, each with its own allocation base, to more accurately reflect the way products actually use a company's resources (activities).
4. Thus ABC costs are closer to the true cost of making products. One should feel more comfortable making decisions using ABC cost data.

Illustration 6

Your Cost Controller is not happy about the existing system of charging overheads to its Products, A and B. You have been newly appointed as a Management Accountant of the company and you are asked to implement the ABC Costing for allocation of overheads to the Products. You have identified the following activities, budgeted costs, and activity consumption cost drivers as follows:

Activity	Budgeted Cost	Activity Consumption Cost Driver
Engineering	₹ 1,25,000	Engineering hours
Setups	3,00,000	Number of setups
Machine operation	15,00,000	Machine-hours
Packing	75,000	Number of packing orders
Total	**₹ 20,00,000**	

You have also gathered the following operating data pertaining to each of its products:

Particulars	Product A	Product B	Total
Engineering hour	5,000	7,500	12,500
Number of setups	200	100	300
Machine hours	50,000	1,00,000	1,50,000
Number of packing orders	5,000	10,000	15,000

You are now required to provide with necessary calculations and relevant information, in the form of a report to the Cost Controller about the allocation of overheads costs to the products.

Solution:

Basic Calculations and Workings:

Activity Consumption Cost Driver	Budgeted Cost	Budgeted Activity Consumption	Activity Consumption Rate
Engineering hours	₹ 1,25,000	12,500	₹ 10 per hour
Number of setups	3,00,000	300	1,000 per setup
Machine hours	15,00,000	1,50,000	10 per hour
Number of packing Orders	75,000	15,000	5 per order

Factory overhead costs are assigned to both products by these calculations:

Product A (5,000 units)

Activity Consumption	Activity Consumption	Rate Activity Consumption Total Overheads	Cost Driver	Overheads per unit
Engineering hours	₹10	5,000	₹50,000	₹ 10
Number of Setups	1,000	200	2,00,000	40
Machine hours	10	50,000	5,00,000	100
Number of packing orders	5	5,000	25,000	5
Overhead cost per unit				155

Product B (20,000 units)

Activity Consumption Cost Driver	Activity Consumption Rate	Activity Consumption	Total Overheads	Overheads per unit
Engineering hours	₹10	7,500	₹ 75,000	₹ 3.75
Number of setups	1,000	100	1,00,000	5.00
Machine hours	10	1,00,000	10,00,000	50.00
Number of packing orders	5	10,000	50,000	2.50
Overhead cost per unit				61.25

The report should cover the above calculations and necessary explanations, about the selection of Cost Drivers and calculation of Cost Driver rates, for the allocations of overheads to the Products A and B.

Illustration 7

Large service organisations, such as Insurance, Banks and Hospitals, used to be noted for their lack of standard costing systems, and their relatively unsophisticated budgeting and control systems compared with large manufacturing organisations, but this is changing and many large service organisations are now revising their use of management accounting techniques.

Requirements:

a. Explain which features of large-scale service organisations encourage the application of activity-based approaches to the analysis of cost information.

b. Explain which features of service organisations may create problems for the application of activity-based costing.

c. Explain the uses for activity-based cost information in service industries.

d. Many large service organisations were at one time state-owned, but have been privatized. Examples in some countries include electricity supply and telecommunications. They are often regulated. Similar systems of regulation of prices by an independent authority exist in many countries, and are designed to act as a surrogate for market competition in industries where it is difficult to ensure a genuinely competitive market.

Explain which aspects of cost information and systems in service organisations would particularly interest a regulator, and why these features would be of interest.

Solution:

a. Large-scale service organisations have a number of features that have been identified as being necessary to derive significant benefits from the introduction of ABC:

(i) They operate in a highly competitive environment;

(ii) They incur a large proportion of indirect costs that cannot be directly assigned to specific cost objects;

(iii) Products and customers differ significantly in terms of consuming overhead resources;

(iv) They market many different products and services. Furthermore, many of the constraints imposed on manufacturing organisations, such as also having to meet financial accounting stock valuation requirements, or a reluctance to change or scrap existing systems, do not apply.

Many service organisations have only recently implemented cost systems for the first time. This has occurred at the same time as when the weaknesses of existing systems and the benefits of ABC systems were being widely publicized.

These conditions have provided a strong incentive for introducing ABC systems.

b. The following may create problems for the application of ABC:

(i) Facility sustaining costs (such as property rents etc.) represent a significant proportion of total costs and may only be avoidable if the organisation ceases business. It may be impossible to establish appropriate cost drivers;

(ii) It is often difficult to define products where they are of an intangible nature. Cost objects can therefore be difficult to specify;

(iii) Many service organisations have not previously had a costing system and much of the information required to set up an ABC system will be nonexistent. Therefore, introducing ABC is likely to be expensive.

c. The uses for ABC information for service industries are similar to those for manufacturing organisations:

(i) It leads to more accurate product costs as a basis for pricing decisions when cost-plus pricing methods are used;

(ii) It results in more accurate product and customer profitability analysis statements that provide a more appropriate basis for decision-making;

(iii) ABC attaches costs to activities and identifies the cost drivers that cause the costs. Thus, ABC provides a better understanding of what causes costs and highlights ways of performing activities more effectively by reducing cost driver transactions.

Costs can therefore be managed more effectively in the long term. Activities can also be analyzed into value-added and non-value added activities and by highlighting the costs of non-value added activities attention is drawn to areas where there is a potential for cost reduction without reducing the products' service potentials to customers.

d. The following aspects would be of most interest to a regulator:

(i) The costing method used (e.g. marginal, traditional full cost or ABC). This is of particular importance to verify whether or not reasonable prices are being set and that the organisation is not taking advantage of its monopolistic situation.

Costing information is also necessary to ascertain whether joint costs are fairly allocated so that cross-subsidization from one service to another does not apply;

(ii) Consistency in costing methods from period to period so that changes in costing methods are not used to distort pricing and profitability analysis;

(iii) In many situations a regulator may be interested in the ROI of the different services in order to ensure that excessive returns are not being obtained. A regulator will therefore be interested in the methods and depreciation policy used to value assets and how the costs of assets that are common to several services (e.g. corporate headquarters) are allocated.

The methods used will influence the ROI of the different services.

Illustration 8

Hamid & Co, make laptop computers for use in dangerous environments. The company's main customers are organisations like oil companies and the military that require a laptop that can survive rough handling in transport to a site and can be made to their unique requirements.

The company started as a basic laptop manufacturer but its competitors grew much larger and RL had to find a niche market where its small size would not hinder its ability to compete. It is now considered one of the best quality producers in this sector.

Hamid & Company had the same finance director for many years who preferred to develop its systems organically. However, due to fall in profitability, a new chief executive officer (CEO) has been appointed who wishes to review Hamid's financial control systems in order to get better information with which to tackle the profit issue.

The CEO wants to begin by thinking about the pricing of the laptops to ensure that selling expensive products at the wrong price is not compromising profit margins. The laptops are individually specified by customers for each order and pricing has been on a production cost plus basis with a mark-up of 45 per cent. The company uses an absorption costing system based on labour hours in order to calculate the production cost per unit.

The main control system used within the company is the annual budget. It is set before the start of the financial year and variances are monitored and acted on by line managers.

The CEO has been reading about major companies that have stopped using budgets and wants to know how such a radical move works and why a company might take such a step. He has been worried by moves by competitors into Hamid's market with impressive new products. This has created unrest among the staff at Hamid with two experienced managers leaving the company.

Required:

An evaluation of the current method of costing against an activity-based costing (ABC) system.

Solution:

The evaluations are based on the following points:

- The direct costs are identical for both costing methods.
- Direct labour is a relatively minor cost but the existing method that allocates overhead costs on the basis of direct labour hours overstates their importance.
- The existing method is based on the assumption that there is a cause-and-effect relationship between overheads and labour hours. This assumption appears to be unlikely based on the information given in the question. If this assumption is incorrect then misleading results will be reported.
- ABC attempts to allocate overheads based on using several different cost drivers rather than the single base used with the existing method.
- ABC seeks to assign overheads based on cause-and-effect cost drivers. The accuracy of the reported ABC product costs depends on the extent to which the cause-and-effect assumption is correct.

Illustration 9

"The basic idea justifying the use of Activity-Based Costing (ABC) and Activity-Based Budgeting (ABB) are well publicized, and the number of applications has increased. However, there are apparently still significant problems in changing from existing systems".

Requirements:

a. Explain which characteristics of an organisation, such as its structure, product range, or environment, may make the use of activity based techniques particularly useful.

b. Explain the problems that may cause an organisation to decide not to use, or to abandon use of, activity based techniques.

c. Some categorizations of cost drivers provide hierarchical models:

(i) unit-level activities, (ii) batch activities, (iii) product sustaining activities, (iv) facility sustaining activities.

Other analyses focus on 'value adding' and 'non-value adding' activities.

Explain what is meant by 'non-value adding activities', and discuss the usefulness of this form of analysis.

Solution:

a. Activity-based costing (ABC) is a costing method that identifies activities in an organisation and assigns the cost of each activity to all products and services according to the actual consumption by each. Therefore, this model assigns more indirect costs (overhead) into direct costs compared to conventional costing.

   ABC system is a very valuable tool of control. It offers a number of advantages to the management and the following are the main advantages:

(i) It brings accuracy and reliability of the costing data in determination of the cost of the products.

(ii) It facilitates cause and effect relationship to exercise effective cost control.

(iii) It provides necessary cost information to the management to take decisions on any matter, relating to the business.

(iv) It is much helpful in fixing the cost and selling price of a product.

(v) It facilitates overhead costs allocate directly to the specific product.

(vi) It enables to manage the activities rather than costs.

(vii)It helps to remove all types of wastages and inefficiencies.

(viii)It provides valuable information to evaluate on the relative efficiencies of various plants and machinery.

(ix) Cost Driver Rates will help in significant impact on the development of new products or modification of existing products.

b. This will arise when the products manufactured by the manufacturing companies are not standardized and labour hours are predominating. Further a clear distinction between value added and non-value added activities are difficult to make.

c. For solution to this part read the relevant portion of this Study Material.

Illustration 10

State with a brief reason whether you would recommend an activity based system of costing in each of the following independent situations:

(i) Company Dee produces one product. The overhead costs mainly consist of depreciation.

(ii) Company BC produces 5 different products using different production facilities.

(iii) A consultancy firm consisting of lawyers, accountants and computer engineers provides management consultancy services.

(iv) Company Simens produces two different labour intensive products. The contribution per unit in both products is very high. The BEP is very low. All the work is carried on efficiently to meet the target costs.

Solution:

(i) ABC is not applicable. One product situation- for allocation of overhead, ABC is not required. ABC for cost reduction not beneficial since most of the overhead is depreciation.

(ii) Multi product situation, production facilities are different - ABC is required for allocation of overhead. ABC is necessary for pricing, Cost drivers are likely to be different, and Cost reduction may be possible through ABC.

(iii) Variety of services and hence ABC is required for cost allocation.

(iv) Different products, but labour intensive. Hence, overhead allocation based on readily traceable direct labour cost will be accurate. Hence, ABC is not required for cost allocation.

Illustration 11

State whether each of the following independent activities is value-added or non-value-added:

(i) Polishing of furniture used by a systems engineer in a software firm.

(ii) Maintenance by a software company of receivables management software for a banking company

(iii) Painting of pencils manufactured by a pencil factory

(iv) Customers' computer key board cleaning by a computer repair centre.

(v) Providing, brake adjustments in cars received for service by a car service center.

Solution:

(i) Non-Value Added

(ii) Value Added

(iii) Value-Added

(iv) Value-Added

(v) Value-Added

Illustration 12

ABC Ltd. uses activity based costing and accumulates overhead costs in the following cost pools:

- Human Resources
- Parts management
- Purchasing
- Quality Control
- Equipment set-up
- Training employees
- Assembly department
- Receiving department

You are to find out for each cost pool whether the cost pool would be unit-level, batch-level, product-level or facility level.

Solution:

Activity Cost Pool	Level
Human Resources	Facility-level
Parts management	Product-level
Purchasing	Batch-level
Quality Control	Unit-level
Equipment set-up	Unit-level
Training employees	Facility-level
Assembly department	Unit-level
Receiving department	Batch-level

Illustration 13

Particulars	Percentage (%)
Costs relating to sets-up	35
Costs relating to materials handling	15
Costs relating to inspection	50
Total production overhead	100

The following total activity volumes are associated with each product line for the period as a whole:

Product	No. of Set-up	No. of movement of materials	No. of Inspections
A	75	12	150
B	115	21	180
C	480	87	670
	670	120	1,000

Required:

Identify the cost drivers for each of the cost mentioned above.

Solution:

Category	Cost Driver
Set-up costs	Number of set-up.
Materials handling costs	Material movements
Inspection costs	Number of inspections

Illustration 14

Total Overheads	₹1,00,000
Costs relating to set ups	50%
Costs relating to inspections	50%
Number of Set ups	100
Number of Inspections	50

Required

Calculate the various Cost Driver Rates.

Solution:

Step 1 – Pooling the costs

Category	Working	Cost Pool (₹)
Set-up costs	(1,00,000 × 50%)	50,000
Inspection costs	(1,00,000 × 50%)	50,000
Total Overheads		1,00,000

Step 2 – Calculation of Cost per Driver

Category	Number of drivers	Cost Pool (₹)	Working	Cost per Driver Rate (₹)
Set-up costs	100	50,000	(₹50,000 ÷ 100)	500
Inspection costs	50	50,000	(₹50,000÷50)	1000

Illustration 15

ABC & Associates provides consulting and tax preparation services to its clients. It charges a ₹100 fee per hour for each service. The firm's revenues and costs for the month March 2022 are shown in the following income statement:

Particulars	Tax Preparation	Tax Consulting	Total
Revenue - Amount (₹)	1,30,000	2,70,000	4,00,000
Expenses:			
Secretarial support			80,000
Supplies			72,000
Computer costs, etc			40,000
Profit			1,92,000

The firm uses ABC and the following are the cost drives:

Overhead Cost	Cost Driver	Tax Preparation	Tax Consulting
Secretarial support	Number of clients	72	48
Supplies	Transactions with clients	200	300
Computer costs	Computer hours	1,000	600

Required:

a. Complete the income statement using activity-based costing and the firm's three cost drivers.

b. Recompute the income statement using direct-labour hours as the only allocation base: 1,300 hours for tax preparation; 2,700 hours for tax consulting.

c. How might the firm's decisions be altered if it were to allocate all overhead costs using direct labour hours?

d. Under what circumstances would the about-based allocation and activity-based costing (using the three cost drivers) result in similar profit results?

Solution:

Activity-based versus Traditional Costing

(a)

Particulars	Tax Preparation Amount ₹	Consulting Amount ₹	Total Amount ₹
Revenue	1,30,000	2,70,000	4,00,000
Less: Expenses Secretarial support	48,000	32,000	80,000
Supplies	28,800	43,200	72,000
Computer Depreciation	25,000	15,000	40,000
Profit	**28,200**	**1,79,800**	**2,08,000**

Working Notes:

(i) ₹80,000 ÷ 120 clients = ₹666.67 per client

(ii) ₹ 72,000 ÷ 500 transactions = ₹144 per transaction

(iii) ₹40,000 ÷ 1,600 hours = ₹25 per computer hour

(iv) ₹666.67 per client × 72 clients = ₹48,000

(v) ₹144 per hour × 200 transactions = ₹28,800

(vi) ₹25 per computer hour × 1,000 hours = ₹ 25,000

(b)

Particulars	Tax Preparation (₹)	Tax Consulting (₹)	Total (₹)
Revenue	1,30,000	2,70,000	4,00,000
Expenses	62,400	1,29,600	1,92,000
Profit	**67,600**	**1,40,400**	**2,08,000**

Working Notes:

(i) ₹48 per labour hour = ₹1,92,000 total expenses ÷ 4,000 labour hours

(4,000 labour hours = ₹ 4,00,000 revenue ÷ ₹100 per labour hour)

(ii) ₹62,400 = ₹48 per labour hour × 1,300 hours of labour

(iii) 2,700 labour hours × ₹48 per labour hour = ₹1,29,600

(c) Under the labour-based overhead allocation, tax preparation appears to be more profitable than it does under ABC, and might lead the firm to concentrate more heavily on tax preparation.

(d) ABC and traditional costing systems generally yield comparable product-line profits when overhead is a small portion of costs, or when cost drivers are highly correlated with direct-labour hours.

In this case, labour hours were distributed 32.5% to Preparation and 67.5% to Consulting. If firm's three cost drivers were each also distributed 32.5% to preparation and 67.5% to Consulting, the labour-hour and ABC allocation would be identical.

Illustration 16

A manufacturing company has three accounts clerks responsible for processing purchase invoices of suppliers. Each clerk is paid a salary of ₹1,50,000 per annum and is capable of processing 5,000 purchase invoices per year. In addition to the salary, the company spends ₹45,000 per year for printing of forms, postage etc. (assuming that 15,000 purchase invoices are processed).

During the year, 12,500 purchase invoices were processed. You are required to:

a. Calculate the activity rate for the purchase order activity. Break the activity rate into fixed and variable components.

b. Calculate the total activity availability and break this into activity usage and unused activity.

c. Calculate the total cost of resources supplied and break this into activity usage and unused activity.

Solution:

a. Activity Rate = [(3 × ₹1,50,000) + ₹45,000] ÷ 15,000 = ₹33 per invoice

Fixed Activity Rate = ₹4,50,000 ÷ 15,000 = ₹30 per invoice

Variable Activity Rate = ₹45,000 ÷ 15,000 = ₹3 per invoice.

b. Activity availability = Activity usage + Unused Activity

15,000 invoices = 12,500 invoices + 2,500 invoices

c. Cost of resources supplied = Cost of activity used + Cost of unused activity

or, ₹4,50,000 + (₹3 × 12,500) = (₹33 × 12,500) + (₹30 × 2,500)

or, ₹4,87,500 = ₹4,12,500 + ₹75,000

Illustration 17

ABC Company manufactures four products, A, B, C and D, using the same manufacturing process. The following data are available relating to a production period:

Product	Volume	Material Cost per unit (₹)	Direct Labour per unit	Machine Time per unit	Labour Cost Cost per unit (₹)
A	500	5	0.5 hour	¼ hour	3
B	5,000	5	0. 5 hour	¼ hour	3
C	600	16	2 hours	1 hour	12
D	7,000	17	2.5 hours	1.5 hours	9

Total Production Overheads are as under:

Particulars	₹
Machine related Costs	37,749
Set-up Costs	4,250
Ordering Costs	1,920
Material Handling Costs	7,560
Spare parts Administration Costs	8,400
	59,879

The Company absorbs factory overheads to the products by machine hour rate method and the hourly rate per machine hour is ₹4.80. The overheads cost of the products are as under:

Product	₹
A	1.2
B	1.2
C	4.8
D	7.2

The production overheads activities for the period reveal the following:

Products	No. of Set-ups	No. of Materials Orders	No. of times Materials handled	Number of Spare parts
A	1	1	2	2
B	6	4	10	5
C	2	1	3	1
D	8	4	12	4

Prepare a Statement of Overhead Cost for all the Products, by using Activity Based Costing and compare the results with Traditional Costing.

Solution:

No. of Activities:

Set-ups = (1+6+2+8) = 17

Ordering = (1+4+1+4) =10

Handling = (2+ 10+ 3 +12) = 27

Spare parts= (2+ 5+ 1 + 4) = 12

Machine Hours = (125 + 1250 + 600 + 10,500) = 12,475

ABC Cost Pool

Overhead Costs	Amount (₹)	Cost Driver	Activity Nos.	Cost Driver Rate (₹)
Machine related	37,749	Machine Hours	12,475	3.0259
Set-up Costs	4,250	No. of Set-ups	17	250
Ordering Costs	1,920	No. of Orders	10	192
Spare parts	8,400	No. of Spares	12	700
Material Handling	7,560	No. of times	27	280

Statement of Overhead Costs **(₹)**

Product	A	B	C	D
No of Units	**500**	**5,000**	**600**	**7,000**
Overhead Costs: Set-up Costs @ ₹250	250	1,500	500	2,000
Material Ordering@ ₹192	192	768	192	768
Material Handling@ ₹280	560	2,800	840	3,360
Spare parts @ ₹700	1,400	3,500	700	2,800
Machine related@ ₹3.0259	378	3,782	1,816	31,773 (Balance)
Total Overheads	2,780	12,350	4,048	40,701
Overheads Cost /unit (ABC)	5.56	2.47	6.75	5.81
Overheads Cost /unit (Traditional)	1.20	1.20	4.80	7.20
Difference	**4.36**	**1.27**	**1.95**	**(1.39)**

Illustration 18

C Ltd manufactures four products W, X, Y and Z. Output and cost data for the period just ended are as follows:

Products	Output units	Material Cost per unit ₹	Labour Cost per unit ₹	Machine Time per unit (Hours)
W	3,000	50	50	0.50
X	500	70	60	0.50
Y	300	160	100	2.00
Z	1,000	180	75	4.00

Products	W	X	Y	Z	Total
No. of Set-up	10	1	2	5	18
No. of Purchase Orders	6	1	1	5	13
No. of Material Handling	12	1	2	15	30

The following are the Overhead Costs:

Particulars	₹
Set-up Costs	9,000
Purchase Ordering Costs	10,400
Handling Costs	6,000
Other Factory Overhead Costs	1,27,000
	1,52,400

Presently overheads costs are charged to the products on the basis of Machine Hours.

Prepare the Cost Statements under Traditional and ABC.

Solution:

Working Notes:

Total Machine Hours = 1,500 + 250 + 600 +4,000 = 6,350 hours

Overheads per machine hour = ₹ (9,000 +10,400 +6,000 +1,27,000) ÷ 6,350 = ₹ 24

No. of Set-up = 18

Cost per set-up = ₹9,000÷18 = ₹ 500

No. of Purchase Orders = 13

Cost per Purchase Order = ₹ 10,400÷13 = ₹800

No. of Materials Handled = 30

Cost per Material Handled = ₹6,000÷30 = ₹ 200

Other Factory Overheads on the basis of Machine Hours = ₹ 1,27,000÷6,350 hours = ₹ 20.

Statement of Total Costs per unit under Traditional Method (₹)

Products	W	X	Y	Z
Material Cost	50	70	160	180
Labour Cost	50	60	100	75
Overheads (on the basis of Machine hour rate)	12	12	48	96
Total Costs	112	142	308	351

Statement of Total Costs per unit under ABC Method (₹)

Products	W	X	Y	Z
Material Cost	50.00	70.00	160.00	180.00
Labour Cost	50.00	60.00	100.00	75.00
Set-up Cost (₹ 500)	1.67	1.00	3.33	2.50
Purchase Ordering Costs (₹800)	1.60	1.60	2.67	4.00
Handling Costs (₹ 200)	0.80	0.40	1.33	3.00
Other Factory Overheads (₹ 20)	10.00	10.00	40.00	80.00
Total Costs	114.07	143.00	307.33	344.50

Workings:

Product

W: Set-up cost/ unit = 10 × ₹ 500 ÷3,000 = ₹ 1.67

X : Set-up cost/ unit = 1 × ₹ 500 ÷ 500 = ₹ 1

Y: Set-up cost/ unit = 2 × ₹ 500 ÷ 300 = ₹ 3.33

Z: Set-up cost/ unit = 5 × ₹ 500 ÷ 1,000 = ₹ 2.50

Product

W: Purchase Ordering Costs / unit =6 × ₹800÷3,000 = ₹1.60

X: Purchase Ordering Costs / unit = 1 × ₹800÷ 500 = ₹1.60

Y: Purchase Ordering Costs / unit = 1 × ₹800÷ 300 = ₹2.67

Z: Purchase Ordering Costs / unit = 5 × ₹800÷ 1,000 = ₹4.00

Product

W: Handling Costs / unit =12 × ₹ 200 ÷ 3,000 = ₹0.80

X: Handling Costs / unit = 1 × ₹ 200 ÷ 500 = ₹0.40

Y: Handling Costs / unit = 2 × ₹ 200 ÷ 300 = ₹1.33

Z: Handling Costs / unit = 15 × ₹ 200 ÷ 1,000 = ₹3

Product

W: Machining Costs / unit = 3,000 × 0.50 × ₹ 20 ÷ 3,000 = ₹10

X: Machining Costs / unit = 500 × 0.50 × ₹ 20 ÷ 500 = ₹10

Y: Machining Costs / unit = 300 × 2 × ₹ 20 ÷ 300 = ₹40

Z: Machining Costs / unit = 1,000 × 4 × ₹ 20 ÷ 1,000 = ₹80

Illustration 19

A.Ltd. manufactures four products, namely A, B, C and D using the same plant and process. The following information relates to a production period:

Product	A	B	C	D
Output in units	720	600	480	504
Cost per unit (₹): Direct Material	42	45	40	48
Direct labour	10	9	7	8
Machine hours per unit	4 hrs	3 hrs	2 hrs	1 hr

The four products are similar and are usually produced in production runs of 24 units and sold in batches of 12 units. Using machine hour rate currently absorbs the production overheads. The total overheads incurred by the company for the period is as follows:

Particulars	₹
Machine operation and Maintenance cost	63,000
Setup costs	20,000
Store receiving	15,000
Inspection	10,000
Material handling and dispatch	2,592
	1,10,592

During the period the following cost drivers are to be used for the overhead cost:

Cost	Cost driver
Setup cost	No. of production runs
Store receiving	No. of Requisition raised
Inspection	No. of production runs
Material handling and dispatch	Orders executed

It is also determined that:

- Machine operation and maintenance cost should be apportioned between setup cost, store receiving and inspection activity in 4:3:2.
- Number of requisition raised on store is 50 for each product and the no. of order executed is 192, each order being for a batch of 12 of a product.

Required:

(i) Calculate the total costs of each product, if all overhead costs are absorbed on machine hour rate basis.

(ii) Calculate the total costs of each product using activity base costing.

(iii) Comment briefly on differences disclosed between overhead traced by present system and those traced by activity based costing.

Solution:

(a) Total cost of different products (overhead absorption on Machine hour basis) (₹)

Particulars	A	B	C	D
Direct material	42	45	40	48
Direct labour	10	09	07	08
Overhead	72	54	36	18
Cost of production per unit	124	108	83	74
Output (in units)	720	600	480	504
Total cost	**89,280**	**64,800**	**39,840**	**37,296**

Working Note:

Machine hours (720 × 4 + 600 × 3 + 480 × 2 + 504 × 1) = 6,144 hours.

Rate per hour = ₹ 1,10,592 ÷ 6,144 hours = ₹ 18 per hour.

(b) Activity based costing system (₹)

Particulars	A	B	C	D
Direct material	30,240	27,000	19,200	24,192
Direct labour	7,200	5,400	3,360	4,032
Setup	15,000	12,500	10,000	10,500
Store receiving	9,000	9,000	9,000	9,000
Inspection	7,500	6,250	5,000	5,250
Material handling and dispatch	810	675	540	567
Total cost	**69,750**	**60,825**	**47,100**	**53,541**
Per unit cost	96.875	101.375	98.125	106.23

Working Note:

Particulars	Cost (₹)	Drivers	No	Cost per unit of driver (₹)
Set-up*	48,000	Production runs	96	500
Store receiving**	36,000	Requisitions raised	200	180
Inspection***	24,000	Production runs	96	250
Material handling etc.	2,592	Orders	192	13.50

Production Run for A (720/24) = 30; B (600/24) = 25; C (480/24) = 20; D (504/24) = 21.

Total Production Run = 30 + 25 + 20 + 21 = 96.

* Setup = 20,000 + (63,000 × 4/9) = 48,000 ; ** Store Receiving = 15,000 + (63,000 × 3/9) = 36,000 ;

*** Inspection = 10,000 + (63,000 × 2/9) = 24,000.

(c)

Particulars	A	B	C	D
Cost per unit (₹) (a)	124	108	83	74
Cost per unit (₹) (b)	96.88	101.38	98.13	106.23
Difference (₹) (b - a)	**(27.12)**	**(6.62)**	**15.13**	**32.23**

The total overheads which are spread over the four products have been apportioned on different bases, causing the product cost to differ substantially, in respect of product A and D a change from traditional machine hour rate to an activity system may have effect on price and profits to the extent that pricing is based on cost plus approach.

Illustration 20

Kalyani Manufacturing Company has three salaried accounts payable clerks responsible for processing purchase invoices. Each clerk is paid a salary of ₹30,000 and is capable of processing 5,000 invoices per year (working efficiently).

In addition to the salaries, Kalyani spends ₹9,000 per year for forms, postage and so on (assuming 15,000 invoices are processed). During the year, 12,500 invoices were processed.

Required

a. Calculate the activity rate for the purchase order activity. Break the activity into fixed and variable components.

b. Compute the total activity availability, and break this into activity usage and unused activity.

c. Calculate the total cost of resources supplied, and break this into activity usage and unused activity.

Solution:

a. Activity rate [(3 × ₹ 30,000) + ₹ 9,000] ÷15,000= ₹ 6.60 per invoice

Fixed activity rate = ₹ 90,000÷15,000= ₹6.00 per invoice

Variable activity rate = ₹9,000÷15,000 = ₹0.60 per invoice

b. Activity availability = Activity usage + Unused activity

15,000 invoices = 12,500 invoices + 2,500 invoices

c. Cost of resources supplied = Cost of activity used + Cost of unused activity

₹90,000 + (₹0.60 × 12,500) = (₹ 6.60 × 12,500) + (₹6.00 × 2,500)

₹97,500 = ₹82,500 + ₹15,000

Illustration 21

Information relating to the four products made and sold by a company is as follows for one period.

Particulars	A	B	C	D
Output in units	120	100	80	120
Direct material (₹ per unit)	40	50	30	60
Direct labour (₹ per unit)	28	21	14	21
Machine hours per unit	4	3	2	3

The four products are similar and are usually produced in production runs of 20 units and sold in batches of of 10 units.

The total of the production overhead for the period has been analysed as follows:

Particulars	Amount (₹)
Machine department costs (rent, business rates, depreciation and supervision)	10,430
Set-up costs	5,250
Stores receiving	3,600
Inspection/quality control	2,100
Materials handling and dispatch	4,620
	26,000

You have ascertained that the cost drivers to be used in an ABC exercise are as listed below for the overhead costs shown:

Cost pools	Cost driver
Set-up cost	Number of production runs
Stores receiving	Requisitions raised
Inspection/quality control	Number of production runs
Materials handling and dispatch	Orders executed

The number of requisitions raised on the stores was 20 for each product, and the number of orders executed was 42, each order being for a batch of 10 of a product.

Calculate the production costs per unit, using ABC.

Solution:

Cost drivers

Machine dept. cost per hour = ₹10,430/1,300= ₹8.02

No. of production runs = Outputs/20 = 420/20 = 21

Set up and inspection/QC costs per run = (₹5,250+₹ 2,100) ÷ 21= ₹350

Stores receiving cost per requisition= ₹3,600/80 =₹45

Materials handling cost per order =₹4,620/42= ₹110

Workings:

Machine department costs:

These costs will be absorbed on the basis of machine hours

The costs can now be summarized as follows:

Particulars	A	B	C	D
Machine hours	480	300	160	360
Overhead absorbed (@ ₹8.02/hr.) (₹)	3,851	2,407	1,284	2,888

Workings:

Other overhead costs:	A	B	C	D	Total
Number of production runs	6	5	4	6	21
Set-up and inspection/quality control cost absorbed (₹)	2,100	1,750	1,400	2,100	7,350
Requisitions raised	20	20	20	20	80
Stores receiving cost absorbed (₹)	900	900	900	900	3,600
Orders executed (Output/10)	12	10	8	12	42
Material handling cost absorbed (₹)	1,320	1,100	880	1,320	4,620

The costs can now be summarized as follows:

Particulars	A	B	C	D
Direct material (₹)	4,800	5,000	2,400	7,200
Direct labour (₹)	3,360	2,100	1,120	2,520
Prime cost (₹)	8,160	7,100	3,520	9,720
Production overheads:				
Machine department (₹)	3,851	2,407	1,284	2,888
Set-up and inspection/QC (₹)	2,100	1,750	1,400	2,100
Stores receiving (₹)	900	900	900	900
Materials handling and dispatch (₹)	1,320	1,100	880	1,320
Total production cost (₹)	16,331	13,257	7,984	16,928
Production cost per unit (₹)	**136.09**	**132.57**	**99.80**	**141.07**

EXERCISE

Theoretical Questions

Multiple Choice Questions

1. Which of the following is a correct definition of activity-based management?

   A. An approach to the costing and monitoring of activities which involves tracing resource consumption and costing final outputs. Resources are assigned to activities and activities to cost objects based on consumption estimates. The latter utilize cost drivers to attach activity costs to outputs.

   B. The identification and evaluation of the activity drivers used to trace the cost of activities to cost objects. It may also involve selecting activity drivers with potential to contribute to the cost management function with particular reference to cost reduction.

   C. A method of budgeting based on an activity framework and utilizing cost driver data in the budget-setting and variance feedback processes.

   D. A system of management which uses activity-based cost information for a variety of purposes including cost reduction, cost modeling and customer profitability analysis.

2. Which of the following characteristics would be an indicator that a company would benefit from switching to activity based costing?

   A. Only one homogenous product is produced on a continuous basis

   B. The existing cost system is reliable and has produced excellent results

   C. Overhead costs are high and increasing and no one seems to know why

   D. The costs of implementing ABC out-weigh the benefits

3. According to the Chartered Institute of Management Accountants (CIMA), cost attribution to cost units on the basis of benefits received from indirect activities e.g. ordering, setting up, and assuring quality is known as:

   A. Absorption costing

   B. Marginal costing

   C. Activity-based costing

   D. Job costing

4. In an ABC system, which of the following is likely to be classified as a batch level activity?

   A. Machine set-up

   B. Product design

   C. Inspection of every item produced

   D. Production manager's work

5. Activity based costing:

   A. Uses a plant wide overhead rate to assign overhead

   B. Is not expensive to implement

C. Typically applies overhead costs using direct labour hours

D. Uses multiple activity rates

6. Which of the following activities is not a batch level activity?

A. Processing purchase orders

B. Designing products

C. Receive raw materials from suppliers

D. Setting up equipment

7. Which of the following is not included in batch level activities?

A. Material ordering cost

B. Machine set-up cost

C. Inspection cost

D. Designing the product

8. Assigning overhead using ABC often:

A. Shifts overhead costs from high-volume products to low-volume products

B. Shifts overhead costs from low-volume products to high-volume products

C. Provides the same results as traditional costing

D. Requires one predetermined overhead rate

9. In Activity Based Costing:

A. Non-manufacturing costs may not be assigned to products

B. Some manufacturing costs may be excluded from product costs

C. Allocation bases are the same as those used in traditional costing methods

D. Similar to traditional costing, ABC only uses one overhead cost pool

10. In an ABC system, the allocation bases that are used for applying costs to services or procedures are called:

A. Cost Pool

B. Cost Driver

C. Cost Absorption

D. Cost Object

11. Which of the following would not be deducted from sales in a management report prepared using ABC?

A. Direct materials

B. Direct labour

C. Variable selling and administration costs

D. Shipping costs

12. ……. an item for which cost measurement is required e.g. product, job or a customer

    A. Cost Pool

    B. Cost Driver

    C. Cost Absorption

    D. Cost Object

13. Which of the following is different in ABC when compared to traditional costing?

    A. Traditional costing and ABC costing usually yield very similar product costs

    B. In an ABC costing system, costs are only assigned to products that actually required work that gave rise to a particular cost

    C. In ABC, batch-level costs are applied to products using unit-level bases

    D. Under traditional costing, batch-level costs are shifted from high-volume products to low-volume products

14. Process of Cost allocation under Activity Based Costing is

    A. Cost of Activities—Activities—Cost Driver – Cost allocated to cost objects

    B. Cost Driver — Cost of Activities— Cost allocated to cost objects – Activities

    C. Activities— Cost of Activities—Cost Driver – Cost allocated to cost objects

    D. Activities—Cost Driver – Cost allocated to cost objects — Cost of Activities

15. Cost of maintaining a building is

    A. Unit Level Cost

    B. Batch Level Cost

    C. Product Level Cost

    D. Facility Level Cost

16. --------- should be subtracted from net product revenues instead of an arbitrary and illogical apportionment.

    A. Facility Level Cost

    B. Product Level Cost

    C. Organizational Level Cost

    D. High Level Cost

17. The basis of apportionment of overheads which takes into account the profitability of various departments is called:

    A. FIFO basis

    B. LIFO basis

    C. Ability to pay basis

    D. Activity basis

18. Which of the following is the main cost driver of customer order processing activity?

    A. Flow of the product from the assembly line

    B. Order value

    C. Number of problem suppliers

    D. Number of machine charges

19. Painting the product would be an example of which activity level groups

    A. Facility-level activity

    B. Product-level activity

    C. Unit-level activity

    D. Batch-level activity

20. Which of the following tasks is not normally associated with an activity-based costing system?

    A. Calculation of cost application rates

    B. Identification of cost pools

    C. Preparation of allocation matrices

    D. Identification of cost drivers

21. All of the following are examples of batch level activities except:

    A. Purchase order processing

    B. Setting up equipment

    C. The clerical activity associated with processing purchase orders to pro-duce an order for a standard product

    D. Worker recreational facilities

22. Plant depreciation is an example of which activity-level group?

    A. Unit-level activity

    B. Facility-level activity

    C. Batch-level activity

    D. Product-level activity

23. Under activity-based costing, 'material ordering' is considered as —

    A. Unit-level activity

    B. Batch level activity

    C. Product level activity

    D. Facility level activity

24. Samsung an appliance manufacturer is developing a new line of ovens that uses controlled-laser technology. Research and testing costs associated with the new ovens is said to arise from a:

    A. Unit Level Activity

    B. Competitive Level Activity

    C. Facility Level Activity

    D. Product Sustaining Activity

25. The salaries of a manufacturing plant's management are said to arise from:

    A. Unit Level Activities

    B. Batch Level Activities

    C. Product Sustaining Activities

    D. Facility Level Activities

26. The division of activities into unit level, batch level, product sustaining level, and facility level categories is commonly known as a

    A. Cost Object

    B. Cost Application Method

    C. Cost Hierarchy

    D. Cost Estimation Method

27. The main reason for the usage of Activity Based Costing, by replacing the traditional costing system is that:

    A. The overhead recovery rates used in traditional costing systems are inappropriate for decision-making.

    B. The companies deal with more number of products at present

    C. No scope for cause and effect relationship in traditional costing

    D. The new manufacturing technology needs information for feedback of performance even the product is in progress.

28. Costs that are caused by a group of things being made or processed at a single time are referred to as:

    A. Product-level costs

    B. Cost pool

    C. Organizational-level costs

    D. Batch level costs

29. The following statements have been made in relation to activity-based costing:

    (1) A cost driver is a factor which causes a change in the cost of an activity

    (2) Traditional absorption costing tends to under-estimate overhead costs for high volume products

    Which of the above statements is/are true?

    A. 1 only

B. 2 only

C. Neither 1 nor 2

D. Both 1 and 2

30. Which of the following statements is true about activity-based costing (ABC)?

A. ABC is a costing method designed to provide managers with cost information for strategic and other decisions that potentially affect capacity and therefore "fixed" costs

B. ABC is an ordinary a replacement, rather than a supplement for, the company's usual costing system

C. Most organizations that use ABC have only one costing system that serves the needs of external reports and internal decision-making

D. In practice, ABC can only be done one way correctly, meaning that different "flavors" are not allowed

31. To calculate activity rates, all of the following are necessary except:

A. Determine the total activity for each cost pool that would be required to produce the current product mix

B. Determine the total activity for each cost pool that would be required to serve present customers

C. Calculate activity rates by dividing the total cost for each activity by its total activity

D. Calculate activity rates by dividing the total cost for each activity by the percentage of the activity allocated to the product

32. Activity-based costing:

A. Uses a plant-wide overhead rate to assign overhead

B. Is not expensive to implement

C. Typically applies overhead costs using direct labor-hours

D. Uses multiple activity rates

33. Cost attribution to cost units on the basis of benefit received from indirect activities, such as ordering, setting-up, assuring quality is known as:

A. Allocation

B. Activity-based costing

C. Always better control

D. Absorption

34. In activity-based costing, the allocation basis used for applying costs to services or products is called—

A. Cost driver

B. Cost object

C. Allocation

D. Application

35. In activity-based costing, an item for which cost measurement is required is called —

    A. Cost driver

    B. Cost object

    C. Allocation

    D. Cost pool

36. A homogeneous cost pool is one that:

    A. Does not change over time

    B. Needs many activity drivers to be allocated to a cost object

    C. Can be explained with a single activity driver

    D. Has only one type of material assigned to it

37. Review cost of commercial loan applications is cost.

    A. Unit level

    B. Facility level

    C. Batch level

    D. Product sustaining

38. In Traditional absorption costing system cost are first traced to:

    A. Activities

    B. Organizational unit

    C. Products

    D. Cost centers

39. An Activity-Based Costing, an inspection of the product is a -------- level activity:

    A. Unit

    B. Batch

    C. Product

    D. Facility

40. ABC is defined as cost attribution to _____ on the basis of benefit received from indirect activities.

    A. Cost units

    B. Cost objects

    C. Cost centres

    D. Production units

41. Which of the following is not a correct match?

	Activity	Cost Drivers
A.	Production scheduling	Number of production runs
B.	Dispatching	No. of Dispatch orders
C.	Goods receiving	Goods received order
D.	Inspection	Machine hours

42. Basic types of cost pool allocations include:

A. Allocation of costs to segments, products, and services

B. Determining inputs for CVP models

C. Establishing cash flows for capital budgeting analyses

D. Reallocation of costs among service departments

43. Activity based cost systems would probably provide the greatest benefits for organizations that use

A. Job order costing

B. Process costing

C. Standard costing

D. Historical costing

44. Under a traditional costing system, which of the following costs would likely be classified as indirect with respect to the various products manufactured?

A. Plant maintenance

B. Factory supplies

C. Machinery depreciation

D. All of the above

45. PKS Ltd. is changing from a traditional costing system to an activity based system. As a result of this action, which of the following costs would likely change from indirect to direct?

A. Direct materials, factory supplies

B. Production setup, finished-goods inspection & direct materials

C. Production setup, finished-goods inspection and product shipping

D. All of the above

46. Which of the following statements about activity based costing is false?

A. Activity based costing cannot be used by service businesses.

B. In comparison with traditional costing systems, activity based costing tends to use more cost pools and more cost drivers.

C. In comparison with traditional costing systems, activity based costing results in less cost averaging of various diversified activities.

D. In comparison with traditional-costing systems, activity based costing results in more costs being classified as direct costs.

47. Which of the following is least likely to be classified as a batch level activity in an activity based costing system?

A. Quality assurance

B. Receiving and inspection

C. Property taxes

D. Production set-up

Answer:

1-D; 2-C; 3-C; 4-A; 5-D; 6-B; 7-D; 8-A; 9-B; 10-B; 11-D; 12-D; 13-B; 14-C; 15-D; 16-C; 17-D; 18-B; 19-C; 20-C; 21-D; 22-B; 23-B; 24-D; 25-D; 26-C; 27-B; 28-D; 29-A; 30-A; 31-D; 32-D; 33-B; 34-A; 35-B; 36-C; 37-A; 38-B; 39-B; 40-A; 41-D; 42-A; 43-A; 44-D; 45-C; 46-A; 47-C.

⊙ **State True or False**

1. The purpose of moving from a traditional costing system to an ABC system must therefore be based on the premise that the new information provided will lead to action that will increase the overall profitability of the business.
2. Traditional product costing systems were designed when most of the companies manufactured a narrow range of products.
3. Activities comprise of units of work or tasks.
4. Unit-level activities (also known as volume-related activities) are performed each time a unit of the product or service is produced.
5. The term cost pools are used to describe a location to which overhead costs are initially assigned.
6. An ABC analysis cannot reveal the cost of each activity within an organization.
7. ABC recognizes the increased complexity of modern businesses with its multiple cost drivers, many of which are transaction based rather than volume based.
8. ABC tends to burden low-volume (new) products with a punitive level of overhead costs and hence threatens opportunities for successful innovation if it is used without due care.
9. ABC is not a complement to Total Quality Management (TQM) and it provides quantitative data that can track the financial impact of improvements implemented as part of the TQM initiative.
10. Activity based costing is not expensive to implement.

Answer:

1-True; 2-True; 3-True; 4-True; 5-True; 6-False; 7-True; 8-True; 9-False; 10-False;

Fill in the Blanks

1. Designing products activity is not a …….
2. LG an appliance manufacturer is developing a new line of ovens that uses controlled-laser technology. Research and testing costs associated with the new ovens is said to arise from a…….
3. Costs that are caused by a group of things being made or processed at a single time are referred to as…….
4. Activity-based costing uses ……
5. An item for which cost measurement is required in ABC is called…….
6. A method of allocating indirect costs to cost objects that correlate a product's consumption of overhead resources with the number of units produced is known as…….
7. A two-stage cost assignment assigns resource costs to activity …… and then to …….
8. Value-added activities- for which ……. are willing to pay.
9. Basic types of cost pool allocations include…….
10. A ……. activity supports the production of a specific product or service.

Answer:

1-Batch level activities; 2-Product sustaining activities; 3-Batch level cost; 4-Multiple activity rates; 5-Cost object; 6-Volume based cost drivers; 7-Cost pools, cost objects; 8-Customers; 9-Allocation of costs to segments, products & services; 10-Product - level.

Short Essay Type Questions

1. What is the main purpose of Activity-Based Costing (ABC)?
2. What are the benefits of activity based costing?
3. What is a 'Cost Driver'? What is the role of cost driver in tracing cost to products?
4. How to calculate activity-based overhead rate?
5. What is an activity center?
6. Describe the ABC cost hierarchy.
7. Distinguish between resource cost drivers and activity cost drivers.
8. Give two examples for each of the following categories in activity based costing:
   (i) Unit Level activities
   (ii) Batch Level activities
   (iii) Product Level activities
   (iv) Facility Level activities

Essay Type Questions

1. Explain the concept of activity based costing. How ABC system supports corporate strategy?
2. What are the areas in which activity based information is used for decision making?
3. What is the fundamental difference between Activity Based Costing System (ABC) and Traditional Costing System? Why more and more organizations in both the manufacturing and non-manufacturing industries are adopting ABC?

4. Explain the concept of cost drivers and indicate what you will consider as cost drivers for the following business function: Research & development; and Customer service.
5. Differentiate between 'Value-added' and 'Non-value-added' activities in the context of Activity-based costing. Give examples of Value-added and Non-value-added activities.
6. How do managers use ABC systems to price goods or services?
7. Discuss the steps in applying Activity Based Costing?
8. How are activities grouped in a manufacturing company?
9. Distinguish between Traditional Costing System and Activity Based Costing.
10. What factors led to the emergence of ABC systems?
11. Describe the circumstances when traditional costing systems are likely to report distorted costs.
12. Describe each of the four stages involved in designing ABC systems.
13. The traditional methods of cost allocation, cost apportionment and absorption into products are being challenged by some writers who claim that much information given to management is misleading when these methods of dealing with fixed overheads are used to determine product costs. You are required to explain what is meant by cost allocation, cost apportionment and absorption and to describe briefly the alternative approach of activity-based costing in order to ascertain total product costs.
14. (a) Why are conventional product costing systems more likely to distort product costs in highly automated plants? How activity does based costing deal with such a situation?

    (b) 'Attributing direct costs and absorbing overhead costs to the product/service through an activity-based costing approach will result in a better understanding of the true cost of the final output.' You are required to explain and comment on the above statement.

Practical Problems

⊙ Multiple Choice Questions:

1. A company makes two products using the same type of materials and skilled workers. The following information is available:

Particulars	Product A	Product B
Budgeted volume (units)	1,000	2,000
Material per unit (₹)	10	20
Labour per unit (₹)	5	20

Fixed costs relating to material handling amount to ₹1,00,000. The cost driver for these costs is the volume of material purchased.

General fixed costs, absorbed on the basis of labour hours, amount to ₹1,80,000.

Using activity-based costing, what is the total fixed overhead amount to be absorbed into each unit of product B (to the nearest whole ₹) ?

A. ₹113

B. ₹120

C. ₹40

D. ₹105

2. A company uses traditional standard costing system. The inspection and set-up costs are actually ₹1,760 against a budget of ₹2,000. ABC system is being implemented and accordingly the number of batches is identified as the cost driver for inspection and set up. The budgeted production is 10,000 units in batches of 1,000 units whereas actually 9,000 units were produced in 11 batches. The cost per batch under ABC system will be

   A. ₹160

   B. ₹200

   C. ₹180

   D. ₹220

3. X Company uses activity-based costing for Product B and Product D. The total estimated overhead cost for the parts administration activity pool was ₹5,50,000 and the expected activity was 2000 part types. If Product D requires 1200 part types, the amount of overhead allocated to product D for parts administration would be:

   A. ₹2,75,000

   B. ₹3,00,000

   C. ₹3,30,000

   D. ₹3,45,000

4. Fast Ltd. manufactures three types of products A, B, and C following ABC System. During a period, the company incurred ₹73,000 as inspection cost and it was worked for 10, 20 and 9 production runs respectively for producing products A, B, and C. The inspection costs for product B under the ABC system was:

   A. ₹ 15,000

   B. ₹ 40,000

   C. ₹ 18,000

   D. ₹ 24,000

5. A company manufactures and sells packaging machines. It recently introduced activity-based costing to refine its existing system. Each packaging machine requires direct materials costs of ₹50,000; 50 equipment parts; 12 machine hours; 15 assembly line hours and 4 inspection hours. The details about the cost pools, allocation bases and allocation rates are given below:

Indirect cost pool	Cost allocation base	Budgeted allocation rate
Material handling	No. of component parts	₹8 per part
Machining	Machine hours	₹68 per machine hour
Assembly	Assembly line hours	₹75 per assembly hour
Inspection	Inspection hours	₹104 per inspection hour

   The company has received an order for 40 can-packaging machines from a customer. Using activity-based costing, indirect costs allocated to the order of the customer would be:

   A. ₹1,30,850

   B. ₹1,25,280

   C. ₹1,15,050

   D. ₹1,10,280

6. A company operates an activity based costing (ABC) system to attribute its overhead costs to cost objects. In its budget for the year-ending 31st August, 2022. The company expected to place a total of 2000 purchase orders at a total cost of ₹1,00,000. This activity and its related costs were budgeted to occur at a constant rate throughout the budget year which is divided into 13 four week periods.

   During the four-week period ended 30th June 2021, a total of 200 purchase orders were placed at a cost of ₹ 9,000. The over recovery of these costs for the four-week period was

   A. ₹ 2,000

   B. ₹ 3,000

   C. ₹1,500

   D. ₹ 1,000

7. The following information relate to ABC

Activity level	60%	80%
Variable costs (₹)	12,000	16,000
Fixed costs (₹)	20,000	22,000

   The differential cost for 20% capacity is

   A. ₹4,000

   B. ₹2,000

   C. ₹6,000

   D. ₹5,000

8. A company manufactures 500 units of product AX the material cost to manufacture is ₹ 1,50,000, Labour cost ₹2,65,000. Material reordering cost is ₹4,500, Material handling cost is ₹2,500 Material order – 35, Material movement – 20.

   Total Material cost under Activity based costing is.

   A. ₹554

   B. ₹4,22,000

   C. ₹1,57,000

   D. ₹1,084

Answer:

1-B; 2-B; 3-C; 4-B; 5-D; 6-D; 7-C; 8-C.

⊙ Comprehensive Numerical Questions

1. Quality Ltd. is engaged in production of three types of ice-cream products: Coco, Strawberry and Vanilla. The company presently sells 50,000 units of Coco @ ₹ 25 per unit, Strawberry 20,000 @ ₹ 20 per unit and Vanilla 60,000 units @ ₹ 15 per unit. The demand is sensitive to selling price it has been observed that every reduction at ₹ 1 per unit in selling price increases the demand for each product by 10% to the previous level. The company has the production capacity of 60,500 units of Coco, 24,200 units of Strawberry and 72,600 units of Vanilla. The company marks up 25% on cost of the product.

   The Company management decides to apply ABC analysis. For this purpose, it identifies four activities and the rate as follows:

Activity	Cost Rate
Ordering	₹ 800 per purchase order
Delivery	₹ 700 per delivery
Shelf stocking	₹ 199 per hour
Customer support and assistance	₹ 1.10 p.u sold

The other relevant information for the products are as follows:

Particulars	Coco	Strawberry	Vanilla
Direct Material p.u (₹)	8	6	5
Direct Labour p.u (₹)	5	4	3
No. of Purchase Orders	35	30	15
No. of Deliveries	112	66	48
Shelf Stocking Hours	130	150	160

Under the traditional costing system, store support costs are changed @ 30% of prime cost. In ABC these costs area coming under customer support and assistance.

A. Calculate the total cost and unit cost of each product at the maximum level using traditional costing.

B. Calculate the total cost and unit cost of each product at the maximum level using activity based costing.

C. Compare the cost of each product calculated in (1) and (2) above and comment on it.

2. Analyst Ltd. makes a single product with the following details:

Description	Current Situation	Proposed Change
Selling Price (₹/unit)	10	
Direct Costs (₹/unit)	5	
Present number of setups per production period, (before each production run, setup is done)	42	
Cost per set-up (₹)	450	Decrease by ₹90
Production units per run	960	1,008
Engineering hours for production per period	500	422
Cost per engineering hour (₹)	10	

The company has begun Activity Based Costing of fixed costs and has presently identified two cost drivers, viz. production runs and engineering hours. Of the total fixed costs presently at ₹ 96,000, after the above, ₹ 72,100 remains to be analyzed. There are changes as proposed above for the next production period for the same volume of output. Required:

(i) How many units and in how many production runs should Catalyst Ltd. produce in the changed scenario in order to break-even?

(ii) Should Analyst Ltd. continue to break up the remaining fixed costs into activity based costs? Why?

3. M Ltd. was absorbing overheads on the basis of direct labour hours. A newly appointed CMA has suggested that the company should introduce ABC system and has identified cost drivers and cost pools as follows:

Activity Cost Pool	Cost Driver	Associated Cost (₹)
Stores Receiving	Purchase Requisitions	2,96,000
Inspection	Number of Production Runs	8,94,000
Dispatch	Orders Executed	2,10,000
Machine Set-up	Number of Set-up	12,00,000

The following information is also supplied:

Particulars	Product A	Product B	Product C
No. of Set-up	360	390	450
No. of Orders Executed	180	270	300
No. of Production Runs	50	1,050	1,200
No. of Purchase Requisitions	300	450	500

Calculate activity based production cost of all the three products.

4. Zee Ltd. manufactures three types of products namely P, Q and R. The data relating to a period are as under:

Particulars	P	Q	R
Machine hours per unit	10	18	14
Direct Labour hours per unit @ 20	4	12	8
Direct Material per unit (₹)	90	80	120
Production (units)	3,000	5,000	20,000

Currently the company uses traditional costing method and absorbs all production overheads on the basis of machine hours. The machine hour rate of overheads is ₹6 per hour. The company proposes to use activity based costing system and the activity analysis is as under:

Particulars	P	Q	R
Batch size (units)	150	500	1,000
Number of purchase orders per batch	3	10	8
Number of inspections per batch	5	4	3

The total production overheads are analyzed as under:

Machine set up costs	20%
Machine operation costs	30%
Inspection costs	40%
Material procurement related costs	10%

(i) Calculate the cost per unit of each product using traditional method of absorbing all production overheads on the basis of machine hours.

(ii) Calculate the cost per unit of each product using activity based costing principles.

5. Lime Limited manufactures three products P, Q and R which are similar in nature and are usually produced in production runs of 100 units. Product P and R require both machine hours and assembly hours, whereas product Q requires only machine hours. The overheads incurred by the company during the first quarter are as under:

Particulars	₹
Machine Department expenses	18,48,000
Assembly Department expenses	6,72,000
Set-up costs	90,000
Stores receiving cost	1,20,000
Order processing and dispatch	1,80,000
Inspect and Quality control cost	36,000

The data related to the three products during the period is as under:

Particulars	P	Q	R
Units produced and sold	15,000	12,000	18,000
Machine hours worked (hrs.)	30,000	48,000	54,000
Assembly hours worked (direct labour hours	15,000	-	27,000
Customers orders executed (in numbers)	1,250	1,000	1,500
Number of requisitions raised on the stores	40	30	50

Required:

Prepare a statement showing details of overhead costs allocated to each product type using activity based costing.

6. 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	Direct Labour cost/unit (₹)	Machine hours/unit
P	1,000	10	1	6	0.50
Q	10,000	10	1	6	0.50
R	1,200	32	4	24	2.00
S	14,000	34	3	18	3.00

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 has 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.

7. The cost accountant of XYZ Manufacturing attended a workshop on activity-based costing and was impressed by the results. After consulting with the production personnel, he prepared the following information on cost drivers and the estimated volume for each driver:

Products	A	B	C	Total
Units produced	25,000	15,000	5,000	45,000
Direct materials Cost Per Unit in ₹	40.0	30.0	55.0	
Direct labour in ₹	15.0	15.0	15.0	

Cost driver	Cost driver volume			
	A	B	C	Total
Number of setups	125	75	50	250
Machine Hours	2,500	1,500	2,000	6,000
Direct labour hours	25,000	15,000	5,000	45,000
Number of Inspection	50	25	25	100

The cost accountant also determined how much overhead costs were incurred in each of the four activities as follows:

Activity	Overhead costs in ₹
Machining- Set-up	1,50,000
Machining	7,50,000
Assembly	3,60,000
Inspection	90,000

Required:

(i) Determine the cost driver rate for each activity cost pool.

(ii) Use the activity-based costing method to determine the unit cost for each product.

8. The information and data in the following tables will be used to determine cost drivers and calculate overheads.

Product X	Product Y	Product Z
High volume	Medium volume	Low volume
Large batches	Medium batches	Small batches
Few purchase orders placed	Medium purchase orders placed	Many purchase orders placed
	Medium components	Many components
Few customer orders placed	Medium customer orders placed	Many customer orders placed

	Product X	Product Y	Product Z	Total
Typical batch size	2,000	600	325	
No. of production runs	25	50	50	125
No. of inspections	25	50	50	125
Purchase orders placed	25	100	200	325
Customer orders received	10	100	200	310
Analysis of indirect labour	₹000	Total	₹000	

Machining:

Supervision	100	
Set-up	400	
Quality control	400	900
Assembly:		
Supervision	200	
Quality control	400	600
Purchasing/order processing:		
Resource procurement	300	
Customer liaison/expediting	300	600
Factory management:		
General administration	100	**2,200**

Prepare an ABC analysis and calculate product costs.

9. Blue Star Company manufactures two products, Deluxe and Regular, and uses a traditional two-stage cost allocation system. The first stage assigns all factory overhead costs to two production departments A and B, based on machine-hours. The second stage uses direct labour-hours to allocate overhead to individual products.

For 2022, the firm budgeted ₹10,00,000 total factory overhead cost for these operations.

Particulars	Production Department A	Production Department B
Machine-hours	4,000	16,000
Direct labour-hours	20,000	10,000

The following information relates to the firm's operations for the month of January:

Particulars	Deluxe	Regular
Units produced and sold	200	800
Unit cost of direct materials	₹100	₹50
Hourly direct labour wage rate	₹25	₹ 20
Direct labour-hours in Department A per unit	2	2
Direct labour-hours in Department B per unit	1	1

The Company is considering implementing an activity-based costing system. Its management accountant has collected the following information for activity cost analysis for 2022:

Activity	Budgeted Overheads (₹)
Material movement	7,000
Machine setups	400,000
Inspections	588,000
Shipment	**5,000**
	10,00,000

Particulars	Budgeted Quantity	Driver Consumption	
		Deluxe	Regular
Number of production runs	350	15	20
Number of setups	500	25	50
Number of units	19,600	200	800
Number of shipments	250	50	100

Required

(i) Calculate the unit cost for each of the two products under the existing volume-based costing system.

(ii) Calculate the overhead per unit of the cost driver under the proposed ABC system.

(iii) Calculate the unit cost for each of the two products if the proposed ABC system is adopted.

10. Company ABC has the following information applicable to its products:

Total Overheads = ₹1,00,000

Total machine Hours = 50,000

Product	A	B
Units of Production	2,500	5,000
Material Cost per/unit (₹)	30	50
Labour Cost per unit (₹)	20	16
Machine Hrs. Per/unit	10	5

Particulars	Percentage Overheads (%)
Set-up Costs	35
Inspections	45
Materials Handling	20

Particulars	A	B	Total
No. of Set-up	300	50	350
No. of Inspections	500	250	750
No. of Movements of Goods	300	700	1000

What is the Cost per unit of A and B?

(i) Under Traditional Absorption Costing.

(ii) Under ABC.

Unsolved Cases

1. You have recently been employed by STU Ltd. as their Management Accountant. The senior partner, Mr. X, has doubts about the usefulness of the figures produced by the previous accountant. He has heard that Activity Based Costing (ABC) may be an appropriate system for the firm to adopt.

   In response to the request from Mr. X, you are required to prepare a brief report on how Activity Based Costing System (ABC) works and what benefits the company can expect from introducing the ABC system. Explain with the help of a simple illustration.

2. ABC Industries manufactures Industrial tools after creating a mould for each newly designed tool. ABC Industries inspects every unit during the trial run of a new mould and 10 percent of the units manufactured in the first three batches.

   Some of the activities of the firm are as under:

   a. Designing moulds

   b. Creating moulds

   c. Inspecting moulds

   d. Modifying moulds

   e. Setting up production

   f. Requesting and moving materials

   g. Machining

   h. Insuring equipment

   i. Paying suppliers

   j. Heating the factory

   You are a newly appointed Cost Accountant, having knowledge in ABC approach, are requested by the Managing Director to classify the above activities into unit-level, batch-level, product-level or facility-level activity and also to identify a proper cost driver for each activity.

Key Terms:
Activity - based costing (ABC) is a costing approach that assigns resource costs to cost objects based on activities performed for the cost objects.
A two - stage cost assignment assigns resource costs to activity cost pools and then to cost objects.
An activity is a specific task or action of work done.
A resource is an economic element needed or consumed in performing activities.
A resource consumption cost driver is a measure of the amount of resources consumed by an activity.
An activity consumption cost driver measures how much of an activity a cost object uses.
A unit- level activity is performed for each unit of the cost object.
A batch- level activity is performed for each batch or group of products or services.
A product- level activity supports the production of a specific product or service.
A facility- level activity supports operations in general.
Batch- related activities- Activities that are performed each time a batch of goods is produced.
Business- sustaining activities- Activities performed to support the organization as a whole, also known as facility-sustaining activity.
Consumption ratio-the proportion of each activity consumed by a product.
Facility-sustaining activities- Activities performed to support the organization as a whole, which are normally not affected by a decision that is to be taken. It is also known as business-sustaining activities.
Resource cost driver- A cause-and-effect cost driver used to allocate shared resources to individual activities.
Volume-based cost drivers- A method of allocating indirect costs to cost objects that correlate a product's consumption of overhead resources with the number of units produced.
Value-added activities- for which customers are willing to pay.
Non-value added activities- for which customers are not willing to pay.

SECTION - C

DECISION MAKING TOOLS

Marginal Costing 3

This Module includes:

Marginal Costing

SLOB Mapped against the Module

To develop detail understanding of costing frameworks, tools, and techniques to facilitate managerial decision making for cost control and optimisation, and determination of prices with optimised product mix. (CMLO 2b, 3a, b)

Module Learning Objectives:

After studying this module, the students will be able to

- Grasp the fundamental difference between the absorption costing system and the marginal costing system.
- Understand the tools and techniques of marginal costing.
- Appreciate the use of the technique of differential costing in decision making.

Concept 3.1

In cost accounting, cost of production per unit of the goods produced or services provided is calculated with the help of the various methods such as Unit Costing (Job Costing, Batch Costing, Contract Costing) or Process Costing. Marginal costing is not a method of calculating the cost of production as per the mentioned methods, but it is a technique applicable to the existing methods to find out the effect on profits if changes are made either in the volume of output or in the type of output. Thus, marginal costing is a technique which helps the management in taking various routine and special or crucial decisions for running the organizational activities like:

a. To continue with a product or not,

b. To change the selling price as per the market conditions,

c. To change the method of production,

d. To make or buy decision,

e. To decide about sales mix.

Marginal Costing

Marginal Costing is the practice of charging all marginal costs to operations processes or products and deducting all fixed costs against the profits for a particular period in which they arise.

Marginal Costing may be defined as "the ascertainment by differentiating between fixed cost and variable cost, of marginal cost and of the effect on profit of changes in volume or type of output." With marginal costing procedure costs are separated into fixed and variable cost.

According to J. Batty, Marginal costing is "a technique of cost accounting pays special attention to the behaviour of costs with changes in the volume of output." This definition lays emphasis on the ascertainment of marginal costs and also the effect of changes in volume or type of output on the company's profit.

In other words, Marginal costing may be defined as the technique of presenting cost data wherein variable costs and fixed costs are shown separately for managerial decision-making. It should be clearly understood that marginal costing is not a method of costing like process costing or job costing. Rather it is simply a method or technique of the analysis of cost information for the guidance of management.

Marginal Cost

The term 'marginal cost' is defined as the amount at any given volume of output by which aggregate costs are changed, if the volume of output is increased or decreased by one unit. It is a variable cost of one unit of a product or a service i.e., a cost which would be avoided if that unit was not produced or provided.

Marginal Cost = Variable Cost = Direct Labour + Direct Material + Direct Expenses + Variable Overheads

The term Marginal Cost refers to the amount at any given volume of output by which the aggregate costs are charged if the volume of output is changed by one unit. Accordingly, it means that the added or additional cost of an extra unit of output.

Marginal cost may also be defined as the "cost of producing one additional unit of product." Thus, the concept marginal cost indicates wherever there is a change in the volume of output; certainly there will be some change in the total cost. It is concerned with the changes in variable costs. Fixed cost is treated as a period cost and is transferred to Profit and Loss Account.

Marginal Costs can be presented as under:

Particulars	₹
Raw Material Cost	x
Direct Labour Cost	x
Direct Expenses	x
Variable Manufacturing Expenses	x
Variable portions of Administration Expenses	x
Variable portions of Selling and Distribution Expenses	x
Total Marginal Costs/ Variable Costs	**xxxx**

Marginal costing principles can be understood with help of the following example:

Illustration 1

XYZ Co. makes a product, the Goldy, which has a variable production cost of ₹6 per unit and a sales price of ₹10 per unit. At the beginning of September 2021, there were no opening inventories and production during the month was 20,000 units. Fixed costs for the month were ₹ 45,000 (production, administration, sales and distribution). There were no variable marketing costs.

Required

Calculate the contribution and profit for September 2021, using marginal costing principles, if sales were as follows:

(a) 10,000 Goldies (b) 15,000 Goldies (c) 20,000 Goldies

Solution:

The stages in the profit calculation are as follows:

1. To identify the variable cost of sales, and then the contribution

2. To deduct fixed costs from the total contribution to derive the profit

3. To value all closing inventories at marginal production cost (₹ 6 per unit)

Amount in ₹

Particulars	10,000 Goldies		15,000 Goldies		20,000 Goldies	
Sales (at ₹10)		1,00,000		1,50,000		2,00,000
Variable production cost	1,20,000		1,20,000		1,20,000	
Less:value of closing inventory (at marginal cost)	60,000		30,000			

Variable cost of sales		60,000		90,000	1,20,000
Contribution		40,000		60,000	80,000
Less: fixed costs		45,000		45,000	45,000
Profit / (loss)		(5000)		15,000	35,000
Profit (loss) per unit		(0.50)		1	1.75
Contribution per unit		4		4	4

The conclusions which may be drawn from this example are as follows:

a. The profit per unit varies at differing levels of sales, because the average fixed overhead cost per unit changes with the volume of output and sales.

b. The contribution per unit is constant at all levels of output and sales. Total contribution, which is the contribution per unit multiplied by the number of units sold, increases in direct proportion to the volume of sales.

c. Since the contribution per unit does not change, the most effective way of calculating the expected profit at any level of output and sales would be as follows.

   (i) First, to calculate the total contribution.

   (ii) Then to deduct fixed costs as a period charge in order to find the profit.

d. In our example the expected profit from the sale of 17,000 Goldies would be as follows:

Particulars	₹
Total contribution (17,000 × ₹4)	68,000
Less: fixed costs	45,000
Profit	**23,000**

   (i) If total contribution exceeds fixed costs, a profit is made.

   (ii) If total contribution exactly equals fixed costs, no profit or loss is made.

   (iii) If total contribution is less than fixed costs, there will be a loss.

Marginal costing, as one of the tools of management accounting helps management in making certain decisions. It provides management with information regarding the behavior of costs and the incident of such costs on the profitability of an undertaking. Marginal costing is defined as "the ascertainment of marginal costs and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs". Marginal costing is not a separate costing. It is only a technique used by accountants to aid management decision. It is also called as "Direct costing". This technique of costing is also known as "Variable Costing", "Differential costing" or "Out-of- pocket" costing. The following points are noteworthy:

a. Only variable costs are considered for product costing and inventory valuation.

b. Fixed costs are regarded as period costs. The Profitability of different products is judged by their P/V ratio.

c. Cost data presented highlight the total contribution of each product.

d. The difference in the magnitude of opening stock and closing stock does not affect the unit cost of production.

e. In case of marginal costing the cost per unit remains the same, irrespective of the production as it is valued at variable cost

Features of Marginal Costing

Features of marginal costing are as follows:

a. Marginal costing is used to know the impact of variable cost on the volume of production or output.

b. Break-even analysis is an integral and important part of marginal costing.

c. Contribution of each product or department is a foundation to know the profitability of the product or department.

d. Addition of variable cost and profit to contribution is equal to selling price.

e. Marginal costing is the base of valuation of stock of finished product and work in progress.

f. Fixed cost is recovered from contribution and variable cost is charged to production.

g. Costs are classified on the basis of fixed and variable costs only. Semi-fixed costs are also divided into fixed cost and variable cost.

Assumptions of Marginal Costing

The technique of marginal costing is based upon the following assumptions:

a. All elements of cost-production, administration and selling and distribution can be segregated into fixed and variable components.

b. Variable cost remains constant per unit of output irrespective of the level of output and thus fluctuates directly in proportion to changes in the volume of output.

c. The selling price per unit remains unchanged or constant at all levels of activity.

d. Fixed costs remain unchanged or constant for the entire volume of production.

e. The volume of production or output is the only factor which influences the costs.

Advantages of Marginal Costing

The following are the important advantages of marginal costing:

a. The Technique of marginal costing is very simple to operate and easy to understand. Since, fixed costs are kept outside the unit cost; the cost statements prepared on the basis of marginal cost are much less complicated.

b. By not charging fixed overhead to cost of production, the effect of varying charges per unit is avoided.

c. It does away with the need for allocation, apportionment and absorption of fixed overheads and hence removes the complexities of under-absorption of overheads.

d. Marginal cost remains the same per unit of output irrespective of the level of activity. It is constant in nature and helps the management in production planning.

e. Marginal costing is essentially useful to management as a technique in cost analysis and cost presentation. It enables the presentation of data in a manner useful to different levels of management for the purpose of controlling costs. Therefore, it is an important technique in cost control.

f. It prevents the carry forward of current year's fixed overheads through valuation of closing stocks. Since fixed costs are not considered in valuation of closing stocks, there is no possibility of factitious profits by over-valuing stocks.

g. It facilitates the calculation of various important factors, break – even point expectations of profits at different levels of production, sales necessary to earn a predetermined target of profit, effect on profit, effect on profit

due to changes of raw materials prices, increased wages, change in sales mixture, etc.

h. It is a valuable aid to management for decision – making and fixation of selling prices, selection of a profitable product/sales mix, make or buy decision, problem of key or limiting factor, determination of the optimum level of activity, close or shut down decisions, evaluation of performance and capital investment decisions, etc.

i. It facilitates the study of relative profitability of different product lines, departments, production facilities, sales divisions, etc.

j. It is complimentary to standard costing and budgetary control and can be used along with them to yield better results.

k. Since fixed costs are not controllable and it is only variable or marginal cost that is controllable, marginal costing, by dividing costs into controllable and non-controllable, help in cost control.

l. When there are different products, the determination of number of units of each product, called Optimum Product Mix, is made with the help of marginal costing.

m. Similarly, optimum sales mix i.e., sales of each and every product to get maximum profit can also be determined with the help of marginal costing.

n. It helps the management in profit planning by making a study of relationship between cost, volume and profits. Further, break-even charts and profit graphs make the whole problem easily understandable even to a layman.

o. It is very useful in management reporting marginal costing facilitates 'Management by exception' by focusing attention of the management towards more important areas than to waste time on problems which do not require urgent attention of the higher managements.

p. It helps in short-term profit planning by breakeven and profitability analysis, both in terms of quantity and graphs. Comparative profitability and performance between two or more products and divisions can easily be assessed and brought to the notice of management for decision making.

q. Apart from the above, numerous managerial decisions can be taken with the help of marginal costing, some of which, may be as follows:-

- Make or buy decisions,
- Exploring foreign markets,
- Accept an order or not,
- Determination of selling price in different conditions,
- Replace one product with some other product,
- Optimum utilisation of labour or machine hours,
- Evaluation of alternative choices,
- Subcontract some of the production processes or not,
- Expand the business or not,
- Diversification,
- Shutdown or continue.

Limitations of Marginal Costing

In spite of so many advantages, the technique of marginal costing suffers from the following limitations:

a. The technique of marginal costing is based upon a number of assumptions which may not hold good under all circumstances.

b. The separation of costs into fixed and variable is difficult and sometimes gives misleading results.

c. Normal costing systems also apply overhead under normal operating volume and this shows that no advantage is gained by marginal costing.

d. All costs are not divisible into fixed and variable. There are certain costs which are semi – variable in nature. It is very difficult and arbitrary to classify these costs into fixed and variable elements.

e. Variable costs do not always remain constant and do not always vary in direct proportion to volume of output because of the laws of diminishing and increasing returns.

f. Selling prices do not remain constant forever and for all levels of output due to competition, discounts for bulk orders, changes in the general price level, etc.

g. Fixed costs do not remain constant after a certain level of activity. Further, marginal costing ignores the fact that fixed costs are also controllable.

h. Application of fixed overhead depends on estimates and not on the actuals and as such there may be under or over absorption of the same.

i. Under marginal costing, stocks and work in progress are understated. The exclusion of fixed costs from inventories affect profit and true and fair view of financial affairs of an organisation may not be clearly transparent.

j. The exclusion of fixed costs from the stocks of finished goods and work-in-progress is illogical since fixed costs are also incurred on the manufacture of products. Stocks valued on marginal costing are undervalued and the profit and loss account cannot reveal true profits. Similarly, as the stocks are undervalued, the balance sheet does not give a true picture.

k. Although the technique of marginal costing overcomes the problem of under or over absorption of fixed overheads, the problem still exists in regard to under or over absorption of variable overheads.

l. Marginal costing completely ignores the 'time factor'. Thus, if two jobs give equal contribution but one takes longer time to complete, the one which takes longer time should be regarded as costlier than the other. But this fact is ignored altogether under marginal costing.

m. The technique of marginal costing cannot be applied in contract or ship building industry because in such cases, normally the value of work-in-progress is very high and the exclusion of fixed overheads may result into losses every year and huge profit in the year of completion of the job.

n. Cost control be better being achieved with the help of other techniques, viz., standard costing and budgetary control than by marginal costing technique.

o. Fixation of selling price in the long run cannot be done without considering fixed costs. Thus, pricing decisions cannot be based on marginal cost alone.

p. In the present days of automation, the proportion of fixed costs in relation to variable costs is very high and hence managerial decisions based upon only the marginal cost ignoring equally important element of fixed cost may not be correct.

q. Volume variance in standard costing also discloses the effect of fluctuating output on fixed overhead. Marginal cost data becomes unrealistic in case of highly fluctuating levels of production, e.g., in case of seasonal factories.

r. Control affected by means of budgetary control is also accepted by many. In order to know the net profit, we should not be satisfied with contribution and hence, fixed overhead is also a valuable item. A system which ignores fixed costs is less effective since a major portion of fixed cost is not taken care of under marginal costing.

s. In practice, sales price, fixed cost and variable cost per unit may vary. Thus, the assumptions underlying the theory of marginal costing sometimes becomes unrealistic. For long term profit planning, absorption costing is the only answer.

Tools and Techniques of Marginal Costing

1. Contribution

In common parlance, contribution is the reward for the efforts of the entrepreneur or owner of a business concern. From this, one can get in his mind that contribution means profit. But it is not so. Technically or in Costing terminology, contribution means not only profit but also fixed cost. That is why; it is defined as the amount recovered towards fixed cost and profit.

Contribution can be computed by subtracting variable cost from sales or by adding fixed costs and profit.

Symbolically, $C = S - V \rightarrow (1)$

Where C = Contribution*

S = Selling Price*

V = Variable Cost*

Also $C = F + P \rightarrow (2)$

Where F = Fixed Cost#

P = Profit

* These can be found out both product wise and total

Fixed cost can be found out only for total

From (1) and (2) above, we may deduce the following equation called Fundamental Equation of Marginal Costing i.e.

$S-V = F + P \rightarrow (3)$ (can be found out only for total)

Contribution is helpful in determination of profitability of the products and/or priorities for profitabilities of the products. When there are two or more products, the product having more contribution is more profitable.

For example: The following are the three products with selling price and cost details:

Amount (₹)

Particulars	A	B	C
Selling Price (₹)	100	150	200
Variable Cost (₹)	50	70	100
Contribution (₹)	50	80	100

In the above example, one can say that the product 'C' is more profitable because, it has more contribution. This proposition of product having more contribution is more profitable is valid, as long as, there are no limitations on any factor of production. In this context, factors of production means, the factors that are responsible for producing the products such as material, labour, machine hours, demand for sales etc.

Measure of profitability when there is a Limiting Factor (or) Key Factor:

In the above example, we find that product having more contribution is more profitable. However, when there is a limitation on any input factor, the profitability of the product cannot simply be determined by finding out the contribution of the unit, but it can be found out by ascertaining the contribution per unit of that factor of production which is limited in the given situation. Such factor of production which is limited in the question is called key factor or limiting factor.

Continuing the above example, it may be explained as follows:

The three products take same raw material. A takes 1 kg, B requires 2 kgs, C requires 5 kgs and the raw material is not abundant.

Then profitability of the above products is determined as follows:

$$\text{Profitability} = \left(\frac{\text{Contribution per unit}}{\text{Key Factor}}\right)$$

A	B	C
50 / 1 = ₹ 50	80 / 2 = ₹ 40	100 / 5 = ₹ 20

Now, product A is more profitable because it has more contribution per kg of material.

The key factor can also be called as scarce factor or Governing factor or Limiting factor or Constraining factor etc., whatever may be the name, it indicates the limitation on the particular factor of production.

From the above, it is essentially understandable that contribution is helpful in determination of profitability of the products, priorities for profitability of the products and in particular, profitabilities when there are limitation on any factor.

2. Profit Volume Ratio (P/V Ratio) or Contribution Ratio

A ratio is a statistical or mathematical tool with the help of which a relationship can be established between the variables of the same kind. Further, it may be expressed in different forms such as fractional form, quotient, percentage, decimal form, and proportional form.

For example:

Gross profit ratio: It may be expressed as follows:

- Gross profit is ¼th of sales
- Sales is 4 times that of gross profit
- Gross profit ratio is 25%
- Gross profit is 0.25 of sales and lastly
- Gross profit and sales are in the ratio of 1:4

So, P/V ratio or contribution ratio is association of two variables. From this, one may assume that it is the ratio of profit and sales. But it is not so. It is the ratio of Contribution to Sales.

$$\text{Symbolicaly, P/V ratio} = \left(\frac{\text{Contribution per unit}}{\text{Key Factor}}\right) \times 100 \rightarrow (1)$$

$$\Rightarrow \quad \text{P/V ratio} = \left(\frac{\text{Contribution}}{\text{Sales*}} \times 100\right)$$

$$\Rightarrow \quad \text{Contribution} = \text{Sales} \times \text{P/V ratio} \rightarrow (2)$$

$$\Rightarrow \quad \text{Sales} = \left(\frac{\text{Contribution}}{\text{P/V Ratio}}\right) \rightarrow (3)$$

When cost accounting data is given for two periods, then:

$$\text{P/V ratio} = \left(\frac{\text{Change in Contribution}}{\text{Change in Sales}} \times 100\right)$$

$$\text{or, P/V ratio} = \left(\frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100\right)$$

* When the limiting factor or key factor is not specifically mentioned, Sales is considered as the limiting factor.

It is to be noted that the above two formulas are valid as long as there are no changes in prices, means input prices and selling prices.

Usually, Sales = Cost + Profit

i.e. it can also be written as Sales = Variable Cost + Fixed Cost + Profit and this is called general sales equation.

Since Sales consists of variable costs and contribution, given the variable cost ratio, P/V ratio can be found out. Similarly, given the P/V ratio, variable cost ratio can be found out.

For example, P/V ratio is 40%, then variable cost ratio is 60%, given variable cost ratio is 70%, then P/V ratio is 30%. Such a relationship is called complementary relationship. Thus, P/V ratio and variable cost ratios are said to be complements of each other.

P/V ratio is also useful like contribution for determination of profitabilities of the products as well as the priorities for profitabilities of the products. In particular, it is useful in determination of profitabilities of the products in the following two situations:

(i) When sales potential in value is limited.

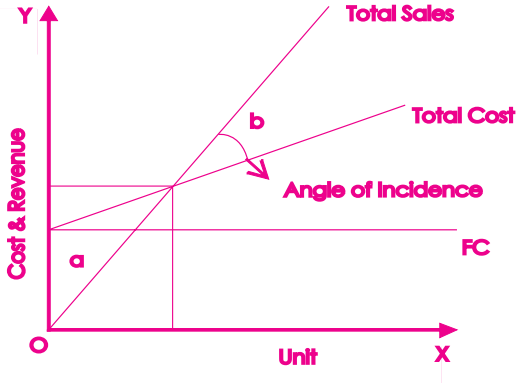
(ii) When there is a greater demand for the products.

3. Break Even Point

When someone asks a layman about his business he may reply that it is alright, but a technical man may reply that it is break even. So, Break Even means the volume of production or sales where there is no profit or loss. In other words, Break Even Point is the volume of production or sales where total costs are equal to revenue. It helps in finding out the relationship of costs and revenues to output. In understanding the breakeven point, cost, volume and profit are always used. The break even analysis is used to answer many questions of the management in day to day business.

Break-even Chart is a graphical representation of the Break- Even Analysis, i.e. Cost-Volume- Profit relationship. It indicates the point of production at which there is neither profit nor loss. It also indicates the estimated profit or loss at different levels of production.

The formal break even chart is as follows:



Area represented by a = Loss Area Area represented by b = Profit Area

Figure 3.1 Graphical representation of the Break-Even Analysis

When no. of units are expressed on X-axis and costs and revenues are expressed on Y-axis, three lines are drawn i.e., fixed cost line, total cost line and total sales line. In the above graph we find there is an intersection point of the

total sales line and total cost line and from that intersection point if a perpendicular is drawn to X-axis, we find break even units. Similarly, from the same intersection point a parallel line is drawn to X-axis so that it cuts Y-axis, where we find Break Even point in terms of value. This is how, the formal pictorial representation of the Break Even chart.

At the intersection point of the total cost line and total sales line, an angle is formed called Angle of Incidence.

Break Even Analysis (or) Cost-Volume-Profit Analysis (CVP analysis):

From the breakeven charts breakeven point and profits at a glance can be found out. Besides, management makes profit planning with the help of breakeven charts. It can clearly be understood by way of charts to know the changes in profit due to changes in costs and output. Such profit planning is made with the variables mainly cost, profit and volume, such an analysis is called breakeven analysis. Throughout the charts relationship is established among the cost, volume and profit, it is also called Cost-Volume-Profit Analysis (CVP analysis). The analysis is further explained in Module 3.3.

COMPUTATION OF BREAK EVEN POINT

Break Even Point in value $= \frac{F \times S}{S - V}$ ..... (1)

$= \frac{F \times S}{C}$ ..... (2)

$= \frac{F \times S}{F + P}$ ..... (3)

$= \frac{F}{P.V.\ Ratio}$ ..... (4)

or $= \frac{F}{C/S}$

or $= \frac{F}{\frac{S - V}{S}}$

or $= \frac{F}{1 - \frac{V}{S}}$ ..... (5)

Break Even Point (in units) = Fixed Cost / Contribution per unit

Proof for basic breakeven:

Let, V be the variable cost per unit

U be the volume of output i.e., No. of units

P be the Profit

F be the Fixed Cost

S be the Selling Price

Where,

F = Fixed Cost

V = Variable Cost per unit

S = Sales

P = Profit

C = Contribution

By substituting the notations in general sales equation:

Sales = Fixed cost + Variable cost + Profit

SU = F + VU + P

At Break Even, SU = F +VU (Since P = 0)

or, SU – VU = F

or, U(S – V) = F

or, $U = \frac{F}{S - V}$

or, No. of Units = $\frac{\text{Fixed Cost}}{\text{Contribution per Unit}}$

Break even sales:

SU (Sales) = $\frac{F \times S}{S - V}$

4. Margin of Safety

It is the sales point beyond the breakeven point. Margin of safety can be obtained by subtracting break even sales from actual sales. It is useful to determine financial soundness of business enterprise. If margin of safety is high, then the financial position of the enterprise is sound.

Margin of Safety = Total Sales – Break Even Sales → (1)

Total Sales = Break Even Sales + Margin of Safety Sales → (2)

- Margin of safety can also be computed as follows:

Margin of Safety = Profit / P/V ratio → (3)

A relative measure to the margin of safety is its ratio to total sales.

- Margin of safety ratio is the ratio of Margin of safety sales to Total sales.

Margin of safety ratio = [Margin of safety / Total sales] × 100 → (4)

- Margin of safety ratio and Break even sales ratios are complements of each other.
- If the sales amount, P/V ratio and M/S ratio are given, then profit can be computed as follows:

Profit = Total sales x P/V ratio x M/S ratio → (5)

Apart from the above formulae, various formulae that are used in the chapter to find out different results are as follows:

Profit = (Sales x P/V ratio) – Fixed Cost

Sales value to earn desired profit = $\frac{\text{Fixed Cost + desired Profit}}{\text{P/V Ratio}}$ and

Required units to earn desired profit = $\frac{\text{Fixed Cost + desired Profit}}{\text{Contribution per unit}}$

Fixed cost = (Sales x P/V ratio) – Profit

Total sales = Break even sales + Margin of safety sales

or, Break even sales = Total sales – Margin of safety sales

or, Margin of safety sales = Total sales – Break even sales

Fixed cost = Break even sales × P/V ratio

$$\text{Shut down sales} = \frac{\text{Fixed Cost - Shut Down Costs}}{\text{P/V Ratio}}$$

$$\text{Shut down Units} = \frac{\text{Fixed Cost - Shut Down Costs}}{\text{Contribution per unit}}$$

The level at which profits are same or the level at which costs are same for two methods or two alternatives

$$\text{i.e., Indifference Point} = \frac{\text{Difference in Fixed Cost}}{\text{Difference in variable costs per unit}}$$

Cost-Volume-Profit Analysis

3.2

Cost-Volume-Profit (CVP) Analysis

Cost-volume-profit (CVP)/break-even analysis is the study of the interrelationships between costs, volume and profit at various levels of activity.

The management of an organisation usually wishes to know the profit likely to be made if the target for production and sales for the year are achieved. Management may also be interested to know the following:

a. The break-even point, at which is the activity level at which there is neither profit nor loss.

b. The amount by which actual sales can fall below anticipated sales, without a loss being incurred.

A company's net income is a measure of management's success in attaining its goals. In planning, management must anticipate how selling prices, costs, expenses, and profits will react to changes in activity when the activity is measured in terms of capacity or volume. When the degree of variability in costs is known, the effect of volume changes can be predicted.

Cost-volume-profit (CVP) analysis is a technique that uses the degrees of cost variability to measure the effect of changes in volume on resulting profits. Such analysis assumes that the fixed costs of the firm will remain the same in total within a wide range of production volume within which the firm expects to operate, known as the relevant range.

Cost-volume-profit analysis considers the relationship between costs (fixed and variable), sales volume and levels of profit. The techniques of CVP analysis are used in breakeven calculations, contribution/ sales ratio analysis and can be applied to indicate the level of sales necessary to make a desired profit (target profit) or the amount by which sales can fall before the product is loss making (margin of safety).

Break-even Analysis

Break-even analysis can be used to help management select an action when several alternatives exist. This analysis is based on the conditions that variable costs will vary in constant proportion to the sales volume and that fixed costs will be fixed over a prescribed or relevant range of activity.

Therefore, if management wishes to test new proposals that will change the percentage of variable costs to sales volume, or the total amount of fixed costs, or a combination of these changes, then it can use the basic breakeven equation to calculate the results.

Break-even point represents the minimum level of sales (revenue or volume) needed to cover total costs (fixed and variable). At breakeven point, profit is equal to zero because our total sales income is equal to total expenditure.

The formula is for breakeven volume is below:

Contribution per unit = unit selling price – unit variable costs

- Profit = (sales volume × contribution per unit) – fixed costs

- Break-even point = activity level at which there is neither profit nor loss = Total Fixed Costs÷ Contribution per unit = Contribution required to break-even÷ Contribution per unit
- Contribution÷ sales (C÷ S) ratio = profit/volume (P/V) ratio = (contribution÷ sales) × 100%
- Sales revenue at break-even point = fixed costs ÷ C/S ratio
- Margin of safety (in units) = Budgeted sales units – Break-even sales units
- Margin of safety (as %) = [(Budgeted sales - Break-even sales) ÷ Budgeted sales] × 100%
- Sales volume to achieve a target profit = (Fixed cost + Target profit) ÷ Contribution per unit

It is an analysis of three variables, viz. cost, volume and profit, which gives the relationship amongst costs, revenue (sales), activity levels (quantity) and the resulting profit. Cost-Volume-Profit (CVP) Analysis is also known as Break–Even Analysis. Every business organisation works to maximize its profits. With the help of CVP analysis, the management studies the co-relation of profit and the level of production.

CVP analysis is concerned with the level of activity where total sales equal the total cost and it is called as the break-even point. In other words, we study the sales value, cost and profit at different levels of production. CVP analysis highlights the relationship between the cost, the sales value, and the profit.

If only we could look into a crystal ball and find out exactly how many customers were going to buy our product, we would be able to make perfect business decisions and maximize profits. While management accounting information can't really help much with the crystal ball, it can be of use in providing the answers to questions about the consequences of different courses of action. One of the most important decisions that need to be made before any business even starts is 'how much do we need to sell in order to break-even?' By 'break-even' we mean simply covering all our costs without making a profit. This type of analysis is known as 'cost-volume-profit analysis' (CVP analysis) Cost-volume profit analysis is an essential tool used to guide managerial, financial and investment decisions.

As quantity increases, variable cost increases but fixed costs remains same, so total cost also increases. Since quantity increases value of sale also increases. Initially when company sells small quantity of units total cost is greater than sales, then it incurs loss. As it sells more & more quantity, sales exceeds total cost, it makes profit. Level at which there is no profit no loss is called as B.E.P. (Break Even Point). Such analysis between quantity (volume), cost, sales & profit is called as CVP analysis. The cost-volume-profit analysis is an extension of marginal costing. It makes use of the principles of marginal costing. It is an important tool of short term planning and is more relevant where the proposed changes in the level of activity are relatively small. It is useful in making short-run decisions.

CVP analysis looks at the effect of sales volume variations on costs and operating profit. The analysis is based on the classification of expenses as variable (expenses that vary in direct proportion to sales volume) or fixed (expenses that remain unchanged over the long term, irrespective of the sales volume). Accordingly, operating income is defined as follows:

Operating Income = Sales – Variable Costs – Fixed Costs

CVP analysis looks primarily at the effects of differing levels of activity on the financial results of a business. The reason for the particular focus on sales volume is because, in the short-run, sales price, and the cost of materials and labour, are usually known with a degree of accuracy. Sales volume, however, is not usually so predictable and therefore, in the short-run, profitability often hinges upon it. For example, Company A may know that the sales price for product X in a particular year is going to be in the region of ₹500 and its variable costs are approximately ₹300. It can, therefore, say with some degree of certainty that the contribution per unit (sales price less variable costs) is ₹200. Company A may also have fixed costs of ₹2,00,000 per annum, which again, are fairly easy to predict. However, when we ask the question, 'Will the company make a profit in that year?' the answer is 'We don't know'. We don't know because we don't know the sales volume for the year. However, we can work out how many sales

the business needs to achieve in order to make a profit and this is where CVP analysis begins.

Assumptions of Break-Even Analysis

(i) All elements of cost, i.e., production, administration and selling and distribution can be segregated into fixed and variable components.

(ii) Variable cost remains constant per unit of output irrespective of the level of output and thus fluctuates directly in proportion to changes in the volume of output.

(iii) Fixed cost remains constant at all volumes of output.

(iv) Selling price per unit remains unchanged or constant at all levels of output.

(v) Volume of production is the only factor that influences cost.

(vi) There will be no change in the general price-level.

(vii) There is only one product or in case of multi-products, the sales mix remains unchanged.

(viii) There is synchronization between production and sales.

Assumptions of CVP Analysis are highlighted as under:

a. All other variables remain constant

It has been assumed that all variables other than the particular one under consideration have remained constant throughout the analysis. In other words, it is assumed that volume is the only factor that will cause costs and revenues to change. However, changes in other variables such as production efficiency, sales mix and price levels can have an important influence on sales revenue and costs. If significant changes in these other variables occur the CVP analysis presentation will be incorrect.

b. Single product or constant sales mix

CVP analysis assumes that either a single product is sold or, if a range of products is sold, that sales will be in accordance with a predetermined sales mix. When a predetermined sales mix is used, it can be depicted in the CVP analysis by measuring sales volume using standard batch sizes based on a planned sales mix. As we have discussed, any CVP analysis must be interpreted carefully if the initial product mix assumptions do not hold.

c. Total costs and total revenue are linear functions of output

The analysis assumes that unit variable cost and selling price are constant. This assumption is only likely to be valid within the relevant range of production.

d. Profits are calculated on a variable costing basis

The analysis assumes that the fixed costs incurred during the period are charged as an expense for that period. Therefore, variable-costing profit calculations are assumed. If absorption-costing profit calculations are used, it is necessary to assume that production is equal to sales for the analysis to predict absorption costing profits.

e. Costs can be accurately divided into their fixed and variable elements

CVP analysis assumes that costs can be accurately analyzed into their fixed and variable elements. In practice, the separation of semi-variable costs into their fixed and variable elements is extremely difficult. Nevertheless, a reasonably accurate analysis is necessary if CVP analysis is to provide relevant information for decision-making.

f. Analysis applies only to the relevant range

CVP analysis is appropriate only for decisions taken within the relevant production range, and that it is incorrect to project cost and revenue figures beyond the relevant range.

g. Analysis applies only to a short-term time horizon

CVP analysis is based on the relationship between volume and sales revenue, costs and profit in the short run, typically a period of one year, in which the output of a firm is likely to be restricted to that available from the current operating capacity. During this period significant changes cannot be made to selling prices and fixed and variable costs. CVP analysis thus examines the effects of changes in sales volume on the level of profits in the short run. It is inappropriate to extend the analysis to long-term decision-making.

Limitations of CVP Analysis

a. It is assumed that fixed costs are the same in total and variable costs are the same per unit at all levels of output. This assumption is a great simplification. The following are two inevitable cases-

(i) Fixed costs will change if output falls or increases substantially (most fixed costs are step costs).

(ii) The variable cost per unit will decrease where economies of scale are made at higher output volumes, but the variable cost per unit will also eventually rise when diseconomies of scale begin to appear at even higher volumes of output (for example the extra cost of labour in overtime working).

The assumption is only correct within a normal range or relevant range of output. It is generally assumed that both the budgeted output and the breakeven point lie within this relevant range.

b. It is assumed that sales prices will be constant at all levels of activity. This may not be true, especially at higher volumes of output, where the price may have to be reduced to win the extra sales.

c. Production and sales are assumed to be the same, so that the consequences of any increase in inventory levels or of 'de-stocking' are ignored.

d. Uncertainty in the estimates of fixed costs and unit variable costs is often ignored.

Break-Even Charts and Profit Charts

3.3

Break-Even Chart: Meaning and Concept

Break-Even means the volume of production or sales where there is no profit or loss. In other words, Break-Even Point is the volume of production or sales where total costs are equal to revenue. It helps in finding out the relationship of costs and revenues to output. In understanding the breakeven point, cost, volume and profit are always used. The break even analysis is used to answer many questions of the management in day to day business.

Break-even Chart is a graphical representation of the Break- Even Analysis, i.e. Cost-Volume- Profit relationship. It indicates the point of production at which there is neither profit nor loss. It also indicates the estimated profit or loss at different levels of production.

A break-even chart is a chart which indicates approximate profit or loss at different levels of sales volume within a limited range. A very serious limitation of breakeven charts is that they can show the costs, revenues, profits and margins of safety for a single product only, or at best for a single 'sales mix' of products. Break-even charts for multiple products can be drawn if a constant product sales mix is assumed.

While constructing the chart, the following assumption is normally considered:

a. Costs are classified into fixed and variable costs.

b. Fixed costs shall remain fixed during the relevant volume range of graph.

c. Variable cost per unit will remain constant during the relevant volume range of graph.

d. Selling price per unit will remain constant.

e. Sales mix remains constant.

f. Production and sales volume are equal.

g. There exists a linear relationship between costs and revenue.

h. Linear relationship is indicated by way of straight line

For example suppose that FA sells three products, X, Y and Z which have variable unit costs of ₹3, ₹4 and ₹5 respectively. The sales price of X is ₹8, the price of Y is ₹6 and the price of Z is ₹6. Fixed costs per annum are ₹10,000. A break-even chart cannot be drawn, because we do not know the proportions of X, Y and Z in the sales mix.

The formal Break-Even Chart is as follows:

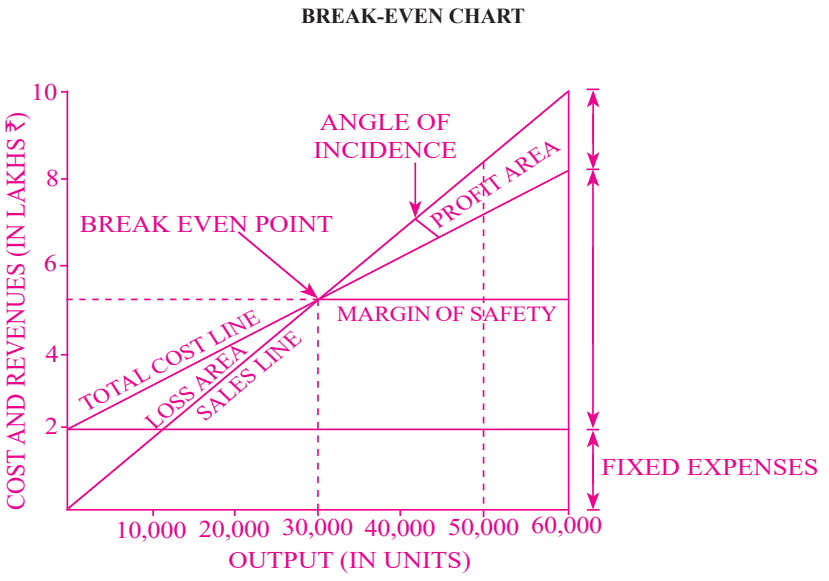


Figure 3.2 Break-Even Point, Angle of Incidence, Profit and Loss Areas.

On the X-axis of the graph is plotted the number of units produced, sold and on the Y-axis are shown costs and sales revenues. The fixed cost line is drawn parallel to X-axis. This line indicates that fixed expenses remain the same with any volume of production. The variable costs for different levels of activity are plotted over the fixed cost line. The variable cost line is joined to fixed cost line at zero volume of production. This line can also be regarded as the total cost line because it starts from the point where fixed cost has been incurred and variable cost is zero. Sales values at various levels of output are plotted joined and the resultant line is the sales line. The sales line will cut the total cost line at a point where the total costs are equal to total revenues and this point of intersection lines is known as breakeven point—the point of no profit no loss.

The number of units to be produced at the breakeven point is determined by drawing a perpendicular to the X-axis from the point of intersection and measuring the horizontal distance from the zero point to the point at which the perpendicular is drawn.

The sales value at breakeven point is determined by drawing a perpendicular to the Y-axis from the point of intersection and measuring the vertical distance from the zero point to the point at which the perpendicular is drawn.

Loss and profit are as have been shown in the charts which show that if production is less than the breakeven point, the business shall be running at a loss and if the production is more than the breakeven level, profit shall result.

Angle of Incidence

Angle of Incidence is an angle formed at the intersection point of total sales line and total cost line in a formal break even chart. If the angle is larger, the rate of growth of profit is higher and if the angle is lower, the rate of growth of profit is lower. So, growth of profit or profitability rate is depicted by Angle of Incidence.

Break Even Analysis (or) Cost-Volume-Profit Analysis (CVP analysis):

From the breakeven charts breakeven point and profits at a glance can be found out. Besides, management makes profit planning with the help of breakeven charts. It can clearly be understood by way of charts to know the changes

in profit due to changes in costs and output. Such profit planning is made with the variables mainly cost, profit and volume, such an analysis is called breakeven analysis. Throughout the charts relationship is established among the cost, volume and profit, it is also called Cost-Volume-Profit Analysis (CVP analysis). That is why it is popularly said by S.C. Kuchal in his book "Financial Management - An Analytical and Conceptual Approach", that Cost-volume-profit analysis, break even analysis and profit graphs are interchangeable words. The analysis is further explained as follows:

The change in profit can be studied through Break even charts under different conditions in the following manner:

(i) Increase in No. of Units:

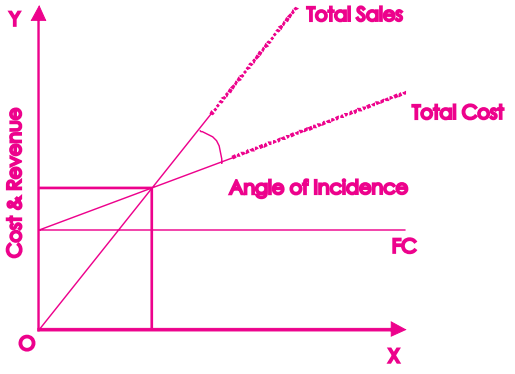


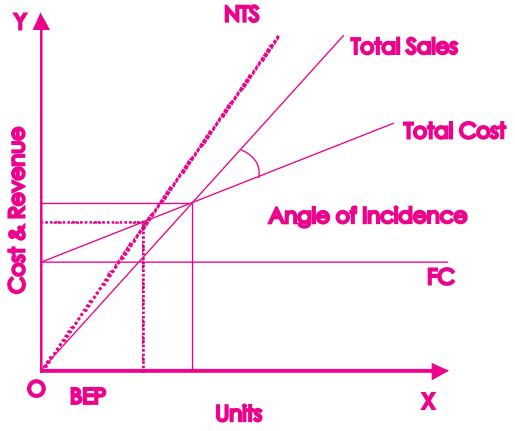
Figure 3.3 Increase in No. of Units but BEP in units remaining same.

'……' line indicates increase in total cost and total sales.

In the above chart, if we clearly observe we find that there is no change in BEP even if there is increase or decrease in No. of units.

(ii) Increase in Sales due to increase in selling price:

NTS = New Total Sales line



'……' line indicates changes in break even point and changes in sales.

Figure 3.4 Changes in Break-Even Point due to change in Sales.

From the above chart, we observe that profit is increased by increasing the selling price and also, if there is change

in selling price, BEP also changes. If selling price is increased then BEP decreases. If selling price is decreased then BEP increases. Thus, we say that there is an inverse relationship between selling price and BEP.

(iii) Decrease in variable cost:

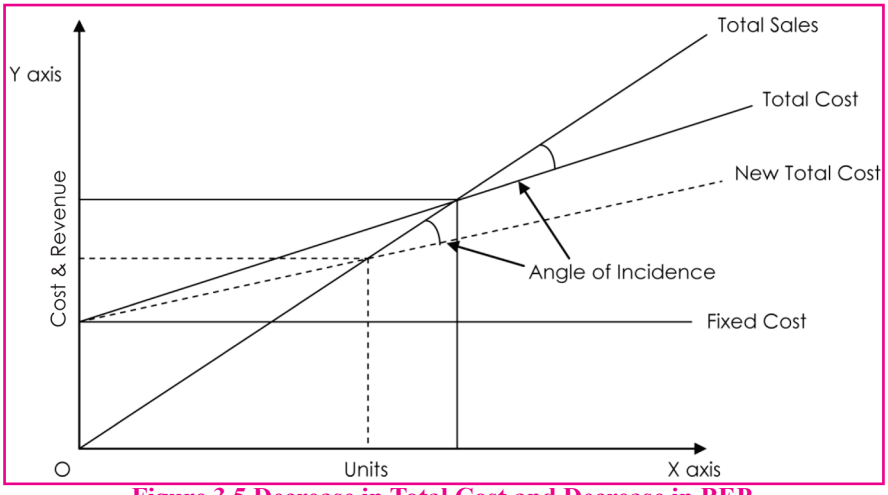


Figure 3.5 Decrease in Total Cost and Decrease in BEP.

'……' line indicates decrease in total cost and decrease in B.E.P

From the above chart, we observe that when variable costs are decreased, no doubt, profit is increased. If there is change in variable cost then BEP also changes. If variable cost is decreased then BEP also decreases. If variable cost is increased then BEP also increases. Thus there is direct relationship between variable cost and BEP.

(iv) Change in fixed cost:

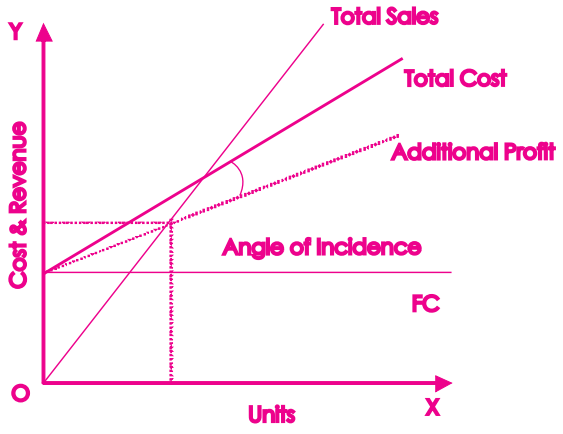


Figure 3.6 Decrease in Fixed Cost and Total Cost and also Decrease in BEP.

'……' line indicates decrease in fixed cost and total cost and also decrease in BEP.

NTC = New Total Cost Line

NFC = New Fixed Cost Line

From the above chart also we find that there is increase in profit due to decrease in fixed cost. If fixed cost is increased then BEP also increases. If fixed cost is decreased then BEP also decreases. Thus, there is a direct relationship between fixed cost and BEP.

Non linear Break-Even Chart:

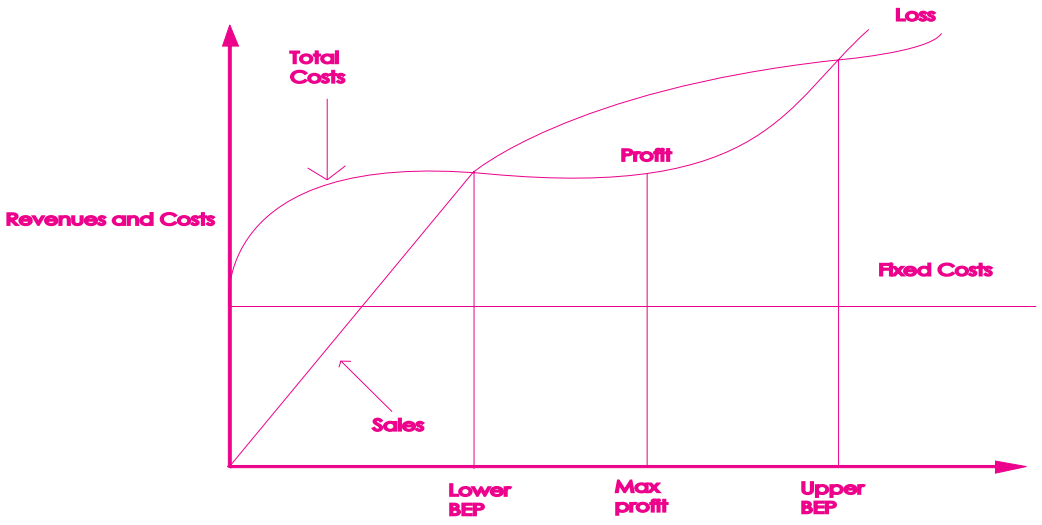


Figure 3.7 Non-linear Break-Even Chart

In some cases on account of non-linear behaviour of cost and sales there may be two or more break even points. In such a case the optimum profit is earned where the difference between the sales and the total costs is the largest. It is obvious that the business should produce only upto this level. This is being illustrated in the above chart.

Cash Break-Even Point:

When break-even point is calculated only with those fixed costs which are payable in cash, such a break-even point is known as cash break-even point. This means that depreciation and other non-cash fixed costs are excluded from the fixed costs in computing cash break-even point. Its formula is-

Cash break-even point = Cash fixed costs / Contribution per unit.

Advantages of Break-Even Chart

a. Graphical representation of cost and revenue data (break-even charts) can be more easily understood by non-financial managers.

b. A breakeven model enables profit or loss at any level of activity within the range for which the model is valid to be determined, and the C/S ratio can indicate the relative profitability of different products.

Conventional/Basic Breakeven Chart

Advantages

- Shows clearly the constant nature of the fixed costs.
- The angle of the profit 'wedge' gives a visual representation of the profitability of the product: the wider the angle, the more rapidly profits will grow once the break-even point has been reached. Conversely, the wider the angle the more rapidly losses will be incurred when sales volume falls below break-even.

Disadvantages

- Although profit can be read from the chart, readings at two separate points are required in order to do so.
- It can be difficult to adapt the chart to show the effect of changes in any of the variables, for example, an increase in the selling price or a decrease in the unit variable cost.
- Contribution cannot be read directly from the chart.

Contribution Breakeven Chart

Advantages

- Contribution can be read directly from the chart.
- As with the conventional chart, the angle of the profit 'wedge' gives a visual representation of the profitability of the product.

Disadvantages

- Although profit can be read from the chart, readings at two separate points are required in order to do so.
- It can be difficult to adapt the chart to show the effect of changes in any of the variables, for example, an increase in the selling price or a decrease in the unit variable cost.

Profit–Volume Chart

Profit-volume chart prominently exhibits the relationship between profit and sales volume. The normal break-even charts suffer from one limitation. Profit cannot be read directly from the chart. It is essential to deduct total cost from sale to know the profit figure. The profit graph overcomes the difficulty by plotting profit directly against an activity. These charts are easy to understand and their preparation involves drawing sales curve and profit curve. The point at which profit line cuts the sales line is called break-even point. Taking the methods and objects under consideration, the profit-volume chat can be further divided into following categories i.e.:

a. Simple Profit-Volume Chart:

Its preparation involves the following steps:

(i) Finding out profit at any two levels of activity.

(ii) Drawing sales line.

(iii) Drawing profit line.

Simple Profit-Volume chart is shown below:

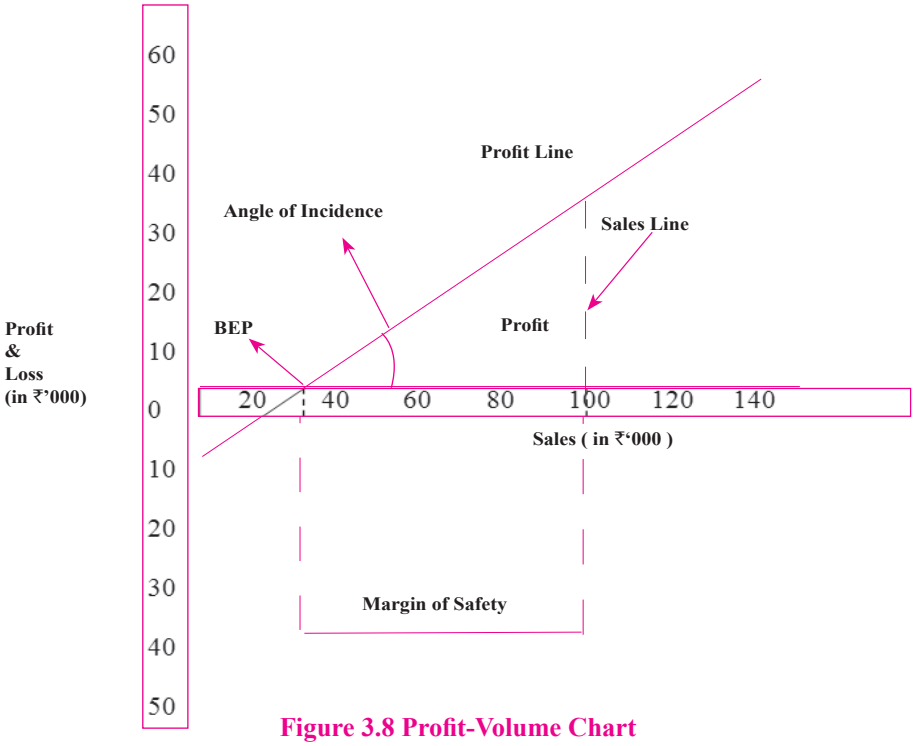


Figure 3.8 Profit-Volume Chart

Profit volume chart showing different breakeven point at different price levels is shown below:

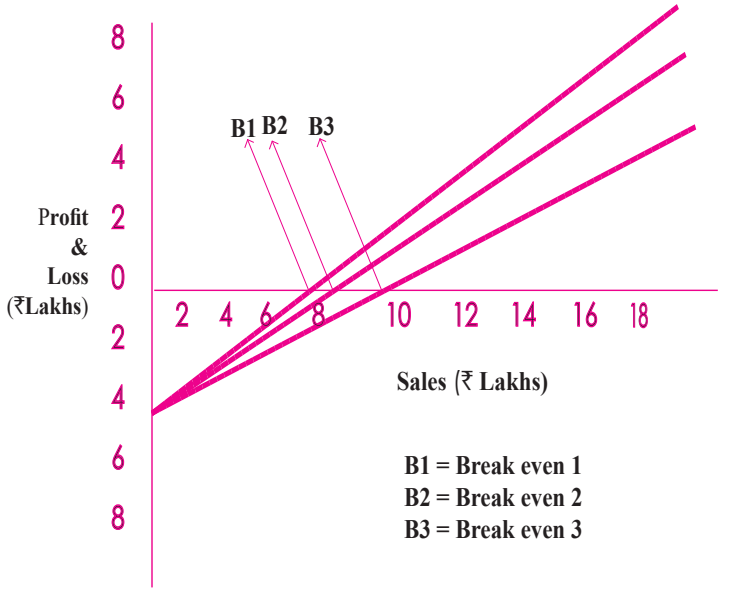


Figure 3.9 Profit-Volume Chart showing different breakeven point at different price levels.

b. Sequential Profit Graph:

Sometimes, a company manufactures more than one product of varying profitability. A change in the profitability of one product will lead to a change in the profitability as a whole. Profit-volume chart can be prepared for a group also. This chart shows relative profitability of different products. It is also called profit-volume graph for a group of products, sequential profit graph or profit path chart. Its main advantage is that it exhibits the relative profitability of different products at a glance. This graph is also useful to show average slope and marginal slope.

Methods of drawing 'Profit Path':

In sequential profit graph or profit graph for a group of products, a line "profit plan" is drawn in order to draw total profit line. For drawing profit path, a statement is prepared showing cumulative sale and cumulative profit. The line 'Profit path' is drawn with the aid of columns for cumulative same and cumulative profit.

Steps in drawing Profit volume graph (or) sequential profit graph:

- First prepare a marginal cost statement to know the P/V ratios.
- Prepare a statement to find out cumulative sale and cumulative profit.
- Draw a profit path with the help of columns, cumulative sale and cumulative profit.
- Draw total profit line for group of products.

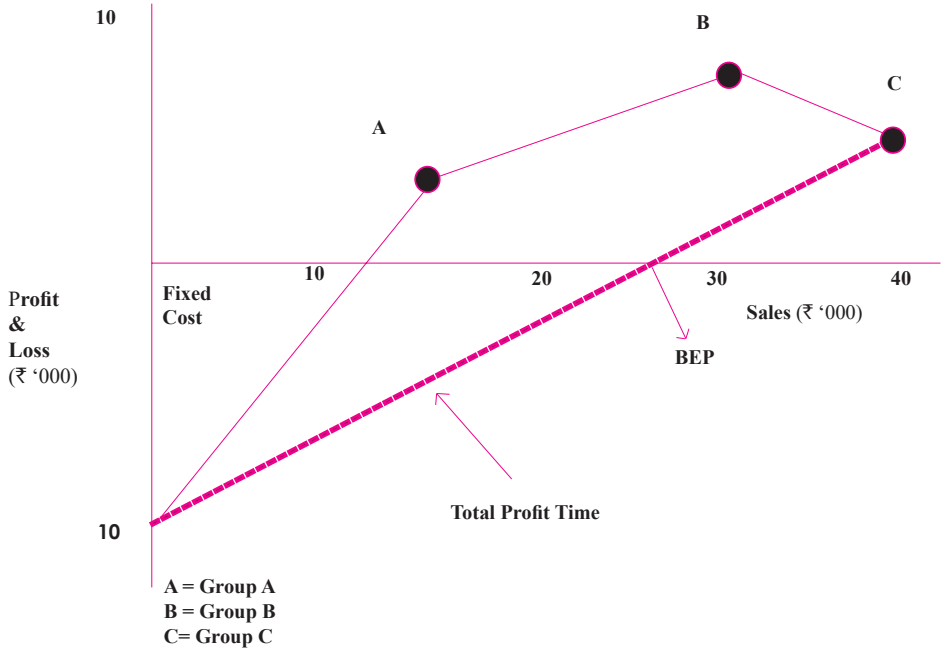


Figure 3.10 Profit-Volume graph (or) sequential profit graph

Advantages of Profit Volume Chart:

- Profit or loss for any level of activity can be read directly from the chart.
- The angle of the profit line gives a visual representation of the profitability of the product.
- The loss below breakeven point is very clearly highlighted.
- Several charts can be drawn on a common set of axes to show clearly the effect of changes in any of the variables, for example, an increase in the selling price or a decrease in the unit variable cost.

Disadvantages of Profit Volume Chart:

- The cost behaviour patterns are not depicted, for example, the constant nature of the fixed costs.

Profit–volume graph

Neither the break-even nor the contribution graphs highlight the profit or loss at different volume levels. To ascertain the profit or loss figures from a break-even graph, it is necessary to determine the difference between the total cost and total revenue lines. The profit–volume graph is a more convenient method of showing the impact of changes in volume on profit.

Example of construction of P/V Graph

Prepare a P/V graph from the following data:

Units produced 60,000; Selling price per unit ₹15; Variable cost per unit ₹10; Fixed costs ₹1,50,000. Show the expected sales on the graph when the profit to be earned is ₹87,500.

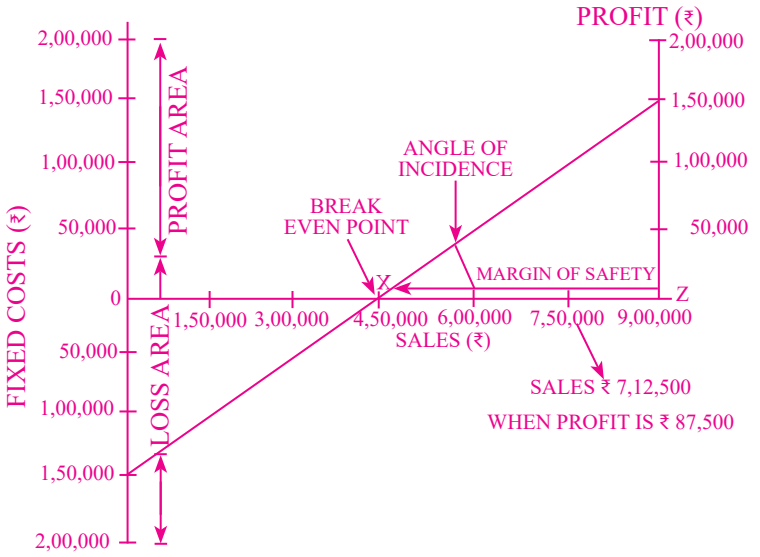


Figure 3.11 Chart showing construction of P/V Graph

Multiple Product Break Even Analysis

3.4

Organisations typically produce and sell a variety of products and services. To perform breakeven analysis in a multi-product organization, however, a constant product sales mix must be assumed. In other words, it is to be assumed that whenever x units of product A are sold, y units of product B and z units of product C are also sold. Such an assumption allows us to calculate a weighted average contribution per mix, the weighting being on the basis of the quantities of each product in the constant mix. This means that the unit contribution of the product that makes up the largest proportion of the mix has the greatest impact on the average contribution per mix.

The only situation when the mix of products does not affect the analysis is when all of the products have the same ratio of contribution to sales (C/S ratio).

Most firms produce and sell many products or services. Here, we shall consider how we can adapt CVP analysis to a multi-product setting. It can be explained with the help of the following example:

Illustration 2

The ABC Company sells two types of products – A and B. The CMA has prepared the following information based on the sales forecast for the period:

Amount in ₹

Product Sales Units (Volume)	A 1200	B 600	Total
Unit selling price	300	200	
Unit variable cost	150	110	
Unit contribution	150	90	
Total sales revenues	3,60,000	1,20,000	4,80,000
Less: Total variable cost	1,80,000	66,000	2,46,000
Contribution to direct and common fixed costs	1,80,000	54,000	2,34,000
Less: Direct Avoidable fixed costs	90,000	27,000	1,17,000
Contribution to common fixed costs	90,000	27,000	1,17,000
Less: Common fixed costs			39,000
Profit			**78,000**

Solution

In the present case the company sells two products so that there are two-unit contribution margins. If all of the fixed costs are directly attributable to products (i.e. there are no common fixed costs), we can apply the same approach as that used for a single product. We simply apply the analysis separately to each product as follows:

Product A, Break-even point = Direct fixed costs ÷ Unit contribution = ₹90,000÷₹ 150 = 600 units

Product B, Break-even point = Direct fixed costs ÷Unit contribution = ₹27,000÷₹ 90 = 300 units

There are some common fixed costs that must be taken into account. Selling 600 units of Product A and 300 units of Product B, will generate a contribution that only covers direct fixed costs; the common fixed costs will not be covered. A loss equal to the common fixed costs will be reported. The break-even point for the firm as a whole has not been ascertained. The common fixed costs cannot be specifically identified with either of the products since they can only be avoided if both products are not sold. The solution to the problem is to convert the sales volume measure of the individual products into standard batches of products based on the planned sales mix. The ABC Company plans to sell 1200 units of Product A and 600 units of Product B and a sales mix of 1200:600, i.e. 2:1.

In other words, for the sale of every two units Product A and one unit of Product B is expected to be sold and we can therefore define our standard batch of products as comprising two units of A and one unit of B, giving a contribution of ₹390 per batch (two units of Product A, at a contribution of ₹150 per unit sold plus one unit of Product B, at a contribution of ₹90).

The break-even point in standard batches can be calculated by using the same break-even equation that we used for a single product, so that:

Break-even number of batches = Total Fixed Costs ÷ Contribution margin per batch

= ₹1,56,000 (1,17,000 + 39,000) ÷ ₹390 = 400 batches

The sales mix used to define a standard batch (2:1) can now be used to convert the break-even point (measured in standard batches) into a break-even point expressed in terms of the required combination of individual products sold. Thus, 800 units of A (2 × 400) and 400 (1 × 400) units of B must be sold to break-even. The following profit statement verifies this outcome:

Amount in ₹

Product Units sold	A 800	B 400	Total
Unit contribution margin	150	90	
Contribution to direct and common fixed costs	1,20,000	36,000	1,56,000
Less: Direct fixed costs	90,000	27,000	1,17,000
Contribution to common fixed costs	30,000	9,000	39,000
Less: Common fixed costs			39,000
Profit			**NIL**

Let us now assume that the actual sales volume for the period was 1200 units, the same total volume as the break-even volume, but consisting of a sales mix of 600 units of each product. Thus, the actual sales mix is 1:1 compared with a planned sales mix of 2:1. The total contribution to direct and common fixed costs will be ₹1,44,000 [(₹150× 600 for A)]+[(₹90×600 for B)] and a loss of ₹12,000 (₹1,44,000 contribution – ₹1,56,000 total fixed costs) will occur. It should now be apparent that the break-even point (or the sales volumes required to achieve a target profit) is not a unique number, it varies depending upon the composition of the sales mix, because the actual sales mix differs from the planned sales mix, the sales mix used to define a standard batch has changed from 2:1 to 1:1 and the contribution per batch changes from ₹390 to ₹240 [(1×₹150)]+[(1×₹90)]. This means that the revised break-even point will be 650 batches (₹1,56,000 total fixed costs/₹240 contribution per batch), which converts to a sales volume of 650 units of each product based on a 1:1 sales mix. Generally, an increase in the proportion of sales of higher contribution margin products will decrease the break-even point whereas increases in sales of the lower margin products will increase the break-even point.

Differential Cost Analysis

3.5

Differential Cost: Meaning & Concept

Differential Cost is the change in the costs which results from the adoption of an alternative course of action. The alternative actions may arise due to change in sales volume, price, product mix (by increasing, reducing or stopping the production of certain items), or methods of production, sales, or sales promotion, or they may be due to 'make or buy' or 'take or refuse' decisions. When the change in costs occurs due to change in the activity from one level to another, differential cost is referred to as incremental cost or decremental cost, if a decrease in output is being considered, i.e. total increase in cost divided by the total increase in output. However, accountants generally do not distinguish between differential cost and incremental cost and the two terms are used to mean one and the same thing.

The computation of differential cost provides an useful method of analysis for the management for anticipating the results of any contemplated changes in the level or nature of activity. When policy decisions have to be taken, differential costs worked out on the basis of alternative proposals are of great assistance.

The determination of differential cost is simple. Differential cost represents the algebraic difference between the relevant costs for the alternatives being considered. Thus, when two levels of activities are being considered, the differential cost is obtained by subtracting the cost at one level from the cost of another level.

For example, difference in costs may arise because of replacement of labour by machinery and difference in costs of two alternative courses of action will be the differential cost.

It is important to note that differential cost may be an increase or a decrease in costs. Suppose, present cost is ₹2,50,000, when the work is done by labour and the expected cost ₹2,25,000 when the work is done by machinery.

In this case, differential cost will be decrease in costs ₹25,000 (i.e., ₹2,50,000 - ₹2,25,000) and the decision of replacement of labour by machinery should be implemented by the firm because differential cost of ₹25,000 (decrease in cost) will increase the profits of the firm by ₹25,000.

If change in cost occurs due to change in level of activity, differential cost is referred to as incremental cost in case of increase in output and decremental cost in case of decrease in output. However, in practice, no distinction is made between differential cost and incremental or decremental cost and two terms are used to mean the same thing.

However, if the alternate course of action does not involve any additional fixed costs change in variable costs will become differential costs and there will be no difference between marginal costs and differential costs.

A management of any type of business organisation is confronted with the problem of making appropriate decisions. "Behaviour of cost" plays a vital and crucial role in decision-making areas. Although the historical costs serve as an effective tool for predicting future costs, they are not suitable to decision-making process. We are of the view that variable costs are affected by a decision and fixed costs are not affected, but in reality, it is not so; particularly in the long run, no type of cost is fixed. Costs tend to vary due to variations in volume of production, method of production, product mix and the like. Such increase or decrease in the total costs at a particular level of activity has

to be analyzed. At this juncture, the concept of differential cost arises.

Characteristics of Differential Costing

a. In order to ascertain the differential costs, only total cost is needed and not cost per unit.

b. Existing level is taken to be the base for comparison with some future or forecasted level.

c. Differential cost is the economist's concept of marginal cost.

d. It may be referred to as incremental cost when the difference in cost is due to increase in the level of production and decremental costs when difference in cost is due to decrease in the level of production.

e. It does not form part of the accounting records, but may be incorporated in budgets.

f. It is not necessary to adopt marginal cost technique for differential cost analysis because it can be worked out on the method of absorption costing or standing costing.

g. What is said of the differential cost above, applies to differential revenue also.

h. Variable costs are the differential costs when the additional output does not involve the additional fixed costs. It is used for planning and decision-making only and not incorporated in the accounting records. It is intended for the comparison of the expected changes in costs and revenues. It is applied only to the existing business and not suitable for new business set-up. Differential costs are future costs.

i. Differential cost analysis is carried on using only relevant costs.

Differential Costing is used for various policy decisions, some of which are stated below:

a. The introduction of a new plant.

b. Make or buy decisions.

c. Lease or buy decisions.

d. Discontinuing a product, suspending or closing down a segment of the business.

e. The profitability of a change in product mix.

f. Acceptance of an offer at a lower selling price.

g. Change in the methods of production.

h. The determination of the most profitable levels of production and price.

i. Submitting tenders.

j. The determination of price at which raw materials can be purchased.

k. Equipment replacement decisions.

l. The profitability or otherwise of further processing.

m. The opening of a new sales area or territory.

n. Determination of most profitable levels of production and price.

o. Acceptance of offer at a lower price or offering a quotation at lower selling price in order to increase capacity.

p. It is used to decide whether it will be more profitable to sell a product as it is or to process it further into a different product to be sold at an increased price.

q. Determining the suitable price at which raw material may be purchased.

r. Decision of adding a new product or business segment.

s. Discontinuing a product or business segment in order to avoid or reduce the present loss or increase profit.

Incremental and Decremental Cost:

Differential costs are also known as incremental costs, although technically an incremental cost should refer only to an increase in cost from one alternative to another; decrease in cost should be referred to as decremental cost. Differential cost is a broader term, encompassing both cost increases (incremental costs) and cost decreases (decremental costs) between alternatives.

The concept of differential costing is vital in planning and decision-making. It is an important tool in evaluating the profitability of alternative choice decisions and helping management in choosing the best alternative. The differential cost analysis can assist management in knowing the additional profit that would be earned if idle or unused capacity is used for extra production or if some additional investments are made by the firm.

"Marginal Cost" and "Differential Cost"

Marginal cost represents the increase or decrease in total cost which occurs with a small change in output say, a unit of output. In Cost Accounting variable costs represent marginal cost.

Differential cost is the change (increase or decrease) in the total cost (variable as well as fixed) due to change in the level of activity, technology or production process or method of production. In other words, it can be defined as the cost of one unit of product or service which would be avoided if that unit was not produced or provided.

Similarity:

(a) Both the techniques of cost analysis and cost presentation.

(b) Both are made use of by the management in decision making and in formulating policies.

(c) The concepts of differential costs and marginal costs mainly arise out of the difference in the behaviour of fixed and variable costs.

(d) Differential costs compare favourably with the economist's definition of marginal cost, viz. that marginal cost is the amount which at any given volume of output is changed if output is increased or decreased by one unit.

Difference:

(a) Differential cost analysis can be made in the case of both absorption costing as well as marginal costing.

(b) While marginal costing excludes the entire fixed costs, some of the fixed costs may be taken into account as being relevant for the purpose of differential cost analysis.

(c) Marginal costs may be embodied in the accounting system whereas differential costs are worked out separately as analysis statements.

(d) In marginal costing, margin of contribution and contribution ratio are the main yardsticks for performance evaluation and for decision making. In differential cost analysis, differential costs are compared with the incremental or decremental revenues, as the case may be.

The main point which distinguishes marginal cost and differential cost is that change in fixed cost when volume of production increases or decreases by a unit of production. In the case of differential cost variable as well as fixed cost i.e. both costs change due to change in the level of activity, whereas under marginal costing only variable cost

changes due to change in the level of activity.

Illustration 3

A company is at present working at 90 per cent of its capacity and producing 13,500 units per annum. It operates a flexible budgetary control system. The following figures are obtained from its budget.

Particulars	90%	100%
Sales (₹)	15,00,000	16,00,000
Fixed expenses (₹)	3,00,500	3,00,600
Semi-fixed expenses (₹)	97,500	1,00,500
Variable expenses (₹)	1,45,000	1,49,500
Units made	13,500	15,000

Labour and material costs per unit are constant under present conditions. Profit margin is 10 per cent.

a. You are required to determine the differential cost of producing 1,500 units by increasing capacity to 100%

b. What would you recommend for an export price for these 1,500 units taking into account that overseas prices are much lower than indigenous prices?

Solution

Computation of material and labour cost

Particulars	₹	₹
Sales at present		15,00,000
(-) Profit @ 10%		1,50,000
Total cost		13,50,000
(-) All costs other than material & labour		
Fixed expenses	3,00,500	
Semi fixed expenses	97,500	
Variable expenses	1,45,000	5,43,000
Material & Labour cost		8,07,000

a. Statement showing differential cost of 1500 units:

Particulars	₹
Material & Labour (₹ 8,07,600 × 1500 ÷ 13,500)	89,667
Fixed expenses (₹ 3,00,600 – ₹ 3,00,500)	100
Semi fixed expenses (₹ 1,00,500 – ₹ 97,500)	3,000
Variable expenses (₹1,49,500 – ₹ 1,45,000)	4,500
Differential cost	**97,267**

b. Differential cost per unit = ₹97,267 ÷1,500 = ₹64.84

The minimum price for these 1,500 units should not be less than ₹64.84.

Marginal Costing vs. Absorption Costing (Advanced Applications)

3.6

Absorption Costing and Marginal Costing

The cost of a product or process can be ascertained using different elements of cost using any of the following two techniques viz.,

1. Absorption Costing
2. Marginal Costing

Absorption Costing

Under this method, the cost of the product is determined after considering the total cost i.e., both fixed and variable costs. Thus this technique is also called traditional or total costing. The variable costs are directly charged to the products where as the fixed costs are apportioned over different products on a suitable basis, manufactured during a period. Thus under absorption costing, all costs are identified with the manufactured products.

Marginal Costing

Marginal costing is "the ascertainment of marginal costs and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs." Several other terms in use like direct costing, contributory costing, variable costing, comparative costing, differential costing and incremental costing are used more or less synonymously with marginal costing.

It is a process whereby costs are classified into fixed and variable and with such a division so many managerial decisions are taken. The essential feature of marginal costing is division of total costs into fixed and variable, without which this could not have existed. Variable costs vary with volume of production or output, whereas fixed costs remains unchanged irrespective of changes in the volume of output. It is to be understood that unit variable cost remains same at different levels of output and total variable cost changes in direct proportion with the number of units. On the other hand, total fixed cost remains same disregard of changes in units, while there is inverse relationship between the fixed cost per unit and the number of units.

Marginal Costing vs. Absorption Costing

Marginal Costing and Absorption Costing will report different profit figures if there is any change in the volume of inventory during the period. If closing inventory is greater than opening inventory, absorption costing will report a higher profit than marginal costing. If opening inventory is greater than closing inventory (i.e. inventory levels decrease), then absorption costing will report a lower profit than marginal costing.

There are two differences between the way that variances are calculated in a marginal costing system and in an absorption costing system:

- In marginal costing, fixed costs are not absorbed into product costs and so there are no fixed cost variances to explain any under or over absorption of overheads. There will, therefore, be no fixed overhead volume variance. There will, however, be a fixed overhead expenditure variance which is calculated in exactly the same way as for absorption costing systems.

- In marginal costing the sales volume variance in units will be valued at standard contribution margin and called the sales volume contribution variance. In standard absorption costing standard profit is used instead of standard contribution.

Marginal Costing :

Here only variable costs are charged to product, processes or operations. Fixed costs are charged as period costs to the profit statement of the same period in which they are incurred. The cost of production under this method does not include fixed factory overheads and therefore, the value of closing stock comprises of only variable costs. No part of the fixed expenses in included in the value of closing stock and carried over to the next period. Since fixed overheads are not included in the cost of production, therefore the question of their under/ over recovery does not arise. Here decisions are made on the basis of contribution i.e. excess of sales price over variable costs. This basis of decision making results in optimum profitability.

Absorption Costing:

Fixed production overheads are charged to the product to be subsequently released as a part of goods sold i.e., it is included in cost per unit.

Profit is the difference between sales and cost of goods sold.

Costs are seldom classified into variable and fixed. Although such a classification is possible, it fails to establish a cost-volume profit relationship.

If inventories increase during a period, this method will reveal more profit than marginal costing. When inventories decrease, fewer profits are reported because under this method closing stock is valued at higher figures. Since inventories are valued at total cost, a portion of fixed overheads are also included in inventories.

Arbitrary apportionment of fixed costs may result in under or over recovery of overheads.

Differences between Absorption Costing and Marginal Costing:

	Absorption Costing	Marginal Costing
1.	Both fixed and variable costs are considered for product costing and inventory valuation.	Only variable costs are considered for product costing and inventory valuation.
2.	Fixed costs are charged to the cost of production. Each product bears a reasonable share of fixed cost and thus the profitability of a product is influenced by the apportionment of fixed costs.	Fixed costs are regarded as period costs. The profitability of different products is judged by their P/V ratio.
3.	Cost data are presented in conventional pattern. Net profit of each product is determined after subtracting fixed cost along with their variable cost.	Cost data are presented to highlight the total contribution of each product.
4.	The difference in the magnitude of opening stock and closing stock affects the unit cost of production due to the impact of related fixed cost.	The difference in the magnitude of opening stock and closing stock does not affect the unit cost of production.
5.	In case of absorption costing the cost per unit reduces, as the production increases as it is fixed cost which reduces, whereas, the variable cost remains the same per unit.	In case of marginal costing the cost per unit remains the same, irrespective of the production as it is valued at variable cost.

Difference in profit under Marginal and Absorption Costing:

(i) No opening and closing stock: In this case, profit/loss under absorption and marginal costing will be equal.

(ii) When opening stock is equal to closing stock: In this case, profit/loss under two approaches will be equal provided the fixed cost element in both the stocks is same amount.

(iii) When closing stock is more than opening stock: In other words, when production during a period is more than sales, then profit as per absorption approach will be more than that by marginal approach. The reason behind this difference is that a part of fixed overhead included in closing stock value is carried forward to next accounting period.

(iv) When opening stock is more than the closing stock: In other words when production is less than the sales, profit shown by marginal costing will be more than that shown by absorption costing. This is because a part of fixed cost from the preceding period is added to the current year's cost of goods sold in the form of opening stock.

Marginal Costing

XYZ Ltd.
Operating Income Statement under Marginal Costing
For the year ended……

Particulars	₹	₹
Sales		xxxxx
Total variable cost:		
Direct material consumed	xxxx	
Direct labour cost	xxxx	
Variable manufacturing overhead	xxxx	
Variable cost of goods produced	xxxx	
Add: Op. stock of finished goods (valued at Total Var. Cost of previous year)	xxxx	
Less: Cl. stock of finished goods (valued at Total Var. Cost of current year)	xxxx	
Variable Cost of Goods Sold		
Add: Variable administration, selling and distribution overhead	xxxx	
Total variable cost	xxxx	
Contribution Margin (Sales - Total variable cost)		xxxx
Less: Fixed operating costs (Production, administration, selling and distribution)		xxxx
Operating Income		**xxxx**

Absorption Costing

XYZ Ltd.
Operating Income Statement under Absorption Costing
For the year ended…….

Particulars	₹	₹
Sales		xxxx
Cost of Goods Sold:		
Direct material consumed	xxxx	
Direct labour cost	xxxx	
Variable manufacturing overhead	xxxx	
Fixed manufacturing overhead	xxxx	
Manufacturing Cost incurred during the year (Gross Factory Cost)	xxxx	
Add: Opening Work-in-Progress	xxxx	
Less: Closing Work-in-Progress	xxxx	

Particulars	₹	₹
Total cost of goods manufactured	xxxx	
Add: Op. stock of finished goods (valued at total cost of previous year)	xxxx	
Less: Cl. stock of finished goods (valued at total cost of current year)	xxxx	
Gross profit/Margin (i.e. Sales - Cost of goods sold)		xxxx
Less: Operating Costs:		
Administration costs, etc. (Both Fixed & Variable)		xxxx
Selling and distribution costs (Both Fixed & Variable)		xxxx
Operating Income		**xxxx**

Illustration 4

ABC Limited has production capacity of 5,00,000 units per annum at its full capacity.

Company's Cost structure is as under:	
Variable production cost per unit	₹32.00
Variable selling expenses per unit	₹ 9.60
Fixed production cost per annum	₹30,00,000
Fixed selling expenses per annum	₹20,00,000

During the year ended 31st March, 2022, the company worked at 80 percent of its capacity.

The operating data for the year are as follows:

Production	4,00,000 Units
Sales	₹ 64 per Unit; 3,87,500 Units
Opening stock of finished goods	50,000 Units

Fixed production expenses are absorbed on the basis of capacity and fixed selling expenses are recovered on the basis of period.

You are required to prepare statements of Cost and Profit for the year ending 31st March, 2022:

a. On the basis of marginal costing

b. On the basis of absorption costing.

Solution:

a. Statement of Cost and Profit under Marginal Costing for the year ending 31st March, 2022 Output = 4,00,000 units

Particulars	Amount (₹)	Amount (₹)
Sales: (3,87,500 units @ ₹ 64 per unit)		2,48,00,000
Less: Marginal costs:		
Variable cost of production (400000 × ₹32)	1,28,00,000	
Add: Opening stock (50000 units @ ₹32)	16,00,000	
Less: Closing Stock [(4,00,000 + 50,000 – 3,87,500) = 62,500 units @ ₹32]	(20,00,000)	
Variable cost of production of 3,87,500 units	1,24,00,000	

Particulars	Amount (₹)	Amount (₹)
Add: Variable selling expenses @ ₹ 9.60 per unit	37,20,000	1,61,20,000
Contribution (sales – variable cost)		86,80,000
Less: Fixed Cost of Production	30,00,000	
Fixed selling expenses	20,00,000	50,00,000
Profit under marginal costing		**3,68,0000**

b. Statement of Cost and Profit under Absorption Costing for the year ending 31st March, 2022 Output = 4,00,000 units

Particulars	Amount (₹)	Amount (₹)
Sales: 3,87,500 units @ ₹64		2,48,00,000
Less : Cost of sales:		
Variable cost of production (4,00,000 @ ₹ 32)	1,28,00,000	
Add: Fixed cost of production absorbed 4,00,000 units @ ₹6 (As per W.N. 1)	24,00,000	
Add: Opening Stock	19,00,000	
Less : Closing Stock	23,75,000	
Production cost of 3,87,500 units	14,72,5000	
Selling expenses: Variable: ₹9.60 × 3,87,500 units	37,20,000	
Fixed	20,00,000	2,04,45,000
Profit		43,55,000
Less : Overheads under absorbed: (As per W.N. 2)		6,00,000
Profit under absorption costing		**37,55,000**

Working Notes:

a. Absorption rate for fixed cost of production = ₹30,00,000÷5,00,000 units = ₹ 6 per unit

b. Fixed production overhead under absorbed = ₹(30,00,000–24,00,000) = ₹ 6,00,000

Observations from the Solution:

Marginal Costing rewards sales and Absorption Costing rewards production.

Solved Illustrations & Cases

Illustration 5

You are given the following information for the coming year of a factory:

Particulars	Amount
Fixed expenses	₹4,00,000
Selling price per unit	₹20
Variable expenses per unit	₹10
Budgeted output	80,000 units

Calculate Break-even Point in Rupees and Margin of Safety in Rupees.

Solution:

For calculating Break-even Point, arranging information in the following format would be appropriate and in the

format, it would be useful to show sales and variable cost per unit and fixed cost in total.

(Budgeted Output – 80,000 Units)

Particulars	Per Unit (₹)	Total (₹)
Sales	20	16,00,000
Less: Variable Cost	10	8,00,000
Contribution	10	8,00,000
Less: Fixed Cost		4,00,000
Profits		4,00,000

Calculation of Break-Even Point (in ₹)

Break-Even Point (in ₹) = (Fixed Costs × Sales) ÷ Contribution

= 4,00,000 × 16,00,000 ÷ 8,00,000

= ₹8,00,000.

Calculation of Margin of Safety (in ₹)

Margin of Safety (in ₹) = Actual (or Budgeted) Sales – Break-Even Sales

= ₹16,00,000 – ₹8,00,000

= ₹8,00,000

Illustration 6

From the following information, calculate the amount of profit using marginal cost technique:

Fixed cost ₹3,00,000

Variable cost per unit ₹5

Selling price per unit ₹10

Output level 1,00,000 units

Solution:

Contribution = Selling Price - Marginal Cost

= (1,00,000 × 10) - (1,00,000 × 5)

= 10,00,000 - 5,00,000

= ₹ 5,00,000.

Contribution = Fixed Cost + Profit

₹ 5,00,000 = ₹ 3,00,000 + Profit

Profit = ₹ 2,00,000

Illustration 7

From the following particulars find out break-even point:

Fixed Expenses ₹1,00,000

Selling price Per unit ₹20

Variable cost per unit ₹15

Solution:

Break-Even Point in Units = Fixed Cost ÷ Contribution per unit

Contribution per unit = Selling Price per unit - Variable Cost per unit

= ₹ 20 - ₹ 15

= ₹ 5

BEP (in units) = ₹1,00,000 ÷ ₹ 5

= 20,000 units

BEP in Sales = 20,000 × ₹ 20

= ₹4,00,000

Illustration 8

From the following information calculate:

(1) P/V Ratio

(2) Break-Even Point

(3) If the selling price is reduced to ₹ 80, calculate New Break-Even Point:

	₹
Total sales	5,00,000
Selling price per unit	100
Variable cost per unit	60
Fixed cost	1,20,000

Solution:

(1) P/V Ratio = Contribution ÷ Sales × 100

Contribution = Sales - Variable Cost

Total Sales = ₹ 5,00,000

Selling price per unit = ₹ 100

Sales in units = 5,000 units

Contribution = ₹ 2,00,000

P/V Ratio = 40%

(2) Break-Even Point in sales = Fixed Cost ÷ P/V Ratio = ₹ 3,00,000

(3) If the Selling price is reduced to ₹ 80:

Sales =₹ 4,00,000

P/V Ratio = (80 - 60) ÷ 80 = 25% , Contribution per unit = 80 - 60 = ₹ 20

Break-Even Point (in units) = 1,20,000 ÷ 20 = 6,000 units

Break-Even Point in Sales = 1,20,000 ÷ 25% = ₹4,80,000

Illustration 9

Sales ₹ 2,00,000

Profit ₹ 20,000

Variable Cost 60%

You are required to calculate:

(1) P/V Ratio

(2) Fixed Cost

(3) Sales volume to earn a profit of ₹ 50,000

Solution:

Sales = ₹ 2,00,000

Variable Cost = 60% = ₹ 1,20,000

(1) P/V Ratio = 40%

(2) Contribution = ₹ 80,000

Contribution = Fixed Cost + Profit

or, Fixed Cost = ₹ 60,000

(3) Sales volume to earn a profit of ₹ 50,000 = Fixed Cost + Desired Profit ÷ P / V Ratio = ₹ 2,75,000

Illustration 10

From the following particulars, calculate:

(a) P/V Ratio

(b) Profit when sales are ₹ 40,000, and

(c) New break-even point if selling price is reduced by 10%

Fixed cost = ₹ 8,000

Break-even point = ₹ 20,000

Variable cost = ₹ 60 per unit

Solution:

(a) Break-Even Point = Fixed Cost ÷ P/V Ratio

P/V Ratio = Fixed Cost ÷ Break-Even Point = 8,000 ÷20,000 × 100 = 40%

(b) Profit when sales are ₹ 40,000

Profit = Sales × P/V Ratio - Fixed Cost

= ₹40,000 × 40% - ₹ 8,000

= ₹ 16,000 – ₹ 8,000

= ₹ 8,000

(c) New break-even point if the selling price is reduced by 10%. If the selling price is ₹ 100, now it is reduced by 10%, i.e., it will be ₹ 90 (100 - 10)

Variable Cost = ₹ 60 Per unit

New P/V Ratio = 33.33%

New Break-Even Point = ₹ 24,002.40

Illustration 11

From the following particulars, calculate Margin of safety:

Fixed cost ₹ 1,00,000

Variable cost ₹ 1,50,000

Total Sales ₹ 3,00,000

Solution:

Contribution = Sales - Variable Cost = ₹ 1,50,000

Profit = Contribution – Fixed Cost = ₹ 50,000

Margin of Safety = Profit ÷ P/ V Ratio = ₹ 1,00,000

P / V Ratio = 50%

Margin of Safety expressed in percentage of sales= 33.33%

Illustration 12

From the following information calculate the Cash Break-Even Point:

Particulars	₹
Selling price per unit	60
Variable cost per unit	40
Fixed cost	2,00,000
Depreciation included in fixed cost	50,000

Solution:

Cash Fixed Cost = ₹ 2,00,000 – ₹ 50,000
= ₹ 1,50,000

Contribution per unit = ₹ 60 – ₹ 40
= ₹20

Cash Break-Even point in units = Cash Fixed Cost ÷ Contribution per unit
= 7,500 units.

Illustration 13

For the coming year, a manufacturing company has budgeted as under:

Contribution/Sales (C/S) Ratio = 45%

Margin of Safety Ratio = $33\frac{1}{2}$ %

Fixed Costs = ₹ 5,85,000

Required: Determine Total Sales-volume for the coming year and Profit thereon.

Solution:

Break-even sales (Volume) = Fixed cost ÷ P/V Ratio

Break-even sales = ₹ 5,85,000 ÷ 45%

Break-even sales = ₹ 5,85,000 × 100/45 = ₹13,00,000

% Profit = P/V Ratio × Margin of sales Ratio × 100

% Profit = 45/100 × 100/300 × 100

% Profit = 15%

Sales Volume (s) = (Fixed cost + Profit % on Sales or S) ÷ P/V Ratio

or, S = (₹ 5,85,000 + 15% S) ÷ 45%

or, 45% S = ₹ 5,85,000 + 15% S

or, 30% S = ₹ 5,85,000

or, S = ₹ 5,85,000 × 100/30 = ₹ 19,50,000

Sales = ₹ 19,50,000, Profit = 15% of ₹ 19,50,000 = ₹ 2,92,500.

Illustration 14

When sales of a company declines from ₹ 9,00,000 to ₹ 7,00,000, its profit of ₹ 50,000 is converted into a loss of ₹ 50,000.

Determine contribution margin ratio.

Solution:

Sales	Profit
₹	₹
9,00,000	50,000
7,00,000	(-) (Loss) 50,000
2,00,000	1,00,000

P/V Ratio or Contribution Margin Ratio = 1,00,000 ÷ 2,00,000 × 100 = 50%

Illustration 15

An exporter of garments is earning a profit of ₹ 1,00,000 on a sale of ₹ 12,00,000. Selling price is ₹ 40 per garment and variable cost is ₹30 per garment. The exporter incurs an additional fixed cost of ₹3,00,000 on product improvement which also enables him to economise ₹5 in per garment variable cost.

As per trade agreements, the sale of his garments is restricted to the old value of ₹ 12,00,000. What should be the selling price per garment so that the exporter earns the same profit at the same sales value?

Solution:

Units sold = Sales ÷ Selling Price per unit = ₹ 12,00,000 ÷ ₹ 40 = 30,000 units

Sales	40	12,00,000
Less: Variable cost	30	9,00,000
Contribution	10	3,00,000
Less: Profits		1,00,000
Fixed Cost		2,00,000

Hence, total fixed cost in the new case = ₹ 2,00,000 + ₹ 3,00,000 = ₹ 5,00,000

Contribution in the New Case = New Fixed Cost + Profits = 5,00,000 + 1,00,000 = ₹ 6,00,000

Since as per agreement the sale value is restricted to the old value that is ₹ 12,00,000. Hence P/V Ratio will be:

₹ 6,00,000 ÷ ₹12,00,000 × 100 = 50%

The variable cost in the new case = ₹ 30 - ₹ 5 = ₹ 25

Variable Cost Ratio = 100 - P/V Ratio = 100 - 50 = 50%

Computation of New Selling Price:

If VC is 50, then SP = ₹ 100

If VC is 1, then SP = 100 ÷ 50

If VC is 25, then SP = 100 ÷ 50 × 25 = ₹ 50 per unit

Illustration 16

On investigation it was found that variable cost in XYZ Ltd is 80 per cent of the selling price. If the fixed expenses are ₹ 10,000, calculate the break-even sales of the company.

Another firm, MN Company Ltd, having the same amount of fixed expenses, has its break-even point at a lower figure than that of XYZ Ltd. Comment on the causes.

Solution:

BEP (amount) = ₹ 10,000/ P/V ratio (100 percent -Variable cost to volume ratio = 0.80)

= ₹ 10,000/0.20

= ₹ 50,000 (XYZ Ltd)

The lower break-even point of MN Ltd vis-à-vis XYZ Ltd is due to its lower variable expenses to volume ratio, which in turn may be either due to its lower VC per unit or higher SP per unit, eventually yielding higher contribution margin and, hence, higher P/V ratio and lower BEP.

Illustration 17

ABC Ltd manufactures and sells four types of products under the brand names of A, B, C and D. The sales-mix in value comprises 33.33, 41.67, 16.67 and 8.33 per cents for products A, B, C and D respectively. The total budgeted sales (100 per cent) are ₹ 60,000 per month. Operating costs are:

Variable costs as per cent of selling price: Product A 60, B 68, C 80, and D 40. Fixed costs, ₹ 14,700 per month.

Calculate the break-even point for the products on an over-all basis.

Solution:

Determination of Weighted PV Ratio:

Product	Sales Revenue (₹)	(%)	Variable Costs (₹)	(%)	Contribution (₹)	P/V Ratio (%)
A	20,000	33.33	12,000	60	8,000	40
B	25,000	41.67	17,000	68	8,000	32
C	10,000	16.67	8,000	80	2,000	20
D	5,000	8.33	2,000	40	3,000	60
Total	60,000	100	39,000	65	21,000	35

BEP = Fixed Costs/Weighted P/V Ratio = ₹14,700 / 0.35 = ₹42,000.

Confirmation

Particulars	₹
Variable Costs (0.65 × ₹ 42,000)	27,300
Fixed Costs	14,700
Total Costs	42,000
Total Sales Revenue	42,000

Illustration 18

From the cost records of a company for a specific period, for product X, the information given in the first column can be ignored since it is only one of the several projections of an assistant accountant, but it may be useful to you.

Particular	This Period Actual (₹)	One of The Future Projections (₹)
Sales (Units)	10,000	20,000
Profit (Loss)	(10,000)	10,000
Fixed Costs	30,000	30,000
Variable Cost Per Unit	8	8

On the basis of the first column, determine

1. What increased sales volume is required to cover an additional attractive packaging cost of ₹ 0.50 per unit, to increase the sales, at the existing sales price, to yield zero profit?
2. What increased sales volume in required at the present sale price, to cover an additional publicity expense of ₹5,000 for that period, while yielding a profit of ₹5,000.
3. What increased sale volume is required to reach a profit of ₹4,000 while reducing the selling price by 3 per cent per unit?

Solution:

(1) Sales volume required to yield zero profit: = Fixed costs/ CM per unit = ₹ 30,000/₹ 1.50 = 20,000 units. Sales volume required = 20,000 units (₹ 2,00,000). Existing sales volume = 10,000 units (₹ 1,00,000). Difference represents increase in sales volume required to make zero profit = 10,000 units (₹ 1,00,000).

(2) Assuming situation (2) independent of (1): Sales volume required to earn a profit of ₹ 5,000 = [₹ 30,000 + ₹5,000 (publicity expenses) + ₹ 5,000 (profit)]/₹ 2 = 20,000 units (₹ 2,00,000); 10,000 units (₹ 1,00,000) is the increased sales volume required.

(3) Assuming (3) to be independent of situations (1) and (2): Desired sales volume to earn a profit of ₹ 4,000= (₹30,000 + ₹ 4,000)/(₹ 9.70 – 8) = 20,000 units (or ₹ 1,94,000). Increased sales volume required is 10,000 units.

Working Note:

Determination of total sales revenue and selling price per unit:

Total sales revenue = Total costs – Loss

Total costs = FC + (VC per unit × Sales in units)

₹ 80,000 = ₹ 30,000 + (₹ 8 × 10,000)

Total sales revenue = ₹ 1,10,000 – ₹ 10,000 = ₹ 1,00,000

SP per unit = ₹ 1,00,000/10,000 = ₹10.

EXERCISE

Theoretical Questions

⊙ Multiple Choice Question (MCQ)

1. To obtain the break-even point in rupee sales value, total fixed costs are divided by:
   A. Variable cost per unit;
   B. Contribution margin per unit;
   C. Fixed cost per unit;
   D. Profit/volume ratio.
2. The break-even point is the point at which:
   A. There is no profit, no loss;
   B. Contribution margin is equal to total fixed cost;
   C. Total revenue is equal to total cost;
   D. All of the above.
3. The primary difference between a fixed budget and a variable (flexible) budget is that a fixed budget:
   A. includes only fixed costs, while a variable budget includes only variable costs.
   B. is concerned with only further acquisitions of fixed costs, while a variable budget is concerned with expenses which vary with sales.
   C. cannot be changed after the period begins, while a variable budget can be changed after the period begins.
   D. is a plan for a single level of sales (or other measure of activity), while a variable budget consists of several plans, one for each of several levels of sales (or other measures of activity).
4. Margin of safety is referred to as:
   A. Excess of actual sales over fixed expenses;
   B. Excess of actual sales over variable expenses;
   C. Excess of actual sales over break-even sales;
   D. Excess of budgeted sales over fixed costs.
5. Contribution margin is known as
   A. Marginal income
   B. Gross profit
   C. Net income
   D. Net profit
6. Fixed cost per unit decrease when
   A. Production volume increases
   B. Production volume decreases
   C. Variable costs per unit decreases
   D. Prime costs per unit decreases

7. Within a relevant range, the amount of variable costs per unit
   A. Differs at each production level
   B. Remains constant at each production level
   C. Increases as production increases
   D. Decreases as production increases
8. Margin of safety is referred to as
   A. Excess of budgeted or actual sales over the variable expenses and fixed expense, at break-even.
   B. Excess of budgeted or actual sales revenue over the fixed expenses.
   C. Excess of actual sales over budgeted sales.
   D. Excess of sales revenue over the variable expenses.
9. Under marginal costing system, the contribution margin discloses the excess of
   A. Revenue over fixed costs
   B. Projected revenues over the break-even point
   C. Revenues over variable costs
   D. Variable costs over fixed costs
10. A decrease in sales price
   A. does not affect the break-even point
   B. lowers the fixed cost
   C. Increases the break-even point
   D. lowers the break-even point

Answer:

1-D, 2-A, 3-D, 4-C, 5-A, 6-A, 7- B, 8- C, 9-C, 10-C.

State True or False

1. Marginal costing and absorption costing will report different profit figures if there is any change in the volume of inventory during the period.
2. Another term for marginal costing is variable costing.
3. For the marginal cost, the stock will be calculated on total cost.
4. The P/V ratio will be equal to the profits by the sale ratio
5. BEP in marginal costing is Break entity profit
6. The kind of cost which will not differ due to the volume of the production is called Fixed cost
7. Under High and Low Point method, the output at two different levels is compared with the amount of total costs incurred at these two points.
8. In Analytical method of calculating marginal costing, it is determined on the basis of past records.
9. Margin of safety will be ₹ 37,500 if Profit is ₹ 15,000 and P/V ratio is 40%.
10. Differential cost is the economist's concept of marginal cost.

11. Marginal Costing is the practice of charging all marginal costs to operations processes or products and deducting all fixed costs against the profits for a particular period in which they arise.
12. Marginal cost may also be defined as the "cost of producing one additional unit of product."
13. Addition of variable cost and profit to contribution is equal to selling price.
14. Fixed costs remain unchanged or constant for the entire volume of production.
15. Marginal cost remains the same per unit of output irrespective of the level of activity.
16. Marginal cost per unit is not constant in nature and helps the management in production planning.
17. Selling prices do not remain constant forever and for all levels of output due to competition, discounts for bulk orders, changes in the general price level, etc.
18. Fixation of selling price in the long run can be done without considering fixed costs.
19. Break-even analysis can be used to help management select an action when several alternatives exist.
20. CVP analysis looks at the effect of sales volume variations on costs and operating profit.

Answer:

1- True, 2- True, 3- False, 4- False, 5- False, 6- True, 7-True, 8-False, 9- True, 10-True. 11. True, 12. True, 13. True, 14. True, 15. True, 16. False, 17. True, 18. False, 19. True, 20. True.

Fill in the Blanks

1. If the total cost of 1000 units is ₹ 60,000 and that of 1001 units is ₹ 60,400, then the increase of ₹ 400 in the total cost is _____.
2. The costing method where fixed factory overheads are added to inventory is called _____
3. The marginal cost of change in the total cost when the quantity of product is —?
4. Contribution margin in marginal costing is also known as _____.
5. Fixed cost is also referred to as _____ in the marginal costing technique.
6. An increase in the variable cost _____.
7. Under marginal costing, the stock is valued at _____
8. Marginal cost is equal to _____.
9. While computing contribution in marginal costing, _____.
10. The marginal cost will be equal to _____.
11. Break-even Chart is a graphical representation of the …….
12. …… of cost and revenue data (breakeven charts) can be more easily understood by non-financial managers.
13. …….. is the result of an alternative course of action.
14. A management of any type of business organization is confronted with the problem of making appropriate ……
15. Differential cost analysis is carried on using only…….
16. The main point which distinguishes …….. and differential as that change in fixed cost when volume of production increases or decreases by a unit of production.

17. Fixed production overheads under……. are charged to the product to be subsequently released as a part of goods sold.
18. The …….to be charged for a product or service is often one of the most important decisions made by managers.
19. When the conditions prevailed both internally and externally are ……..to the companies, they usually plan to earn some planned profit
20. The decision about whether to produce parts and components in-house, or to sub-contract work to external suppliers, is referred to as the…….

Answer:

1- Marginal cost, 2- Absorption costing, 3- increased by one unit., 4- Marginal income, 5- Period cost, 6- Improves margin of safety, 7- Variable Cost, 8- Prime cost plus variable overheads, 9- The total marginal cost gets deducted from total sales revenue, 10- Prime cost plus all the variables overhead, 11. Break- Even Analysis, 12. Graphical representation, 13. Differential cost, 14. Decisions, 15. Relevant costs, 16. Marginal cost, 17. Absorption costing, 18. Price, 19. Favourable, 20. 'Make-or-buy decision'.

⊙ Short Essay Type Questions

1. What do you mean by marginal costing? Discuss its usefulness and limitations.
2. Distinguish between absorption costing and variable costing.
3. Discuss the role of contribution in marginal costing in decisions relating to fixation of selling price.
4. What are the limitations of break-even analysis?
5. Define break-even point. How can the break-even point be computed?

⊙ Essay Type Questions

1. What do you understand by the term margin of safety with reference to volume of production?
2. What do you understand by the term break-even analysis"? Enumerate its uses.
3. Discuss the uses of CVP analysis and its significance to management.
4. Mention the basic assumption made for 'Break-even Analysis' and also state how far they are valid.
5. Mention some possible courses of action to improve profit-volume ratio.

Practical Problems

⊙ Multiple Choice Question (MCQ)

1. Determine Margin of safety if Profit is ₹15,000 and P/V ratio is 40%.
   A. ₹37,500
   B. ₹33,000
   C. ₹38,000
   D. None of the above
2. What is Margin of Safety if Sales is 20,000 units and B.E.P is 15,000 units?
   A. 15000 units
   B. 5000 units
   C. 10000 units

D. 20000 units

3. Calculate margin of safety if sales is ₹3,00,000 and B.E.P is ₹ 4,50,000.

   A. ₹1,00,000

   B. ₹1,50,000

   C. Amount of sales < B.E.P, therefore no margin of safety

   D. None of the above

4. Determine sales in rupees for desired profit if fixed cost is ₹10,000, Variable cost is ₹30,000, Sales is ₹50,000 and desired profit is ₹5,000.

   A. ₹73,500

   B. ₹75,000

   C. ₹5,000

   D. ₹37,500

5. What will be sales in rupees for desired profit if fixed cost is ₹30,000, desired profit is ₹15,000 and P/V ratio is 30%?

   A. ₹1,50,000

   B. ₹1,00,000

   C. ₹2,00,000

   D. None of the above

6. Calculate sales in rupees for desired profit if fixed cost is ₹10,000, selling price is ₹20 per unit, Variable cost is ₹15 per unit and desired profit is ₹1 per unit.

   A. ₹20,000

   B. ₹50,000

   C. ₹70,000

   D. ₹10,000

7. Determine sales in units for desired profit if Fixed cost is ₹15,000, desired profit is ₹5,000 Selling price per unit is ₹20 and Variable cost per unit is ₹16.

   A. ₹5,000 units

   B. ₹5,000

   C. ₹10,000

   D. ₹10,000 units

8. What will be sales in units if fixed cost is ₹50,000 Contribution per unit is ₹60 and desired profit per unit is ₹10.

   A. ₹6,000 units

   B. ₹1,000

   C. ₹1,000 units

   D. ₹6,000

9. Determine B.E.P in units and amount if Units produced if ₹10,000, Fixed cost is ₹40,000, Selling price is ₹50 per unit and Variable cost us ₹30 per unit.

   A. ₹40 per unit, ₹2,00,000

   B. ₹50 per unit, ₹10,00,000

   C. ₹20 per unit, ₹1,00,000

   D. None of the above

10. Determine B.E.P if Sales is ₹1,00,000, Variable cost is ₹50,000 and Profit is ₹20,000.

    A. ₹60,000

    B. ₹40,000

    C. ₹80,000

    D. None of the above

Answer:

1-A, 2-B, 3-A, 4-D, 5-A, 6-B, 7- A, 8- C, 9-C, 10-A.

Comprehensive Numerical Questions

1. A company having annual sales of ₹10 crores is earning 12% profit before charging interest and depreciation. Interest and depreciation amount to ₹60 lakhs and ₹100 lakhs respectively. If the contribution/sales ratio of the company is 0.4, calculate its break-even sales.

2. In a purely competitive market 10,000 units of a product can be manufactured and sold and certain amount of profit is generated. It is estimated that 2,000 units of that product need to be manufactured and sold in a monopoly market to earn the same profit.

   Profit under both the market conditions is targeted at ₹2,00,000. The variable cost per unit is ₹100 and the total fixed cost is ₹37,000.

   You are required to determine the selling prices under both monopoly and competitive conditions.

3. A company has a fixed cost of ₹ 20,000. It sells two products A and B, in the ratio of 2 units of A and 1 unit of B. Contribution is ₹1 per unit of A and ₹2 per unit of B. How many units of A and B would be sold at break-even point?

4. ABC Ltd. manufactures three products, P, Q and R. The unit selling prices of these products are ₹100, ₹80 and ₹50 respectively. The corresponding unit variable costs are ₹ 50, ₹40 and ₹20. The proportions (quantity-wise) in which these products are manufactured and sold are 20%, 30% and 50% respectively. The total fixed costs are ₹14,80,000.

   Given the above information, you are required to work out the overall break-even quantity and the product wise break-up of such quantity.

5. A producer of Ladies purses is earning a monthly post tax profit of ₹ 60,000 when income tax rate is 40%. Selling price of a purse is ₹50 and per unit variable cost is ₹30. How many more purses he should sell to earn same monthly post tax profit, if the tax rate goes up to 50%?

6. Calculate break-even for a train journey between Delhi- Bangalore where cost of an Engine is ₹ 1,00,000 and of a bogie ₹20,000. Capacity of a bogie is 80 passengers and each ticket for the journey is ₹600. There is no variable cost per passenger.

7. W Ltd. is a single product producer with P/V ratio of 40% for the product during the current year.

   Due to increasing competition it is believed that the price will have to be reduced by 10% in the next year. By what percentage sales value and sales quantity should increase so that W Ltd. earns same profit in the next year also?

8. A company has a contribution/sales ratio of 40%. It maintains a margin of safety of 20%. If its annual fixed cost amount to ₹ 24 lakhs, calculate its

   A. Break-even sales,

   B. Margin of safety,

   C. Total sales,

   D. Total variable costs and

   E. Profit

9. A company sells its product at ₹15 per unit. In a period, if it produces and sells 8000 units, it incurs a loss of ₹5 per unit. If the volume is raised to 20000 units, it earns a profit of ₹ 4 per unit.

   Calculate break-even point in terms of rupees as well as in units.

10. A Company manufactures radios, which are sold at ₹ 1,600 per unit. The total cost is composed of 30% for direct materials, 40% for direct wages and 30% for overheads. An increase in material price by 30% and in wage rates by 10% is expected in the forthcoming year, as a result of which the profit at current selling price may decrease by 40% of the present profit per unit. You are required to prepare a statement showing current and future profit at present Selling Price.

    How much Selling Price should be increased to maintain the present rate of profit?

⊙ Unsolved Cases

1. Prepare a profit and loss statement under

   (i) Absorption costing and

   (ii) Marginal costing from the following data:

   Total units produced 5000 units

   Total units sold 4000 units

   Selling price per unit ₹10

   Total fixed overheads ₹15,000

   Cost structure:

Particulars	(Per unit)
Direct material	₹ 2
Direct wages	₹2
Variable overhead	₹2
Fixed overhead	₹3

2. You are required to ascertain profit t and loss under (i) marginal-costing- and (ii) absorption-costing method from the following data:

   Basic production data:

   Normal volume of production = 20,000 units per period.

Sales price = ₹5 per unit.

Variable cost = ₹3 per unit.

Fixed cost = ₹1 per unit.

Total fixed cost = ₹20,000 (20,000 × ₹1).

Selling and distribution costs (not available).

The opening and closing stocks consist of both finished goods as well as equivalent units of WIP.

3. A company produces a variety of products each having a number of component parts. Product B takes 10 hours to process on a machine working to its full capacity. B has a selling price of ₹100 and a marginal cost of ₹50.

   'AA' – a component part (used for product A), could be made on the same machine in 2 hours for a marginal cost of ₹15. The suppliers' price is ₹20. Should one make or buy the component 'AA'? Assume that the machine hour is the limiting factor.

4. A company has a capacity of producing 50,000 units of a certain product in a month. The sales department reports that the following schedule of sale prices is possible:

Volume of Production	Selling Price per unit (₹)
60%	0.95
70%	0.90
80%	0.85
90%	0.75
100%	0.60

   The variable cost of manufacture between these levels is ₹0.20 per unit and the fixed cost is ₹15,000. At which volume of production will the profit be the maximum?

5. The following date relates to a manufacturing company:

   Plant capacity: 2,00,000 units per annum

   Present utilization = 50%

   Actuals for the year are:

   Selling price ₹40 per unit

   Materials cost ₹15 per unit

   Variable manufacturing costs ₹9 per unit

   Fixed costs ₹18 lakhs

   In order to improve the capacity utilization, the following proposals are being considered:

   (i) Reduce the selling price by 15%.

   (ii) Spend additionally ₹2,00,000 on sales promotion

   How many units should be made and sold in order to earn a profit t of ₹5,00,000 per year?

Key Terms

Marginal cost—Marginal cost is the aggregate of variable costs.

Marginal costing—Marginal costing is a technique which is concerned with the changes in costs and profits result from changes in volume of output.

Absorption Costing—Absorption costing is the total cost technique. It is the practice of charging all costs, both variable and fixed, to operations, processes or products.

Higher contribution—Higher contribution means more profit

Break-even Analysis—In CVP analysis, an attempt is made to measure variations of costs and profit with volume of production.

Break-even point- Break-even point may be as the point of sales volume at which total revenue equals total costs.

Angle of Incidence: Angle of Incidence is the angle between sales and total cost line. This angle is an indicator of profit earning capacity of the firm over the break-even point sales.

Break-even Analysis: Break-even Analysis is a method for examining the relationship between sales revenue, variable costs and fixed costs to determine the minimum value of production necessary to break-even.

Break-even Chart: Break-even Chart is the chart which shows the profitability or otherwise of a firm at various levels of activity. It indicates the point at which neither profit nor loss is made.

Contribution or Gross Margin: Contribution or Gross Margin is the difference between sales value and the variable cost. In other words, Contribution or Gross Margin is defined as the amount recovered towards fixed cost and profit.

Differential Cost: Differential Cost is the change in the costs which results from the adoption of an alternative course of action.

Margin of Safety: Margin of Safety is represented by excess sales over and above the break-even point sales.

Profit Volume Ratio (P/V Ratio) or Contribution Ratio: Profit Volume Ratio (P/V Ratio) or Contribution Ratio is the ratio of Contribution to Sales.

P/V Ratio = (Contribution/Sales) × 100 or

= [(Sales – Variable cost)/Sales] × 100 or

= (Change in Contribution/Change in Sales) × 100 or

= (Change in Profit/Change in Sales) × 100

Marginal cost plus prices are based on the marginal cost of production or the marginal cost of sales, plus a profit margin.

Desired Profit: It is a profit level desired by the fi rm to earn at the given level of sales volume.

Key Factor: Factor of influence on the component of contribution.

Applications of Marginal Costing in Short Term Decision Making

4

This Study Note includes:

4.1 Pricing Decision

4.2 Make or Buy decisions

4.3 Accept an Order or Reject

4.4 Optimum Utilization of Factor of Production [Limiting Factor Analysis]

4.5 Replacement Decision

4.6 Evaluation of Alternative Choices

4.7 Subcontracting and Ancillarisation

4.8 Expansion of Business

4.9 Shutdown or Continue

Applications of Marginal Costing in Short Term Decision Making

SLOB Mapped against the Module

To develop detail understanding of costing frameworks, tools, and techniques to facilitate managerial decision making for cost control and optimisation, and determination of prices with optimised product mix. (CMLO 2b, 3a, b)

Module Learning Objectives:

After studying this module, the students will be able to

- Contextualise the short term decision making process.
- Appreciate the application of marginal costing technique in short term financial decision making.

Pricing Decision

4.1

The price to be charged for a product or service is often one of the most important decisions made by manager. One of the most important decisions that the management has to take is about the price for its company's product. In case of a new product, it is necessary to determine the price at which the product is to be sold. In the case of an existing product, it is necessary to determine the extent to which the price is to be revised in the light of cost hikes which the company has painfully be experiencing. Pricing is considered as both an important and difficult one. This is considered as an important one as this is one of a few determinants of profitability of the company. Pricing is a difficult task for two important reasons. Firstly, there are a large number of factors, both internal and external, which are to be taken into consideration before deciding the price for a product. Secondly, there is no ready formula which can be used to determine, and/or revise, the price of a product.

The price is determined by the market forces, viz. demand, Supply, etc. At the same time, our experience states that these two market forces are influenced even by the price. Further it is well known that the majority of the companies aim at earning reasonable to maximum rate of profit. If at all a company wants to earn profit, its price should be higher than its costs. This implies that the companies should base their prices on costs.

a) **Pricing additional or special sales**

In the case of the companies operating below their capacity, idle capacity exists. That means, the normal demand from their regular customer is for lower volume than what the companies are capable of producing and selling. For example, a company with an annual capacity of 10,000 units of a product may be producing and selling only 8,000 units due to the lack of demand. This type of companies also receives additional offer either from new customer or from their regular customer. Therefore, the companies have to take decision about accepting or rejecting the offer. For the purpose of taking proper decision in this regard, it is necessary to look into the impact of acceptance of the special offer on costs, revenue and profit. All the costs which are going to change due to the acceptance of the offer are relevant for the purpose of deciding whether to accept the offer or not. Usually, the acceptance of the offer increases the items of variable costs. The items of fixed costs may or may not register an increase. If these costs change, they are to be reckoned as relevant. Otherwise, they are irrelevant. So, the aggregate of changes in the items of costs is the incremental cost which is attributable to the additional sales or special offer.

As far as revenue is concerned, two types of special business can be found. One, in the form of asking for the price which the company wishes to quote for certain number of units of its product. In this case, the company has to consider the incremental cost. The price to be quoted should be at least equal to the incremental cost. Any price in excess of this incremental cost is a profitable price. The price should not be quoted on the basis of total costs, which includes even a share in the common and inescapable or unavoidable fixed costs, because, if the price is quoted on the basis of total costs, the quoted price may be at higher level resulting in the rejection of the offer of the company concerned by the customer. Further, a company receives an offer wherein the offer states that the prospective buyer is willing to buy certain quantity of the company's product at a specific price. In this case, the company has to decide about the acceptance of the offer. In order to take decision, the price offered by the buyer is to be compared with the incremental cost. If the offered price exceeds the incremental

cost, it is better to accept the offer. Otherwise, it is not a profitable proposition. Yet, there may be a third type of offer and this relates to the pricing of export business. In this case, some additional costs and benefit associate with the exports. Special care is to be given to the packing, insurance, transportation, quality of the product, etc. These are some of the aspects which cause an increase in the costs. Therefore, they fall into the category of relevant costs. Some additional benefits also accrue to export sales such as cash subsidy, duty drawback, etc. Hence, these are relevant items. The amount of these benefits may be used to reduce the total of incremental costs. The net incremental cost should be used to quote the price for international market or the net incremental cost may be compared with the price offered and on the basis of this comparison, the decision is to be taken.

b) **Pricing under normal and favourable conditions:**

When the conditions prevailed both internally and externally are favourable to the companies, they usually plan to earn some planned profit. Consequently, the companies wish to price their products on the basis of cost plus profit. The desired profit which the companies plan to earn may be expressed either as a percentage of sales revenue or as percentage on their investments.

c) **Pricing under abnormal conditions:**

As already stated, a large number of factor influence the pricing aspect and a number of changes take place in these influencing factor on a continual basis. Consequently, the conditions which were favourable to the companies start changing. The companies should have a vigilant eye on the market conditions. Hence, whenever the conditions start changing, the companies make some appropriate changes in their policies, programmes, etc. One of the variables wherein the companies make adjustments is the price. The extent to which the price is to be lowered depends upon the gravity of the problem and also the composition of price. In some cases, a 10% reduction in the price may be adequate and in some other cases, a 40% reduction in the price may be necessary. Further, a company may be willing to forego the entire profit in case the market demands such a drastic move. Another or the same company may be forced to sell at below the cost price. Otherwise, the company will be out of market. It is therefore necessary to decide whether to sell the product at reduced price or to suspend the activities temporarily.

Two alternatives are available to the companies in the above cases. One, continuing to produce and sell the goods and services at the reduced prices. Depending upon the quantum of reduction in the selling price, the company earns reduced amount of profit or incur loss. If the company is not ready to incur the loss or if it does not satisfy with the reduced profit or if it is not willing to operate at BEP, the company has to take the second alternative of suspending its sales activities till the conditions improve for the company. Here also, the company has to incur some loss equivalent to inescapable fixed costs. Hence, it is necessary to compute the loss under each of these two alternatives and whichever involves the minimum loss is to be preferred, if the company takes the decision purely on the basis of financial aspects.

Perhaps the most important criticism of full cost pricing is that it fails to recognize that since sales demand may be determined by the sales price; there will be a profit-maximizing combination of price and demand. A full cost based approach to pricing will be most unlikely, except by coincidence or 'luck', to arrive at the profit-maximizing price. In contrast, a marginal costing approach to looking at costs and prices would be more likely to help with identifying a profit-maximizing price.

Special order requires a relevant cost approach to the calculation of the price.

A special order is a one-off revenue earning opportunity. These may arise in the following situations:

a. When a business has a regular source of income but also has some spare capacity allowing it to take on extra work if demanded. For example, a brewery might have a capacity of 5,00,000 barrels per month but only be producing and selling 3,00,000 barrels per month. It could therefore consider special order to use up some of its spare capacity.

b. When a business has no regular source of income and relies exclusively on its ability to respond to demand.

A building firm is a typical example as are many types of sub-contractor. In the service sector consultants often work on this basis. The reason for making the distinction is that in the case of (a) a firm would normally attempt to cover its longer-term running costs in its prices for its regular product. Pricing for special order need therefore take no account of unavoidable fixed costs. This is clearly not the case for a firm in (b)'s position, where special orders are the only source of income for the foreseeable future.

Illustration 1

A Company is manufacturing a product marks an average net profit of ₹ 2.50 per piece on a selling price of ₹ 14.30 by producing and selling 6,000 pieces or 60% of the capacity. His cost of sales is as under:

Particulars	₹
Direct material	3.50
Direct wages	1.25
Works overheads (50% fixed)	6.25
Sales overheads (25% variable)	0.80

During the current year, he intends to produce the same number but anticipates that fixed charges will go up by 10%, with direct labour rate and material will increase by 8% and 6% respectively but he has no option of increasing the selling price. Under this situation, he obtains an offer for further 20% of the capacity. What minimum price you will recommend for acceptance to ensure the manufacturer an overall profit of ₹ 16,730.

Solution:

Computation of profit at present after increase in cost

Particulars	₹
Selling price	14.30
Variable costs:	
Material (₹ 3.5 × 106÷100)	3.710
Labour (₹ 1.25 × 108÷100)	1.350
Works overhead	3.1250
Sales overhead	0.200
Total	8.385
Contribution per unit	5.915
Total contribution (6,000 × ₹ 5.915)	35,490
Fixed costs	
Works OH ₹3.125	
Sales OH ₹ 0.600 3.725 (₹3.725 × 6,000 = ₹ 22,350 × 110/100)	24,585
Profit	**10,905**

Computation of selling price of the order	(₹)
Variable cost of order (2,000 × 8.385)	16,770
(+) required profit (16,730 – 10,905)	5,825
Sales required	22,595
Selling price of order = ₹ 22,595÷2,000 = 11.2975 (or)	**11.30**

Make or Buy decisions

4.2

This kind of decision typically arises when the product being manufactured has a component part that can either be made within the factory or brought from an outside supplier. On the face of it, since the only extra cost to make the part is the marginal cost, the amount by which this falls below the supplier's price is the saving that arises on making. However, this may not be so as it is also important to consider what work would otherwise be carried out using the relevant facilities if the part were not made. Clearly, if other work has to be displaced so as to make the part, the business will forego the contribution, this work would otherwise have earned. Such a contribution loss must be added to the marginal cost of the part.

So, in a make-or-buy decision there are two factors which must be compared, namely:

a. The supplier's price;

b. The marginal cost of making, plus the loss of contribution from displaced work.

This loss of contribution is usually best found by use of the contribution per unit of key factor. It should also be appreciated that this lost contribution is an opportunity cost.

An organisation might want to do more things than it has the resources for, and so its alternatives would be as follows:

a. Make the best use of the available resources and ignore the opportunities to buy help from outside.

b. Combine internal resources with buying externally so as to do more and increase profitability.

Buying help from outside is justifiable if it adds to profits. A further decision is then required on how to split the work between internal and external effort. What parts of the work should be given to supplies or sub-contractor so as to maximize profitability?

In a situation where a company must sub-contract work to make up a shortfall in its own in-house capabilities, its total costs will be minimized, if those units bought have the lowest extra variable cost of buying per unit of scarce resource saved by buying.

The decision about whether to produce parts and components in-house, or to sub-contract work to external supplies, is referred to as the 'make-or-buy decision'. Making products in-house is often cheaper than buying them, because an external supplier will charge a price which must cover his fixed costs and give him a profit, but the direct comparison of in-house costs with supplies prices is only one factor in the make-or-buy equation. Other issues to consider are the following:

a. When a company makes products in-house it is tying up resources, management and labour, working capital, fixed assets, space in buildings etc., which could be used for other more profitable purposes. There is an opportunity cost which might make in-house production costlier than buying from outside e.g. in terms of lost opportunities for expansion into other product-market areas.

b. If a company cannot produce all the output it needs in-house, it will be forced to use external supplier to some extent. If it must do so, it will have to try to ensure that the sources of supply remain open, and that supply is

never in danger of 'drying up'. This might oblige the company to offer a supply contract to a supplier which guarantees a minimum supply quantity over a period of time, so as to:

(i) Help the supplier to make the profits he needs to stay in business; and

(ii) Receive 'favoured customer' treatment from the supplier; and perhaps

(iii) Persuade the supplier to make modifications to his own production methods so as to meet the company's requirements more exactly.

c. In-house production should be easier to control in terms of product quality and the reliability of delivery, but if a company tries to do too much itself (e.g. forces employees to work overtime, introduces shift working, or imposes unrealistic production schedules) it might then suffer from employee unrest, and industrial relations difficulties.

d. External supplier need to be reliable in terms of product quality and reliability of delivery times, and alternative sources of supply should be sought, in case one supplier becomes too unreliable or too expensive.

Manufacturing ties up large quantities of capital, and so if a company's strengths lie in marketing or development, then it might be advisable to concentrate on these areas and to subcontract the production work to other organisations.

In order to overcome problems of limited resources, a firm may buy in a product instead of making it itself. Where incremental costs of manufacture are less than those of buying in, the firm should make, assuming that there are no limited resources.

Where resources are limited, the firm should concentrate on making those products which give the greatest saving (over buying in) per unit of the scarce resource.

To decide which products should be made and which should be bought, we calculate the saving per unit of scarce resource from making the product rather than buying it in.

Note: Make or buy decisions should nearly always be made from a strategic viewpoint and not from a short-term marginal cost point of view, but here it assumed that a short-term decision is needed and marginal costing is used, and that it suggests that the product under consideration should be made rather than bought in.

Various Non-costs Factors:

a. Possible use of released production capacity and facility as a result a buying instead of making.

b. Sources of supply should be reliable, and they are capable of meeting un-interruptedly the requirement of the concern.

c. Assurance about the quality of goods supplied by outside supplier.

d. Reasonable certainty from supplier's side about meeting the target delivery dates.

e. The decision of buying the product / component from outside supplier should be discouraged, if the technical know-how used is highly secretive.

f. The decision of buying from outside sources should not result in the laying off the worker and create industrial relation problems. In fact, on buying from outside, the resources freed should be better utilized elsewhere in the concern.

g. The decision of manufacturing product / component should not adversely affect the concern's relationship with the supplier.

h. To ensure that more than one supplier of the product / component is available to reduce the risk of outside buying.

i. In case, the necessary technical expertise is not available internally then it is better to buy the requirements from outside.

Illustration 2

Prem Industry is considering making its own motor castings, which it currently purchases for ₹ 20.50 per unit. This purchase price does not include the ordering, receiving, and inspection costs, which Prem estimates to be ₹ 2 per unit. Prem feels that, it can manufacture the 6,500 required units at a lower cost than it pays by purchasing externally. The relevant costs for both the producing and buying alternatives are as follows:

Incremental Analysis for Motor Castings (6,500 Units) ₹

Particulars	Per Unit	Cost to Make	Cost to Buy
Direct Materials	6.25	40,625	
Direct Labour	10.00	65,000	
Variable Factory Overhead	5.00	32,500	
Purchase Price	20.50		1,33,250
Ordering, Receiving and Inspection Costs	2.00		13,000
Total Relevant Costs		1,38,125	1,46,250

Solution:

Assuming that Prem's facilities will remain idle if they do not manufacture the casting, Prem Industries would increase income by ₹ 8,125 per year (₹1,46,250 – ₹ 1,38,125) by making the component instead of purchasing it. If, however, Prem could use the idle capacity to manufacture a new product line instead of producing the motor castings, the contribution margin of the new product line must be considered as an opportunity cost of the "make" decision. The estimated revenue and cost data for the housings (new product line) are as follows:

Particulars	Per Unit (₹)	Total (₹)
Sales Revenue (4,800 units)	31.25	1,50,000
Manufacturing Costs :		
Direct Materials	10.00	48,000
Direct Labour	12.25	58,800
Variable Overheads	5.00	24,000
Total	27.25	1,30,800
Incremental Profit	4.00	19,200

Particulars	Make (₹)	Buy (₹)
Total Cost of Purchasing Motor Castings	-	1,46,250
Cost of Manufacturing Motor Castings	1,38,125	-
Opportunity Cost	19,200	
Net Relevant Costs	1,57,325	1,46,250

The firm would benefit by ₹ 11,075 (₹1,57,325 - ₹ 1,46,250), if it elects to buy the motor castings and manufacture the housings (new product line).

Opportunity cost concept

Where the choice of one course of action requires that an alternative course of action be given up the financial benefits that are foregone or sacrificed are known as opportunity costs. Opportunity costs thus represent the lost contribution to profits arising from the best alternative foregone. They arise only when the resources are scarce and have alternative uses. Opportunity costs must therefore be included in the analysis when presenting relevant information for decision-making.

Accept an Order or Reject

4.3

Frequently the management of a company is offered a special order for one of its products at a price lower than its customary selling price. When a business is operating at something lower than its normal value, such a special order can prove attractive depending on the effect of incremental revenues and costs on overall profits of the business. In this case differential cost system provides a useful means for appraising the economic benefits of such an opportunity.

Illustration 3

A Co. currently operating at 80% capacity has the following; profitability particulars:

Particulars	Amount (₹)	Amount (₹)
Sales		12,80,000
Costs:		
Direct Materials	4,00,000	
Direct labour	1,60,000	
Variable Overheads	80,000	
Fixed Overheads	5,20,000	11,60,000
Profit		1,20,000

An export order has been received that would utilise half the capacity of the factory. The order has either to be taken in full and executed at 10% below the normal domestic prices, or rejected totally. The alternatives available to the management are given below:

a) Reject order and Continue with the domestic sales only, as at present;

b) Accept; order, split capacity equally between overseas and domestic sales and turn away excess domestic demand;

c) Increase capacity so as to accept the export order and maintain the present domestic sales by:

   (i) buying an equipment that will increase capacity by 10% and fixed cost by ₹40,000 and

   (ii) Work overtime at one and a half the normal rate to meet balance of required capacity. Prepare comparative statements of profitability and suggest the best.

Solution:

Statement showing computation of comparative profit of different alternatives: Amount (₹)

Particulars	80% capacity	100% capacity	130% capacity
Sales	12,80,000	*8,00,000 + 7,20,000	**12,80,000 + 7,20,000
Variable cost:			
Material	4,00,000	5,00,000	6,50,000
Direct labour	1,60,000	2,00,000	2,60,000
Variable Overheads	80,000	1,00,000	1,30,000
Overtime premium			20,000
	6,40,000	8,00,000	10,60,000
Contribution	6,40,000	7,20,000	9,40,000
Fixed cost	(5,20,000)	(5,20,000)	(5,60,000)
Profit	1,20,000	2,00,000	3,80,000

From the above computations we find that the profit is more at alternative III i.e., accepting the foreign order fully & maintaining the present domestic sales.

* $\frac{12,80,000}{80\%} \times \frac{1}{2} + \frac{12,80,000}{80\%} \times \frac{1}{2} \times 90\%$

** $12,80,000 + \frac{12,80,000}{80\%} \times \frac{1}{2} \times 90\%$

Optimum utilization of Factor of Production [Limiting Factor Analysis]

4.4

Key Factor/Limiting Factor

An organisation might be faced with just one limiting factor (other than maximum sales demand) but there might also be several scarce resources, with two or more of them putting an effective limit on the level of activity that can be achieved.

Examples of limiting factor include sales demand and production constraints.

(i) Labour: The limit may be either in terms of total quantity or of particular skills.

(ii) Materials: There may be insufficient available materials to produce enough units to satisfy sales demand.

(iii) Manufacturing capacity: There may not be sufficient machine capacity for the production required to meet sales demand.

It is assumed in limiting factor analysis that management would make a product mix decision or service mix decision based on the option that would maximize profit and that profit is maximized when contribution is maximized (given no change in fixed cost expenditure incurred). In other words, marginal costing ideas are applied.

Contribution will be maximized by earning the biggest possible contribution per unit of limiting factor. For example, if grade A labour is the limiting factor, contribution will be maximized by earning the biggest contribution per hour of grade A labour worked. The limiting factor decision therefore involves the determination of the contribution earned per unit of limiting factor by each different product. If the sales demand is limited, the profit-maximizing decision will be to produce the top ranked product(s) up to the sales demand limit. In limiting factor decisions, we generally assume that fixed costs are the same, whatever product or service mix is selected, so that the only relevant costs are variable costs.

When there is just one limiting factor, the technique for establishing the contribution-maximizing product mix or service mix is to rank the products or services in order of contribution-earning ability per unit of limiting factor.

A key factor is defined as the factor in the activities of an undertaking which, at a particular point of time or over a period, will limit the volume of output. Other variant terms are limiting factor, Principal Budget Factor & scarce factor. Limiting factors are governed by both internal & external facto₹. It may be actual or potential. If a factor of production is in short supply, then the best-paying product becomes that which yields the highest contribution per unit of limiting factor.

Profitability = Contribution ÷ Key Factor

Thus, Contribution per unit of key factor may be ascertained & maximized according to priority (ranking).

Some examples of key factors are:

(i) Materials - Scarce Raw Material; Restrictions by licenses, etc.

(ii) Labour - General Shortage; Shortage of a particular type of labour.

(iii) Plant - Imbalance; Insufficient capacity due to shortage of capital, supply, etc.

(iv) Management - Shortage of efficient staff; policy decisions.

(v) Capital - Shortage of capital; insufficient research activity

(vi) Sales - Market demand; insufficient advertisement.

Where there is a maximum potential sales demand for an organisation's products or services, they should still be ranked in order of contribution-earning ability per unit of the limiting factor. The contribution-maximizing decision, however, will be to produce the top-ranked products (or to provide the top-ranked services) up to the sales demand limit.

Illustration 4

A company is producing two products A and B. The particulars of the company are as follows:

Particulars	Product A (₹ per unit)	Product B (₹ per unit)
Sales	75	80
Material Cost	15	20
Labour Cost	20	15
Direct Expense	10	12
Variable overheads	10	15
Machine Hours used	3 hours	2 hours
Consumption of material	2 kgs	2 kgs

Comment on profitability of each product, if both use the same raw material, when:

(i) Total sales potential in units is key factor.

(ii) Total sales potential in values is key factor.

(iii) Raw material is in short supply.

(iv) Production Capacity (in terms of machine hr.) is the key factor.

Solution:

Particulars	Product A (₹ per unit)	Product B (₹ per unit)
Sales	75	80
Marginal Costs:		
Materials	15	20
Wages	20	15
Direct expense	10	12
Variable overheads	10	15
Total Marginal Cost	55	62
Contribution (Sales– Total marginal cost)	20	18

Particulars	Product A (₹ per unit)	Product B (₹ per unit)
Contribution (per ₹ of Sales)	20/75	18/80
(Contribution/Sales)	₹ 0.267	₹ 0.225
Contribution per kg of materials	₹10	₹ 9
Contribution per hour	₹6.6	₹9

Comments:

a. When total sales potential in units is limited, product A is more profitable as its contribution per unit is more than that of product B.

b. When total sales potential in value is limiting factor, product A is more profitable as it has more contribution as per sales in rupees than that of product B.

c. Product A is more profitable than product B, when raw material is in short supply.

d. Product B is more profitable that product A, when production capacity in terms of machine hour is the key factor.

Replacement Decision

4.5

One of the more important decisions involving alternative choices is whether or not to buy new capital equipment. Generally, the economic advantage offered by such an investment is the realization of operating cost savings which are translated into increased net profits. Therefore, some means of applying relevant cost to the measurement of such increased profit and, in turn, to the incremental capital investment is necessary.

Replacement of equipment is a capital investment or long-term decision but one aspect of asset replacement decisions that we will consider at this stage is how to deal with the book value (i.e. the written down value) of old equipment. This is a problem that has been known to cause difficulty, but the correct approach is to apply relevant cost principles (i.e. past or sunk costs are irrelevant for decision-making).

Illustration 5

X Ltd. wants to replace one of its old machines. Three alternative machines namely X_1, X_2 and X_3 are under its consideration. The costs associated with these machines are as under:

Particulars	Amount (₹)		
	X_1	X_2	X_3
Direct material cost p.a…….....	50	100	150
Direct labour cost p.a…….	40	70	200
Variable overhead p.a……	10	30	50
Fixed cost p.a……..	2,50,000	1,50,000	70,000

(i) Compute the cost indifference points for these alternatives.

(ii) Based on these points suggest a most economical alternative machine to replace the old one when the expected level of annual production is 1,200 units.

Solution:

(i) Computation of Cost Indifference Points for three alternatives

Cost Indifference Point of two machines = Difference in fixed Cost ÷ Difference in variable Cost per unit

Machine X_1 & X_2 =₹2,50,000 - ₹ 1,50,000 ÷ ₹ 100 = 1,000 units

Machine X_2 & X_3 =₹1,50,000 - ₹ 70,000 ÷₹ 200 = 400 units

Machine X_1 & X_3 =₹2,50,000 - ₹ 70,000 ÷ ₹ 300 =600 units

Remarks:

From the above computations, it is clear that at activity level below the indifference point the alternative (machine) with lower fixed cost and higher variable costs should be used. In case the activity level exceeds the indifference point, a machine with lower variable cost per unit (or higher contribution per unit) and higher fixed cost, is more profitable to operate. At the activity level equal to the indifference point both machines are on equal footing. Hence from the above we may conclude as follows:

Activity Level	Machine Preference
Less than 400 units	X_3
Exactly 400 unit	Either X_2 or X_3
Above 400 units but less than 1,000 units	X_2
Exactly 1,000 units	Either X_1 or X_2
Above 1,000 units	X_1

(ii) When expected level of activity is 1,200 units i.e. more than 1,000 units, Machine X_1 should be used.

Evaluation of Alternative Choices

4.6

A major part of decision making involves the analysis of a defined set of alternatives against selection criteria. These criteria usually include costs and benefits, advantages and disadvantages, and alignment with preferences.

For example, when choosing a place to establish a new business, the criteria might include rental costs, availability of skilled labour, access to transportation and means of distribution, and proximity to customer. Based on the relative importance of these factors, a business owner makes a decision that best meets the criteria.

Sometimes the management has to select a course of action from amongst various alternative courses. Each course of action has its own merits and limitations. The course of action to be selected should ensure maximum profit to the business concern. The appraisal of the various courses of action available is possible through the analysis of contribution. The course of action ensuring highest contribution is generally adopted by the management.

The decision maker may face a problem when trying to evaluate alternatives in terms of their strengths and weaknesses. This can be especially challenging when there are many factors to consider. Time limits and personal emotions also play a role in the process of choosing between alternatives. Greater deliberation and information gathering often takes additional time, and decision maker often must choose before they feel fully prepared. In addition, the more that is at stake the more emotions are likely to come into play, and this can distort one's judgment. Sometimes a manufacturer is faced with the problem of the application of alternative methods of manufacture i.e., whether machine work or hand work, employment of hand-driven machine or power-driven machine or employment of one machine or another machine etc. For the purpose of selecting the method of production to be adopted, a comparison of the amount of contribution available under different methods of manufacture shall be made. The alternative providing the maximum contribution per unit shall be considered to be more profitable. However, the limiting factor, if any, involved in the method of production, must be given proper consideration.

Illustration 6

The Management Accountant of X ltd., has prepared the following estimates of working results for the year ending 31st December, 2021 for the purpose of preparing the budgets for the year ending 31st December, 2022.

		Year ending 31/12/2021
Direct material	₹/unit	16.00
Direct wages	”	40.00
Variable overheads	”	12.00
Selling price	”	125.00
Fixed expenses	₹	6,75,000 p.a.
Sales	₹	25,00,000 p.a.

During the year 2022, it is expected that the material prices and variable overheads will go up by 10% and 5% respectively. As a result of re-organisation of production methods 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 technical director states that the same level of output as obtained in 2021 should be maintained in 2022 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 the 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 2022.

(ii) Find the revised price and the percentage of increase in the price for 2022 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 an overall income statement for 2022 at that level of output.

Solution:

I. Statement of profit at budget

Particulars	Amount (₹)
(i) Selling price	125.00
(ii) Variable cost	
a. direct material	16.00
b. direct wages	40.00
c. variable overheads	12.00
	68.00
(iii) Contribution (i-ii)	57.00
(iv) No. of units (25,00,000/125)	20,000.00
(v) Total contribution	11,40,000.00
(vi) Less: Fixed cost	6,75,000.00
(vii) Profit (v-vi)	4,65,000.00

II. Computation of selling price, if the technical director views are implemented

Variable cost	Workings	Amount (₹)
Direct material	(16 × 110%)	17.60
Direct wages	[(40 × 105%) × (100/112)]	37.50
Variable overheads	(12 × 105%)	12.60
		67.70

In order to get the same profit contribution to be recovered is as follows:

Particulars	Amount (₹)
Existing fixed overheads	6,75,000.00
Add :Expected increase	1,25,000.00
	8,00,000.00
Add : desired profit	4,65,000.00
	12,65,000.00

Therefore contribution per unit (12,65,000/20,000)	₹ 63.25
Required selling price = variable cost + contribution = 67.7+63.25	₹ 130.95
% increase in sale price = [{(130.95-125)/125}×100]	4.76%

III. Computation of additional profit at four alternatives proposed by marketing director

Additional Units	2000	4000	6000	8000
	Amount (₹)			
a. contribution per unit (125-67.7)	57.30	57.30	57.30	57.30
b. Total contribution	1,14,600.00	2,29,200.00	3,43,800.00	4,58,400.00
c. additional fixed cost	80,000.00	1,94,000.00	3,20,000.00	4,60,000.00
d. Profit/(loss)	34,600.00	35,200.00	23,800.00	(1,600.00)

Statement showing overall income for the year 2022

a. No. of units	24,000.00
	Amount (₹)
b. Contribution per unit	57.30
c. Total contribution	13,75,200.00
d. Fixed cost (8,00,000+1,94,000)	9,94,000.00
e. Profit	3,81,200.00

Subcontracting and Ancillarisation

4.7

Capacity planning is necessary when an organisation decides to increase its production or introduce new products into the market or to increase the volume of production to gain the advantages of economies of scale. Once the existing capacity is evaluated and a need for new or expanded facilities is determined, decisions regarding the facility location and process technology selection are undertaken. The variables of the production system are labour, materials and capital. More labour effort is required to generate higher volume of output. Hence, the employment and use of overtime (OT) are the two relevant variables.

Materials help to regulate output. The alternatives available to the company are inventories, back ordering or subcontracting of items.

These controllable variables constitute pure strategies by which fluctuations in demand and uncertainties in production activities can be accommodated.

Subcontracting refer to off- loading, some of the jobs to outside vendor thus hiring the capacity to meet the requirements of the organisation. A careful analysis as to whether to make or to buy should be done. An economic comparison between cost to make the component or buy the component is to be made to take the decision.

In subcontracting, a decision is taken by the management after consideration of relevant costs of subcontracting. The management should look, how the excess demand can be met by subcontracting some products to the subcontractor, by the application of relevant revenues and costs and after judging the cost and benefit analysis.

Illustration 7

T.T.D Ltd., manufacturing a single product has normal working capacity of 8,000 units per annum. The sales manager has projected a sale of 10,000 units for the year 2021 - 22 at a price of ₹250 per unit.

The operating budget for 2021-22 as under:

Particulars	₹ in lakhs	₹ in lakhs
Sales: 8,000 units @ ₹250 each		20.00
Cost of production		
Raw material	12.00	
Direct wages	3.00	
Works overhead (50% Fixed)	1.40	
Admn. overhead (all fixed)	0.60	
Selling & Distribution OH (80% fixed)	1.00	18.00
Profit		2.00

In order to increase production to meet the sales demand, two proposals have been put forward as under:

1) Subcontracting the production of 2,000 units at ₹225 per unit.

2) Installing additional machine which will entail the following expenses :

(a) Cost of machine ₹2,00,000; Life 20 years

(b) Recruitment of 10 workers including direct workers to operate the machine at a wage rate of ₹500 each per month. Add 25% towards employee benefits. (None of the existing workers will be utilised for this purpose).

(c) Interest on capital required for the purchase of machine 15% p.a.

The following additional fixed expenses will be required in respect of both alternatives.

Administration expenses - ₹10,000 per year.

Selling & Distribution expenses - ₹20,000 per year.

You are required to prepare

(1) A statement showing respective profitability of the two methods of increasing the production.

(2) Comment upon the choice of one of the two proposals.

Solution:

Statement Showing Computation of Profit at Proposed alternatives as well as present position:

	Particulars	Present Position (8000)	Sub Contract (10000)	Own Expansion (10000)
		₹ In lakhs	₹ In lakhs	₹ In lakhs
I	Sales	20	25	25
II.	Variable Cost			
	Raw Materials	12	12	15
	Direct Wages	3	3	3
	Works Overhead	0.7	0.7	0.875
	Selling & Distribution Overhead	0.2	0.2	0.25
	Sub Contract Cost		4.5	
	Add Workers			0.75
		15.9	20.4	19.875
III.	Contribution	4.1	4.6	5.125
IV.	Fixed Cost	2.1	2.4	2.8
V.	Profit	2.0	2.2	2.325

The best proposal is to produce by their own to meet the additional demand by installing a new machine because it has highest profit.

Fixed Cost includes interest & depreciation.

Expansion of Business

4.8

While considering a new plant design or the redesign or expansion of an existing system, a high level decision regarding the production capacity is called for. In order to determine future capacity of the plant adequate consideration should be given to certain factor such as sales forecasts of physical volume, policy decisions on what will be purchased instead of made, engineering estimates of machine productivity and production plans on how equipment will be used. Upon this must be super imposed central management policies regarding desired capacity including policies regarding provisions for peak versus normal requirements, backward taper of capacity provision for growth and balance of facilities.

One of the most vital decisions which have to be made regarding production capacity is whether the company should build so much capacity to satisfy all demands during peak periods or whether it should maintain a smaller capacity and hope that failure to render service during requirements will not have unbearable consequences. Generally, companies providing utilities have a policy of building capacity to cope with peak demands (during hot summer days), but the investment made for peak demands is tremendous.

In view of burgeoning amount of investment, the moot question that arises is whether capacity installed in order to meet the maximum expected demand should be maintained at all times. It may not be disadvantageous to maintain the excess capacity throughout the year if one is confident that excess capacity can be utilized by expanding exports or by accumulating stocks if the duration of the surplus capacity is expected to be limited.

There are some organisations that prefer to build smaller capacity to take care of normal requirements and meet peak demands by way of imports or subcontracting. Some organisations employ measures such as off-peak discounts, mail early campaign, etc. to induce customer to avoid peak periods.

Another way of meeting high peak demands is to switch over to two shifts from the single shift. Before making a final decision in this direction, cost-benefits analysis must be undertaken. With doubling of shifts, investment costs are not halved because increments of capacity are not equally expensive. Many other costs are also involved. Wage premiums say 10 to 15 per cent, are generally given for second shifts.

Multiple shifts also increase supervision costs. An analysis of building and equipment costs resulting from doubled shifts is necessary to determine the total additional cost. Additional cost should be matched with additional benefits. Where benefit exceeds costs it will be in the interest of the organisations to run double shifts to cope with peak demands.

Adequate provision for coping with growth requirements of the organisation must be mace while determining production capacity. For this, it is necessary for the top management to decide how much growth is expected and the extent to which investment will be made in anticipation of growth. This decision will have to be taken very carefully otherwise it may result in too much or too little capacity in serious consequences.

Illustration 8

Nice and Warm Ltd. manufactures and markets hot plates. During the first five years of operations, the company has

experienced a gradual increase in sales volume, and the current annual growth in sales of 5% is expected to continue in the foreseeable future. The plant is now producing at its full capacity of one lakh hot plates.

At the monthly Management Advisory committee meting, amongst other things, the plan of action for next year was discussed.

Managing Director proposed two alternatives. First, operations could be continued at full capacity and with the existing facilities, an output of one lakh hot plates at a selling price of ₹100 per plate per unit could be maintained. Secondly, production and sales could be increased by 5% to take advantage of the rate of expansion in demand for the product. But this could increase cost, as to achieve the output, the company will have to resort to weekend and over time workings. However, a policy of steady growth was preferable to maintaining status quo.

In view of the company's competitors having a substantial share of the market, the Works Director was of the view that it was not enough for the company to maintain merely the present share of the total market. A large share of the total market should be obtained. For that, the company should increase production by 10% through a modest expansion of the plant capacity. In order to sell the output of 1,10,000 units the selling price could be reduced to ₹95 per unit.

Thinking on the same lines, the Marketing Director put forth a more radical proposal. The strategy should be to seize the competitive leadership in the market with regard to both price and volume. With this end in view, he suggested that the company should straightaway embark on an expensive modernisation programme, which will initially increase volume by 20%. The entire output of 1,20,000 hot plates could be easily sold at a price of ₹90 per unit.

At this juncture, the Managing Director expressed concern about the probable behavior of the company's competitors. They might also expand in order to produce more and sell at lower prices. Suppose this happened, he wanted also the financial effects of the proposals of the Works Director and Marketing Director, if in these proposals, the expected increase in sales were to be only half of that predicted.

As a Cost Accountant of the company, you are required to critically evaluate the six alternatives along with your recommendations and circulate the same to the Directors. In this connection, you have gathered the following details:

(i) If next year's production was maintained at the current year's level, variable cost would remain at ₹50 per unit. Fixed cost would remain unchanged at ₹30 lakhs.

(ii) The week-end and overtime working would increase with the variable and fixed costs. Variable cost would rise to ₹55 per unit while fixed cost would increase to ₹30,25,000.

(iii) In the proposal of the Works Director, the ratio of variable costs to sales would continue to be 50%. Fixed costs would rise to ₹32,25,000.

(iv) In the proposal of Marketing Director, as a result of increased production, efficiency and some savings from purchase of materials, it is estimated that the ratio of variable cost of sales would decrease to 48% and the fixed costs would increase by ₹5,16,000.

Your answer should contain:

(a) A tabular statement of comparative figures pertaining to total turnover, total contribution, Percentage of Profit to Sales and Breakeven units as regard to each of the six proposals.

(b) Comments on the relative risk involved.

(c) Consideration of the short-term and long-term implications of the Managing Director's proposals.

(d) Comment on the price elasticity of demand for the company's products and your suggestions on the pricing policy and cost structure.

(e) Comment on financial implications of the expansion scheme.

Solution:

(a) Statement showing contribution, profit at six alternatives

Particulars	Managing director		Works director		Marketing director	
	I	II	I	II	I	II
i) No. of units	1,00,000.00	1,05,000.00	1,10,000.00	1,05,000.00	1,20,000.00	1,10,000.00
ii) Selling price per unit (₹)	100.00	100.00	95.00	95.00	90.00	90.00
iii) Sales turnover (₹ Lakhs)	100.00	105.00	104.50	99.75	108.00	99.00
iv) Variable cost per unit (₹)	50.00	55.00	47.50	47.50	43.20	43.20
v) Contribution per unit (ii-iv) (₹)	50.00	45.00	47.50	47.50	46.80	46.80
vi) Total contribution (₹ Lakhs)	50.00	47.25	52.25	49.88	56.16	51.48
vii) Fixed cost (₹ Lakhs)	30.00	30.25	32.25	32.25	35.16	35.16
viii) Profit (₹ Lakhs) (vi-vii)	20.00	17.00	20.00	17.63	21.00	16.32
ix) % of profit on sales (%)	20.00	16.19	19.14	17.67	19.44	16.48
x) Break even units (vii/v)(units)	60,000.00	67,222.00	67,895.00	67,895.00	75,128.00	75,128.00
xi) Margin of safety units	40,000.00	37,778.00	42,105.00	37,105.00	44,872.00	34,872.00
xii) P.V ratio	0.50	0.45	0.50	0.50	0.52	0.52

(b) Managing Director's first proposal seems to be more favorable from the risk point of view because it has low break even and high margin of safety coupled with higher percentage of profit to sales.

(c) From the short run point of view, Managing director's second proposal, i.e steady growth of 5% a year would be better, even by resorting to weekend over time working. However, from the long term view point, the above proposal is not advisable because when they have steady growth, they can go for expansion of business rather than resorting to overtime working. If it is not possible to go for expansion, a steady status quo is the best solution.

(d) It was given that, annual growth of sales of 5% is expected to continue in foreseenable future. It is not clear, why the second proposal of the works director and marketing director should suggest, reduction in price for 5% and 10% respectively.

It seems no serious study has been made on the price elasticity of demand of the product. If there is demand for the product and increased production, they may reduce the price by adapting discriminate price policy.

(e) If the company desires to expand the production, it is necessary to find out the sources of financing of expansion scheme by relative profitability of different funds.

Shutdown or Continue

4.9

Shutdown point is a point at which a businessman thinks that there is no benefit in continuing the business operations and decides to shut down the business either temporarily or permanently is called the shutdown point. This situation could be a result of output and price where the business earns just the revenue enough to cover the total variable costs. Shutdown point occurs exactly when the marginal profit of the business reaches a negative scale. At the shutdown point, no economic benefit is seen to continue production. If there is an additional loss—either a rise in variable costs or a drop in revenue, the cost of operations may outweigh the revenue. In this situation, shutting the business down is the better choice than to continue it. If the situation is reversed, then continuing the business would be a better option. Very often it becomes necessary for a firm to temporarily close down the factory due to trade recession with a view to reopening it in the future. In such cases, the decision should be based on the marginal cost analysis. If the products are making a contribution towards fixed expenses or in other words if selling price is above the marginal cost, it is preferable to continue because the losses are minimized. By suspending the manufacture, certain fixed expenses can be avoided and certain extra fixed expenses may be incurred depending upon the nature of the industry, say, for example, extra cost incurred in protecting the machinery. So the decision is based on as to whether the contribution is more than the difference between the fixed expenses incurred in normal operation and the fixed expenses incurred when the plant is shut down.

Shut down costs are those costs which have to be incurred under all situations in the case of stopping manufacture of a product or closing down a department or division. Shut down costs are always fixed costs. If the manufacturing of a product is stopped, variable cost like direct materials, direct labour, direct expenses, and variable factory overhead will not be incurred. However, a part of fixed costs (if not total fixed costs) associated with the product will be incurred such as rent, watchman's salary, property taxes etc. Such fixed costs are unavoidable. Some fixed costs associated with the product become avoidable and need not be incurred in case production is stopped such as supervisor's salary, factory manager's salary, lighting, etc. Shut down costs; thus, refer to minimum fixed costs which are incurred in the event of closure of a department or division.

For long-run pricing decisions, full costs of the product inform manager of the minimum costs they need to recover to continue in business rather than shut down. Using variable costs as a base does not give manager this information. There is then a temptation to engage in excessive long-run price cutting as long as prices provide a positive contribution margin. Long-run price cutting, however, may result in losses if long-run revenues are less than long run full costs of the product.

Cost is not only criterion for deciding in the favour of shut down. Non-cost factors worthy of consideration in this regard are as follows:

- Interest of workers - If the workers are discharged, it may become difficult to get skilled worker later on re-opening of the factory. Also shut-down may create problems.
- Competition - In the face of competition it may be difficult to re-establish the market for the product.

- Depreciation - Plant may become obsolete or depreciate at a faster rate or get rusted.

Thus, heavy capital expenditure may have to be incurred on re-opening.

Shut Down Point =Avoidable Fixed Cost÷ Contribution per Unit

Shut down point (in ₹) = Avoidable Fixed Cost ÷ P/V Ratio

Decision Making in the context of Shut Down Point:

(i) Level of sales below shut down point, to close down operations, because avoidable fixed costs itself are not fully recovered.

(ii) Equal to shut down point, to continue operation, since avoidable fixed costs are just recovered.

(iii) Above shut down point, to continue operation, since avoidable fixed costs are recovered and further contribution leads to recovery of balance fixed cost.

Illustration 9

The Hope Company has three divisions. Each of which makes a different product. The budgeted data for the coming year are as follows:

Particulars	A (₹)	B (₹)	C (₹)
Sales	1,12,000	56,000	84,000
Direct Material	14,000	7,000	14,000
Direct Labour	5,600	7,000	22,400
Direct Expenses	14,000	7,000	28,000
Fixed Cost	28,000	14,000	28,000

The Management is considering closing down the division C. There is no possibility of reducing fixed cost. Advise whether or not division C should be closed down.

Solution:

Statement showing computation of profit before closing down of division C

Particulars	A (₹)	B (₹)	C (₹)	Total (₹)
Sales	1,12,000	56,000	84,000	2,52,000
Direct Material	14,000	7,000	14,000	35,000
Direct Labour	5,600	7,000	22,400	35,000
Direct expenses	14,000	7,000	28,000	49,000
Total Variable Cost	33,600	21,000	64,400	1,19,000
Contribution	78,400	35,000	19,600	1,33,000
Fixed cost				70,000
Profit				63,000

Statement showing computation of profit after closing 'C'

Particulars	A (₹)	B (₹)	Total (₹)
Sales	1,12,000	56,000	1,68,000
Variable costs:			
Direct Material	14,000	7,000	21,000
Direct Labour	5,600	7,000	12,600
Direct expenses	14,000	7,000	21,000
Total Variable Costs	33,600	21,000	54,600
Contribution	78,400	35,000	1,13,400
Fixed cost			70,000
Profit			**43,400**

From the above computations, it was found that profit is decreased by ₹ 19,600 by closing down division 'C', it should not be closed down. In other words, as long as if there is a contribution of ₹1, from division 'C', it should not be closed down.

Further Applications of Marginal Costing in decision making are as follows:

1. Capacity Decisions

While considering a new plant design or the redesign or expansion of an existing system, a high level decision regarding the production capacity is called for. In order to determine future capacity of the plant adequate consideration should be given to certain factor such as sales forecasts of physical volume, policy decisions on what will be purchased instead of made, engineering estimates of machine productivity and production plans on how equipment will be used. Upon this must be super imposed central management policies regarding desired capacity including policies regarding provisions for peak versus normal requirements, backward taper of capacity provision for growth and balance of facilities.

Main reasons for the determination of capacity are as follows: -

(i) Selecting a base activity for overhead rate determination or overhead distribution.

(ii) It is required in connection with Schedule VI of the Companies Act for indicating the licensed and installed capacity and also the actual production.

(iii) It is necessary for the Cost Auditor to give his comments on capacity utilization.

(iv) It helps to compare the actual capacity utilization with the budgeted capacity utilization and to analyze the deviations for taking corrective action.

(v) Capacity utilization is an important factor in price fixation.

(vi) It enables the company to analyze the under or over absorption of overheads for proper treatment.

(vii) Capacity determination helps in preparation of flexible budgeting and achieving overall control over the operation of business.

Illustration 10

The Manager of Alpha Co. provides you with the following information:

Particulars	₹
Sales:	4,00,000
Costs: Variable (60% of sales)	2,40000
Fixed cost:	80,000
Profit before tax:	80,000
Income-tax (60%)	48,000
Net profit:	32,000

The company is thinking of expanding the plant. The increased fixed cost with plant expansion will be ₹40,000. It is estimated that the maximum production in new plant will be worth ₹ 2,40,000. The company also wants to earn additional income ₹3,200 on investment. On the basis of computations, give your opinion on plant expansion.

Solution:

Statement showing computation of profit before and after plant expansion

Amount in ₹

Particulars	Present (Before expansion)	Expansion value	Total (After expansion)
Sales	4,00,000	2,40,000	6,40,000
Variable cost (60%)	2,40,000	1,44,000	3,84,000
Contribution	1,60,000	96,000	2,56,000
Fixed cost	80,000	40,000	1,20,000
Profit before tax	80,000	56,000	1,36,000
Profit after tax	32,000	22,400	54,400

Conclusion:

From the above computations, it is found that the profit is increased by ₹ 22,400 by expanding the plant, which is much higher than the expected income of ₹ 3,200, hence the opinion should be in favour of plant expansion.

2. Alternative Methods of production

Labour force is necessary for the purpose of converting the raw materials into finished goods. The companies use both the manual labour force and the mechanical labour force for this purpose. Both are, to some extent, good substitutes. That means, manual labour force may be replaced, to some extent, by the mechanical labour force and vice versa. That means, some works can be carried out either by the manual labour force or by the mechanical labour force. Further a work may be carried out with the help of one machine or the other. In this type of situation, the question arises as to which is the most economical method of production? In order to answer this question and to select the most economical method of production, the costs which differ between the alternatives are to be considered as relevant costs. The alternative which involves the minimum cost is to be selected as the most economical alternative. Alternatively, the amount of contribution from each alternative is to be considered and the alternative which ensures higher amount of contribution is to be preferred.

3. Decision to Drop a Product Line

Since the objective of any business organisation 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:

a. Contribution from unprofitable product (i.e. Sale Revenue Less Variable Costs)

b. Specific fixed costs of the unprofitable product, which can now be avoided or reduced.

c. Contribution from the other profitable product, which is proposed to produce with the balance capacity.

Marginal costing is a useful method of appraising the respective profit contributions of the several products in a company's business but, in so far as this method is used to report past income, the information is irrelevant. What is needed is an analysis of the effects on the future profits of the company of a decision to drop (or add) a product. In the case a product is eliminated, its sales revenue and certain costs will also be eliminated and, if a product is added, the reverse will be true. The problem is to determine the incremental data attributable to the product line in question and measure their probable effects on future company profits.

4. Decision Regarding Equipment Replacement

One of the more important decisions involving alternative choices is whether or not to buy new capital equipment. Generally, the economic advantage offered by such an investment is the realization of operating cost savings which are translated into increased net profits. Therefore, some means of applying relevant cost to the measurement of such increased profit and, in turn, to the incremental capital investment is necessary.

5. Product Diversification

Companies are diversifying their lines of product either for the purpose of survival in the market or for the purpose of accomplishing higher results or for both. Further, limited product life, availability of idle capacity, possibility of utilizing the wastes, by-products, to produce a new product, etc. encourage or forces the companies to introduce a new product either in addition to the existing products or in place of an existing product. It is therefore necessary to find out whether it is economical and profitable to introduce a new product or not. In order to answer this question, it is necessary to estimate the costs that would associate, with the new product and the anticipated revenue from the same. As far as the revenue side is concerned, it makes no difference whether a company uses full costing or marginal costing, but, costs attributable to the new product differ from marginal costing method to full costing method. If the costs are analyzed under full costing, there is every possibility of management taking wrong decisions, because, full costing assigns both relevant and irrelevant costs (i.e. common and inescapable costs) to the new product and this makes the new product a less profitable or not at all a profitable one. Hence, the problem is to be analyzed based on the principles of marginal costing. Costs attributable to a new product usually include the Variable costs. If the introduction of a new product causes the increase in the fixed costs, it should also be considered as the same is identifiable with the new product. The extent of increase in the Fixed costs caused by the new product is called direct fixed costs. Hence the aggregate of variable cost and specific fixed cost is to be compared with the revenue from the new product. If the revenue exceeds costs, it is profitable to introduce the new product. Otherwise, it is not profitable. If both are same, it makes no impact on the company's profit and therefore, management may or may not introduce the product. To put it alternatively, if the new product is capable of earning some contribution towards common fixed costs and profit (after the recovery of its variable costs and specific fixed costs), it is profitable. Otherwise, it is not profitable.

6. Sell or Further Process Decision

Often management has to decide whether to sell joint products at the split off point or to sell them after further processing. If further processing adds to the profit of the firm, the decision will be in favour of further processing. Incremental revenue (that is, the difference between sale value after further processing and sale value at the split off point) is compared with differential cost (that is, the additional cost of further processing) to determine whether further processing will result in additional profit. The allocation of joint cost in no way influences the decision because the total income effect does not get changed by the method of allocation of joint cost. Allocation of joint cost is useful for inventory valuation only and not for decision making

7. Evaluation of Capital Expenditure Proposals

The concept of relevant cost and revenue is very much considered while making an evaluation of capital expenditure proposal. By relevant cost we mean the amount of capital outlay, which is necessary for funding the initial investment at the beginning of the year at time t_0, the amount of working capital needed to finance the day-to-day operation of the manufacturing organisation, the amount that will be generated from the sale of old equipment is also considered. At this particular point, it is to be remembered that, profit or loss on the disposal of the old equipment is not relevant and the book value of the old plant sanding in the books is an example of a sunk cost. Cash-inflows are considered as relevant for capital expenditure proposal, which means profit after tax added back with it the amount of depreciation. Present value of cash-inflows for different years including the salvage value al the last year under consideration are to be discounted by a discounting factor to arrive at the total present value and from which the original cost of the investment is deducted to arrive at the net present value. A proposal having higher positive net present value is accepted. In this connection, it is important to note that there must be release of working capital in the terminal year, the present value of which is also included in the so called total present value.

8. Optimal Level of Activity

It is very well-known that every business organisation usually wishes to earn maximum possible amount of profit. A number of avenues are available to the companies to achieve this objective. Setting the plant at the optimum level is one of the important avenues. This deals with the economies of large-scale production and sales, and also the resultant effect on the selling price, because, whenever there is an increase in the volume of output, some economies accrue in the production costs. In the same way, some diseconomies may also be incurred. It all depends upon how changes in the volume of output or the levels of activity are going to influence the cost items. In other words, it all depends upon how the cost items are going to respond to the changes in the volume of output and sales. However, one can find the reduction in the average cost whenever there is an increase in the output. That means, upto a particular level of activity, the average or the unit cost goes on decreasing as the output increases. It is due to the spreading of fixed costs on larger number of units. If the volume of output exceeds a particular level, diseconomies may take place resulting in the increase in the average cost. The increase in the unit or average cost may also be due to the increase in the fixed costs. This is one aspect influencing profit. There is an inverse relationship between the volume of supply or the sales volume and the Sales Price. Increased volume can be sold usually by lowering sales price and vice-versa. This is another aspect to be considered while finding out the optimum level of activity. Considering these cost and price behaviours, it is necessary to decide the level of activity which ensures the maximum amount of profit. Therefore, it is necessary to find out the incremental revenue and the differential cost be comparing the costs and revenue at two different levels of activity. If the incremental revenue exceeds the incremental or differential costs, the result will be incremental profit. Consequently, the company's profit will increase to the extent of incremental profit. That means, profit at the higher level of activity will be more to the extent of incremental profit than the profit at the lower level of activity.

9. Decision Regarding Temporary Shut Downs

It is found in practice that a business continues its operations even when the demand for its products is low and it is operated far below its normal capacity. Such a situation is forced on the business because it is expensive in many cases to shut down the business for a short time only.

In case operations are continued, instead of being temporarily closed down, the revenues from the sales of its products may not be adequate to cover fixed costs. There are some fixed costs, which can be substantially reduced due to temporary closing down of operations, while others have the tendency to remain constant.

The decision would depend upon a comparison of direct economic consequence of shutting down business operations and continuing them at below normal capacity. Thus, if fixed costs not recovered from out of product sales exceed the costs of shut down it would be worthwhile to put a stop to business operations until they can be conducted at an economic advantage.

It is, of course, quite obvious that variable costs are not at all relevant for any decision of this type.

The following non-cost factors are also to be considered for these types of decisions:

(i) Loss of market share to competition (Effect on Goodwill).

(ii) Strain in labour-management relations.

(iii) Availability of skilled labour on re-opening.

(iv) Risk of obsolescence of machinery.

(v) Need to maintain machine in operating condition.

(vi) Arrangement of finance for compensation payable, if any.

10. Decision Regarding Additional Shifts

A very common decision to be taken by management is in connection with the operation of one or more shifts by a business having only one shift.

It is evident that, when an additional shift is added, the costs are bound to be higher, though the cost increases may or may not be in proportion to increases in output. Economies in expenses can possibly be effected by the purchase of materials in larger quantities and better utilisation of some of the fixed costs. The decision on this would be taken after comparing the additional revenue to be earned from the production resulting from one or more shifts and the incremental costs incurred in deriving that revenue. This would have to be weighted together with the quantitative factor, if any, involved in the decision.

11. Product Mix Decision

When a company manufactures more than one item, the optimum combination to produce must be determined. The following procedures are followed when making this decision:

(i) Produce the maximum of the item with the highest contribution margin per unit under a particular constraint (e.g., machine hour).

(ii) If there are any remaining machine hour, produce the maximum that can be sold of the item with the next highest contribution margin per unit, continuing until all machine hours are utilized.

Solved Illustrations & Cases

Illustration 11

A particular electrical goods is sold for ₹ 1,009.99. The direct material cost per unit is ₹ 320, the direct labour cost per unit is ₹192 and the variable production overhead cost per unit is ₹132. Fixed overheads per annum are ₹1,00,000 and the budgeted production level is 1,000 units. What is the contribution per unit of the electrical goods?

Solution:

The contribution per unit is ₹365.99, as per the workings:

Workings

Particulars	₹	₹
Selling price per unit		1,009.99
Marginal cost per unit		
Direct material	320.00	
Direct labour	192.00	
Variable production overhead	132.00	644.00
Contribution per unit		**365.99**

Note to solution:

The absorbed fixed overheads are not included in the calculation of marginal cost per unit and also for contribution per unit.

Illustration 12

Z Co. makes a product the Beauty, which has a variable production cost of ₹ 6 per unit and a sales price of ₹ 10 per unit. At the beginning of September 2022, there were no opening inventories and production during the month was 20,000 units. Fixed costs for the month were ₹ 45,000 (production, administration, sales and distribution). There were no variable marketing costs.

Required

Calculate at each of the following sales levels, the total contribution and total profit for September 2022 and the contribution per unit and the profit/loss per unit, using marginal costing principles.

(a) 10,000 Beauties

(b) 15,000 Beauties

(c) 20,000 Beauties

Also calculate the expected profit from the sale of 17,000 Beauties and make your observations.

Solution:

The first stage in the profit calculation must be to identify the variable costs, and then the contribution. Fixed costs are deducted from the total contribution to derive the profit. All closing inventories are valued at marginal production cost (₹ 6 per unit).

Particulars	10,000 Beauties	15,000 Beauties	20,000 Beauties
Sales (at ₹ 10)	1,00,000	1,50,000	2,00,000
Opening inventory	0	0	0
Variable production costs:	60,000	90,000	1,20,000
Less: value of closing Inventory	60,000	30,000	–
(at marginal cost)			
Variable cost of sales	60,000	90,000	1,20,000
Contribution	40,000	60,000	80,000
Less: fixed costs	45,000	45,000	45,000
Profit/ (loss)	(5,000)	15,000	35,000
Profit/ (loss) per unit	₹ (0.50)	₹ 1	₹ 1.75
Contribution per unit	₹4	₹4	₹4

The conclusions which may be drawn from this example are as follows:

a. The profit per unit varies at differing levels of sales, because the average fixed overhead cost per unit changes with the volume of output and sales.

b. The contribution per unit is constant at all levels of output and sales. Total contribution, which is the contribution per unit multiplied by the number of units sold, increases in direct proportion to the volume of sales.

c. Since the contribution per unit does not change, the most effective way of calculating the expected profit at any level of output and sales would be as follows:

   (i) First to calculate the total contribution.

   (ii) Then to deduct fixed costs as a period charge in order to find the profit.

d. The expected profit from the sale of 17,000 Beauties would be as follows:

Particulars	₹
Total contribution (17,000 × ₹4)	68,000
Less fixed costs	45,000
Profit	**23,000**

Illustration 13

A company is manufacturing electronic equipments and 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 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:

	Particulars	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	18,00,000 ÷ 18	30,00,000 ÷ 20
	Justification of the installation of the machine	= 1,00,000	=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

Advise: To 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. Difference in variable cost per unit = ₹12 - ₹ 10 = ₹ 2.

Volume required to justify Automatic machine = ₹12,00,000 ÷ ₹ 2= 6,00,000 components

Illustration 14

Susma 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 ₹ $16\frac{2}{3}$ 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 materializes, the cost increases with immediate effect are:

a. 10% in the Direct Materials.

b. 25% in the Direct Labour.

c. ₹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 in direct proportion to the output.

Solution:

Present Selling price = ₹ 15,00,000/15,000 units = ₹ 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 (₹ 15,00,000 -₹9,00,000)	6,00,000
Profit (₹ $16\frac{2}{3}$ per unit)	2,50,000
Fixed Overheads	3,50,000

Comparative statement of the proposals (Revised cost basis)

Particulars	Present capacity	Maximum Capacity	Present plus 10,000 units
Units	15,000	20,000	25,000
Sales value (₹)	15,00,000	20,00,000	15,00,00 (+) 9,00,000
			= 24,00,000
Direct materials (33% on sales value)(₹)	4,95,000	6,60,000	4,95,000
(10/15 × ₹4,95,000)			(+) 3,30,000
Direct labour (25% on sales value) (₹)	3,75,000	5,00,000	3,75,000
(10/15 × 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
Sales drive Costs	-	60,000	-
Depreciation on new Equipment	-	-	1,00,000
Total costs	14,20,000	18,20,000	22,00,000
Profit	**80,000**	**1,80,000**	**2,00,000**

It will be advisable for the company not to accept the offer. The Company should instead to sell 20,000 units @ ₹100 per unit, since the acceptance of the offer will reduce the amount of profit.

Illustration 15

Samsung Electric Ltd. furnishes the following information from its cost records for the first quarter of the current year.

Normal production (units) 1,000

Actual production (units) 1,100

Actual overheads per quarter at normal production ₹ 4,000

Other expenses per quarter ₹300

Standard fixed overhead rate per unit ₹ 4

Variable costs per unit ₹ 6

Sales volume (selling price is ₹14) Nil

Prepare the income statement under absorption and variable costing.

Solution:

Income Statement (Absorption Costing)

Particulars	Amount (₹)	Amount (₹)
Sales Revenue		NIL
Less: Total Cost of Manufacturing:		
Variable Costs (1,100 × ₹6)	6,600	
Fixed Overheads (1,100 × ₹4)	4,400	
	11,000	
Less: Cost of Inventory at the end of the year (1,100 × ₹10)	11,000	
Cost of Goods Manufactured and Sold		NIL

Gross Margin (Unadjusted)		NIL
Capacity Variance (Favourable) (Over absorbed 100 ×₹ 4)		400
Gross Margin (Adjusted)		400
Less: Other Expenses		300
Net Income before Taxes		100

Income Statement (Variable Costing)

Particulars	Amount (₹)	Amount (₹)
Sales Revenue		NIL
Less: Variable Costs (Production Costs) (1,100 ×₹ 6)	6,600	
Less: Cost of Inventory at the end to the year (1,100 × ₹6)	6,600	
Cost of Goods Manufactured and Sold		NIL
Contribution		NIL
Less: Fixed Costs:		
Fixed Overheads	4,000	
Other Expenses	300	(4,300)
Net Income before Taxes (Loss)		**(4,300)**

Under absorption costing, the net income before taxes is ₹ 100 while in marginal costing, net income before taxes is (₹4,300) (loss). This significant difference can be attributed to the fact that under absorption costing, the fixed manufacturing overheads are included in inventory, whereas in variable costing, inventory carries only variable costs.

Inventory Valuation:

Under absorption Costing ₹11,000

Inventory Valuation under Variable Costing ₹ 600

Difference ₹ 4,400

This difference is equal to difference between net income before taxes under absorption costing and variable costing.

Illustration 16

A company has a capacity of producing 1 lakh units of a certain product in a month. The sales department reports that the following schedule of sales prices is possible:

Volume of Production	Selling Price per unit (₹)
(%)	
60	0.90
70	0.80
80	0.75
90	0.67
100	0.61

The variable cost of manufacture between these levels is 15 paise per unit and fixed cost ₹ 40,000.

Prepare a statement showing incremental revenue and differential cost at each stage. At which volume of production will the profit be maximum?

Solution:

Statement showing computation of differential cost, incremental revenue and determination of capacity at which profit is maximum:

Amount (₹)

Capacity %	Units	Sales @ 0.15	Variable Cost	Fixed Cost	Total Cost	Differential Cost	Incremental Revenue
60%	60,000	54,000	9,000	40,000	49,000	-	
70%	70,000	56,000	10,500	40,000	50,500	1,500	2,000
80%	80,000	60,000	12,000	40,000	52,000	1,500	4,000
90%	90,000	60,300	13,500	40,000	53,500	1,500	300
100%	1,00,000	61,000	15,000	40,000	55,000	1,500	70

From the above computation, it is observed that the incremental revenue is more than the differential cost up to 80% capacity; the profit is maximum at that capacity.

Illustration 17

A company can make any one of the 3 products X, Y or Z in a year. It can exercise its option only at the beginning of each year. Relevant information about the products for the next year is given below:

Particulars	X	Y	Z
Selling Price (₹ / unit)	10	12	12
Variable Costs (₹ / unit)	6	9	7
Market Demand (units)	3,000	2,000	1,000
Production Capacity (units)	2,000	3,000	900
Fixed Costs (₹)		30,000	

Required:

Compute the opportunity costs for each of the products.

Solution:

Statement Showing Opportunity Cost for each of the Products

Products	X	Y	Z
Sales Price (₹/unit)	10.00	12.00	12.00
Variable Costs (₹/unit)	(6.00)	(9.00)	(7.00)
Contribution (₹/unit)	4.00	3.00	5.00
Total Contribution (₹)	8,000	6,000	4,500
Opportunity Cost (₹)	10,500	12,500	14,000

Opportunity cost is the maximum possible contribution forgone by not producing alternative product i.e. if Product X is produced then opportunity cost will be maximum of ₹ 6,000 from Y, ₹ 4,500 from Z.

Illustration 18

GL Company is attempting to decide sales prices for two products, L and T. The products are both made by the same workforce and in the same department. 30,000 direct labour hours are budgeted for the year. The budgeted fixed costs are ₹30,000 and it is expected that the department will operate at full capacity. Variable costs per unit are as follows:

Particulars	L	T
	Amount (₹)	Amount (₹)
Materials	4	4
Labour (2 hours)	6	9 (3 hours)
Expenses (1 machine hour)	2	2 (1 machine hour)
	12	15

Expected demands are: 7,500 units of L and 5,000 units of T.

Required:

Calculate the unit prices which will give a profit of 20% on full cost, if overheads are absorbed on the following bases:

(a) On a direct labour hour basis

(b) On a machine hour basis

(c) Interpret the results.

Solution:

(a) A direct labour hour basis

Budgeted fixed Costs ÷ Budgeted labour hours = ₹ 30,000÷ (15,000 +15,000) = ₹ 1

Absorption rate ₹ 1 per direct labour hour:

Particulars	L (₹)	T (₹)
Variable cost	12.00	15.00
Overhead absorbed	2.00	3.00
	14.00	18.00
Profit (20%)	2.80	3.60
Price	16.80	21.60

The total budgeted profit would be ₹ (2.80 × 7,500) + (₹ 3.60 × 5,000) = ₹ 39,000

(b) A machine hour basis

Budgeted fixed costs ÷ Budgeted machine hours = ₹ 30,000 ÷ (7,500+ 5,000) = ₹ 2.40

Absorption rate ₹ 2.40 per machine hour

Particulars	L (₹)	T (₹)
Variable costs	12.00	15.00
Overhead absorbed	2.40	2.40
Full cost	14.40	17.40
Profit (20%)	2.88	3.48
Price	**17.28**	**20.88**

The total budgeted profit would be ₹ (₹2.88 × 7,500) + (₹3.48 × 5,000) = ₹ 39,000

(c) The different bases for charging overheads result in different prices for both L and T. It is unlikely that the expected sales demand for the products would be the same at both sales prices. It is questionable whether one (or either) product might achieve expected sales demand at the higher price. In other words, although the budgeted profit is ₹39,000 whichever overhead absorption method is used, this assumes that budgeted sales would be achieved regardless of the unit price of each product. This is an unrealistic basis on which to make a decision.

Illustration 19

A plant is running at present at 50% of its capacity. The following details are available:

Particulars	Cost of production per unit (₹)
Direct materials	2
Direct Labour	1
Variable overhead	3
Fixed Overhead	2
Total Cost per unit	8
Production per month	20,000 units
Total cost of production	₹1,60,000
Sales Price	₹1,40,000
Loss	₹20,000

An exporter offers to buy 5,000 units per month at the rate of ₹6.50 per unit and the company hesitates to accept the offer for fear of increasing its operating losses. Advise whether the company should accept or decline this offer.

Solution:

Particulars	Existing (20,000 units)	Offer (5,000 units)	Total
	₹	₹	₹
Sales (S)	1,40,000	32,500	1,72,500
Variable Costs (V):			
Materials	40,000	10,000	50,000
Labour	20,000	5,000	25,000
Variable Overhead	60,000	15,000	75,000
Total variable cost	1,20,000	30,000	1,50,000
Contribution (S-V)	20,000	2,500	22,500
Less: Fixed Cost	40,000	---	40,000
Profit (Loss)	(-)20,000	2,500	(-)17,500

The firm must accept the offer because the amount of loss stands reduced from ₹ 20,000 to ₹17,500.

Illustration 20

A company is engaged in three distinct lines of production. Their production cost per unit and selling prices are as under:

Production (Units)	X	Y	Z
	3,000	2,000	5,000
	₹	₹	₹
Material Cost	18	26	30
Wages	7	9	10
Variable overheads	2	3	3
Fixed Overheads	5	8	9
	32	46	52
Selling price	40	60	61
Profit	8	14	9

The management wants to discontinue one line and gives you the assurance that production in two other lines shall be raised by 50%.

They intend to discontinue the line which produces Article X as it is less profitable.

(a) Do you agree to the scheme in principle?

(b) Offer your comments and show the necessary statements to support your decision.

Solution:

The decision should be taken on the relative profitability of various alternatives as ascertained below:

Total fixed Expenses	₹
X (3,000 × ₹ 5) =	15,000
Y (2,000 × ₹8) =	16,000
Z (5,000 × ₹9) =	45,000
Total Fixed Expenses =	76,000

Contribution per unit of different products: (S-V)

X	₹ (40-27) =	₹ 13 per unit
Y	₹ (60-38) =	₹ 22 per unit
Z	₹ (61-43) =	₹18 per unit

Profit from different production arrangements may be found as under:

a) If 'X' is given up , sale of 'Y' and 'Z' will increase by 50%. The sales of Y would be i.e., Y – 3,000 units, Z – 7,500 units.

Contribution Y = 3,000 × ₹ 22	= ₹66,000
Contribution Z = 7,500 × ₹ 18	= ₹1,35,000
Total	= ₹2,01,000
Less: Fixed Cost	= ₹76,000
Profit	= **₹1,25,000**

b) If Y is discontinued, production of X and Z will be more by 50% i.e., X-4,500 units, Z- 7,500 units.

Contribution X = 4500 × ₹ 13	= ₹58,500
Contribution Z = 7500 × ₹ 18	= ₹1,35,000
	₹1,93,000
Less: Fixed Cost	= ₹76,000
Profit	= ₹1,17,500

c) If Z is given up, production of 'X' and 'Y' will be is X – 4500 units, Y – 3000 units.

Contribution X = 4500 × ₹ 13 =	₹ 58,500
Contribution Y = 3000 × ₹ 22 =	₹66,000
	₹1,24,500
Less: Fixed Cost	= ₹ 76,000
Profit	= **₹48,500**

Under these three alternatives the profit is maximum (₹ 1,25,000) when 'X' is discontinued. Therefore, we may agree with the management's decision to discontinue product 'X'.

Illustration 21

M & Co. has a sale team with a salary based on a monthly fixed payroll. The management wants to increase sale incentive to promote sales, and proposes to change 30% of the fixed salary into a bonus based on sale amount, assuming that the current monthly sale is ₹ 2,50,000 and the sale can increase by 15% if the new salary structure is implemented. Total fixed cost is 40% of the current sale amount, and variable cost is 40%. Salary cost for the sale team is 20% of the total fixed cost.

What should be the proposed sale commission system to make benefits for both sale team and the firm from the scheme?

Solution:

The overall purpose of the new scheme is to increase sale by motivating salespersons to sell. As current monthly sale is the achievable target for the sale team, salespersons should at least keep the same salary payment with the current target and anticipate additional bonus for extra sales. The management of M & Co. will have additional profit if the sale team can excel above the current monthly sale. Based on this principle, the detailed new scheme is computed as follows:

Total salary payment for the sale team: ₹ 2,50,000 × 40% × 20% = ₹ 20,000

Portion of the fixed salary converted into commission: ₹ 20,000 × 30% = ₹ 6,000

Commission rate based on sale amount: ₹ 6,000 / ₹ 2,50,000 × 100 = 2.4% on sale amount

For target sale exceeding 15% of ₹ 2,50,000 (assuming no capacity problem):

Salespersons' additional commission: ₹ 2,50,000 × 15% × 2.4% = ₹ 900

The firm's additional profit: ₹ 2,50,000 × 15% × (1 – 40%) – ₹ 900 = ₹ 21,600

Illustration 22

H Ltd. uses a scheme of pricing based on cost plus. All the overheads are charged, based on direct labour and based on the total cost arrived at the selling price is fixed.

The following figures are from the Annual Budget for 2022 prepared by the company:

Particulars	(₹)
Sales	10,00,000
Direct materials	1,80,000
Direct labour	3,20,000
Factory superintendent's salary	30,000
Commission paid on sales (5%)	50,000
Foreman's salaries	60,000
Insurance	10,000
Advertisement	0,000
Depreciation on assets	30,000
Administrative expenses	90,000
Variable Factory Costs:	
Repair and Maintenance	60,000
Tools consumed	40,000
Miscellaneous supplies	10,000

The company has submitted a tender quoting ₹ 10,000 on a large order with a cost of ₹ 1,800 Direct material and ₹3,200 Direct labour. The customer strikes the business ₹8,900 on a 'take it or leave it' basis. If the company accepts the order, the total sales for 2022 would be ₹10,08,900. The company is reluctant to accept the order, as it would be against its policy of accepting on order below cost.

Write a note to the Managing Director; recommending the acceptance of the order, substantiating your recommendation fully with supporting figures to explain that the price offered would not be below cost and a sizeable profit also would be made. Also comment on the pricing policy of the company.

Solution:

The Note should consider the following point:

(1) The pricing in this case will be based on relevant costs of accepting the offer.

(2) To consider the recovery of variable overheads cost only on the basis of direct wages.

The Pricing Policy the company is following on the basis of full cost plus mark-up, which is not applicable in the context of additional order.

It is also to be assumed that, capacity exists otherwise opportunity cost should be taken into consideration.

Illustration 23

As a Management Accountant of Bush Radio Company you find that while it costs ₹12.50 to make a component X, the same is available in the market at ₹11.50 with an assurance of continued supply. The break-down of the cost is:

Materials	₹5.50
Labour	₹3.50
Other variable overheads	₹1.00
Depreciation & other fixed cost	₹2.50
Total Cost	₹12.50

a. Should you make or buy?

b. What would be your decision, if the supplier offered the component at ₹ 9.70 each**?**

Solution:

Marginal Cost Statement

Particulars	per Unit ₹
Materials	5.50
Labour	3.50
Variable Overheads	1.00
Marginal Cost	10.00

a. The marginal cost of producing the component is ₹ 10 per unit and fixed cost per unit is ₹ 2.50, thereby making a total cost of ₹ 12.50 per unit. But this component is available in the market at ₹ 11.50. As the market price per unit is less than the total cost, apparently it looks better to buy the component instead of making it. But a close observation reveals that the component will actually cost ₹ 14 (i.e. 11.50+2.50) if it is purchased, as the fixed cost of ₹ 2.50 is required to be incurred even if the component is purchased. Therefore, it may not be wise to buy a component which will actually cost ₹ 14, which is being manufactured at ₹ 12.50.

b. If the price offered by the supplier is ₹ 9.70 per unit, then it is advisable to purchase the component from the outside market as the outside market price of ₹ 9.70 is less than marginal cost of ₹ 10. There will be saving of ₹0.30 per unit if the component is purchased from outside market.

One of the best ways for sales promotion is to offer quotations at low rates. A company is producing 80,000 units (80% of capacity) and making a profit of ₹ 2,40,000. Suppose the Central Government has given a tender notice for 20,000 units. It is expected that the units taken by the Government will not affect the sale of 80,000 units which the company is already selling and the company also wishes to submit the lowest possible quotation. The company may quote any amount above marginal cost, because it will give an additional marginal contribution and hence profit.

Illustration 24

The HUL Snow Company manufactures and sells direct to consumer's 10,000 jars of 'Everest Snow' per month at ₹ 1.25 per jar. The company's normal production capacity is 20,000 jars of snow per month. An analysis of cost for 10,000 jars is given below:

Particulars	₹
Direct Materials	1,000
Direct Labour	2,475
Power	140
Jar	600
Misc. Supplies	430
Fixed Expenses of Manufacturing, Administration and Selling	7,955
Total	12,600

The company has received an offer for the export under a different brand name of 1,20,000 jars of snow at 10,000 jars per month at 75 paise a jar.

As a Management Accountant, mention the brief points on the advisability or otherwise of accepting the offer.

Solution:

Make necessary calculations for Present Capacity considering 50 % capacity level and proposed another 50% capacity level and make for Total for 100% capacity level.

Observations:

At the present level of activity, i.e., 10,000 units, there is a loss of ₹ 100 in spite of the fact that variable cost is only ₹ 0.4645 against a selling price of ₹ 1.25 per unit. The reason is that the total cost per unit (including fixed costs) is ₹ 1.26 per unit.

But if additional 10,000 units are sold it converts the loss of ₹ 100 into a profit of ₹ 2,755 in spite of the fact that additional offer for 10,000 units is @ 75 paise per unit only.

This is so because of the fact that additional sales give a contribution of ₹ 2,855 i.e. (₹0.75- ₹ 0.4645 or say ₹ 0.2855 per unit). As additional sales give contribution and no additional fixed costs are involved, the offer should he accepted.

However, before taking a final decision the following further points should be studied:

(i) The cost of exporting, if any

(ii) Risk or re-import of the same goods into the home market and generating competition with itself.

(iii) Effect of lower export price on the home market.

(iv) Alternative uses of surplus capacity.

Illustration 25

T Limited manufactures 20,000 units of 'X' in a year at its normal production capacity. The unit cost as to variable costs and fixed costs at this level are ₹ 13 and ₹ 4 respectively. The selling price per unit of the units sold is ₹ 20 per unit. Due to trade depression, it is expected that only 2,000 units of 'X' can be sold during the next year. The Management of T Ltd is considering the shut-down of the plant. The fixed costs for the next year then are expected to be reduced to ₹ 33,000. Additional costs of plant shut-down are expected at ₹ 12,000. You have been recently appointed as a Management Accountant of the Company. Advise the management, whether the plant should be operated or shut down.

Solution:

As a Management Accountant, the following considerations are to be made and report accordingly to the management about shut-down of the plant:

The decisions regarding the plant to shut-down require calculation of shut-down point, which is calculated as under:

Statement of Profitability

Particulars	Plant is operated	Plant is shut-down
	₹	₹
Sales	40,000	-
Variable costs	26,000	-
Fixed costs	80,000	33,000
Additional shut down costs	-	12,000
Total Costs	1,06,000	45,000
Loss	**(66,000)**	**(45,000)**

Suggestions:

While comparing the loss figures as indicated above, loss is reduced if the plant is shut-down. In fact by doing so the organisation's loss would be reduced by ₹ 21,000 (₹66,000 - ₹ 45,000).

For the perspective of management, the shut-down point is also calculated:

Avoidable fixed cost for the period (or fixed cost which will not be incurred if the plant is shut down) = Total fixed cost for the period – (Unavoidable fixed costs + Additional shut down costs)= ₹80,000 – ₹45,000= ₹35,000.

Shut-down point = Avoidable fixed cost for the period ÷ Contribution per unit= ₹ 35,000÷ ₹ 7 = 5,000 units.

Other considerations in shut down decisions:

Besides cost factors, non-cost factors should also be taken into consideration. The non-cost factors are to be considered:

1. Point of view of the workers: If the workers are discharged it may become difficult to get skilled workers later, on re-opening of the factory. Also shut down may create problem for the workers which may far exceed the cost benefits of the shutdown.
2. Point of view of competition: Once the firm is closed down, competitors may establish their products and thus it may be difficult to introduce the product in the market again.
3. Point of view of Plant: The plant may become obsolete or depreciate at a larger rate when not in operation. Thus, heavy capital expenditure may have to be incurred on re-opening.

Illustration 26

A firm's operations are at present performed manually. It has a proposal to install a new machine which can produce at a faster rate. Following information is available. As a Management Accountant advise the management about the profitability of mechanization.

Particulars	Manual Operations	Machine Operations
Selling price per unit (₹)	28	28
Variable costs per unit (₹)	22	20
Additional fixed cost per unit (₹)	-	3
Total cost per unit (₹)	22	23
Production in units per hour	1	2

Solution:

The decision will be based on the following points:

Particulars	Manual Operations	Machine Operations
	Amount (₹)	Amount (₹)
Selling price per unit	28	28
Less: Marginal cost per unit	22	23
(including additional fixed cost)		
Contribution per unit	6	5
Contribution per hour	6	10

Observations:

If there is a huge demand for the products, it is advisable to go for machine operations, because the contribution per hour is more when machine operation is carried on. However, if there is an idle capacity and there will be an under- absorption of fixed overheads to the extent of ₹ 3 per unit the total cost will be ₹ (23 + 3) = 26, leaving a contribution of ₹ 2 per unit. The contribution per hour will, therefore, be ₹4 which is less than that of obtaining under manual operation. Hence mechanization will not be advisable under these circumstances.

Illustration 27

You are the Management Accountant of F & Company, which manufactures stoves, has an opportunity to buy the handles for its stoves for ₹8 per unit. The MD is not sure about, what should be done for the best interest of the Company and need your help, in arriving at a decision. This purchase would affect prices, volume, and costs as follows:

Particulars	Buy	Make
	₹	₹
Unit Selling Price	340	340
Volume (per month)	500	500
Unit Variable Costs	88	95
Purchased Parts (per unit)	8	0
Fixed Costs	4,700	5,500

You are to decide whether the part should be made or bought

Solution:

Particulars	Buy	Make	Difference
	₹	₹	₹
Revenue	1,70,000	1,70,000	0
Less:			
Variable Costs to Produce and Sell	44,000	47,500	3,500 lower
Variable Costs of Goods Bought	4,000	0	4,000 higher
Total Contribution Margin	1,22,000	1,22,500	500 lower
Less: Fixed Costs	4,700	5,500	800 lower
Operating Profit	1,17,300	1,17,000	300 higher

Operating profit for the F&Company increases by ₹300, if it purchases the handles rather than makes them, so the company should outsource, instead of making the same.

Illustration 28

Recently your Managing Director, who is an engineer, called a meeting of the Cost Department and in the meeting he has asked some explanations for certain items listed below, as relevant costs or not. He is not having clear ideas about relevant costs. You are heading the Cost Department and asked to clarify the same, highlighting the relevancy or irrelevancy of each item.

(a) The salary to be paid to a market researcher who will oversee the development of a new product. This is a new post to be created especially for the new product but ₹1,20,000 salary will be a fixed cost. Is this cost relevant to the decision to proceed with the development of the product?

(b) The ₹25,000 additional monthly running costs of a new machine to be purchased to manufacture an established product. Since the new machine will save on labour time, the fixed overhead to be absorbed by the product will reduce by ₹1,000 per month. Are these costs relevant to the decision to purchase the new machine?

(c) Office cleaning expenses of ₹1,250 for next month. The office is cleaned by contractors and the contract can be cancelled by giving one month's notice. Is this cost relevant to a decision to close the office?

(d) Expenses of ₹ 7,500 paid to the marketing manager. This was to reimburse the manager for the cost of travelling

to meet a client with whom the company is currently negotiating a major contract. Is this cost relevant to the decision to continue negotiations?

Solution:

As a Departmental head of the Company the above items will be considered on case to case basis as under:

(a) The salary is a relevant cost of ₹ 1,20,000. There should not be any confusion of the fact that it is a fixed cost. It is a cost that is relevant to the decision to proceed with the future development of the new product. This is an example of a directly attributable fixed cost. A directly attributable fixed cost may also be called a product-specific fixed cost.

(b) The ₹ 25,000 additional running costs are relevant to the decision to purchase the new machine. The saving in overhead absorption is not relevant since we are not told that the total overhead expenditure will be altered. The saving in labour cost would be relevant but we shall assume that this has been accounted for in determining the additional monthly running costs.

(c) This is not a relevant cost for next month since it will be incurred even if the contract is cancelled today. If a decision is being made to close the office, this cost cannot be included as a saving to be made next month. However, it will be saved in the months after that so it will become a relevant cost saving from month 2 onwards.

(d) This is not a relevant cost of the decision to continue with the contract. The ₹7,500 is sunk and cannot be recovered even if the company does not proceed with the negotiations.

EXERCISE

Theoretical Questions

⊙ Multiple Choice Questions

1. If the total cost of 1000 units is ₹ 60,000 and that of 1001 units is ₹60,400, then the increase of ₹400 in the total cost is:

A. Prime cost
B. All variable overheads
C. Marginal cost
D. None of the above

2. Which of the following statements are true about marginal costing?

A. In marginal costing, fixed costs are treated as product costs
B. Marginal costing is not an independent system of costing
C. The elements of cost in marginal costing are divided into fixed and variable components
D. Both b and c

3. The costing method where fixed factory overheads are added to inventory is called:

A. Activity-based costing
B. Absorption costing
C. Marginal costing
D. All of the above

4. While computing profit in marginal costing:

A. The fixed cost gets added to the contribution
B. The total marginal cost gets deducted from total sales revenue
C. The total marginal cost gets added to total sales revenue
D. None of the above

5. Which of the following assumptions are made while calculating marginal cost?

A. Total fixed cost is constant at all levels of output
B. Total variable cost varies according to the volume of output
C. All elements of cost can be divided into fixed and variable components
D. All of the above

6. Contribution margin in marginal costing is also known as:

A. Net income
B. Gross profit
C. Marginal income
D. None of the above

7. The term 'Contribution' refers to the:

A. Excess of selling price over variable cost per unit
B. Difference between the selling price and total cost

C. Subscription towards raising capital

D. None of the above

8. Which of the following techniques of costing differentiates between fixed and variable costs?

A. Marginal costing

B. Standard costing

C. Absorption costing

D. None of the above

9. Fixed cost is also referred to as in the marginal costing technique:

A. Total cost

B. Product cost

C. Period cost

D. None of the above

10. Variable cost is also referred to as in the marginal costing technique:

A. Total cost

B. Product cost

C. Period cost

D. None of the above

11. The margin of safety, which is the difference between actual sales and break-even point, can be improved by:

A. Lowering variable costs

B. Lowering fixed costs

C. Increasing sales volumes

D. All of the above

12. The profit/volume ratio in marginal costing can be improved by:

A. Lowering fixed cost

B. Increasing the selling price

C. Increasing variable cost

D. None of the above

13. Under marginal costing, the stock is valued at:

A. Total Cost

B. Fixed Cost

C. Variable Cost

D. None of the above

14. The profit at which total revenue is equal to the total cost is known as:

A. Margin of safety

B. Break-even point

C. Both a and b are incorrect

D. Both a and b are correct

15. The cost that does not fluctuate based on the volume of the production is known as:

A. Variable cost

B. Fixed cost

C. Semi-variable cost

D. None of the above

16. Fixed cost includes:

A. Property taxes

B. Rent

C. Insurance premium

D. All of the above

17. Variable cost includes:

A. Cost of raw materials

B. Salaries and wages

C. Electricity bills

D. All of the above

18. Marginal cost is equal to:

A. Variable overheads

B. Prime cost plus variable overheads

C. Prime cost minus variable overheads

D. None of the above

19. Marginal costing is also called:

A. Variable costing

B. Total costing

C. Marginal costing

D. Activity based costing

20. What is the opportunity cost of making a component part in a factory given no alternative use of the capacity?

A. The variable manufacturing cost of the component

B. The total manufacturing cost of the component

C. The total variable cost of the component

D. Zero

21. The difference in total cost that results from two alternative courses of action is called:

A. Relevant Cost

B. Opportunity Cost

C. Differential Cost

D. Marginal Cost

22. Another name for 'Contribution' is:

    A. Marginal Income
    B. Gross Profit
    C. Net Income
    D. None of the above

23. Relevant costs are:

    A. unavoidable, future and measured by cash
    B. avoidable, future and measured by cash
    C. avoidable, future and measured by profit
    D. unavoidable, future and measured by profit

24. Which one of the following statements is true?

    A. Non-cash costs are always relevant.
    B. Opportunity costs are always relevant.
    C. Sunk costs are always relevant.
    D. Committed costs are always relevant.

25. Which of the following costs would not be accounted for in a company's recordkeeping system?

    A. an unexpired cost
    B. an expired cost
    C. a product cost
    D. an opportunity cost

26. A fixed cost is relevant if it is:

    A. uncontrollable.
    B. avoidable
    C. sunk.
    D. a product cost.

Answers:

1-C, 2-D, 3-B, 4-B, 5-D, 6- C, 7- A, 8- A, 9- C, 10- B, 11- D, 12- B, 13- C, 14-B, 15- B, 16- D, 17-A, 18- B, 19- A, 20-D, 21-C, 22- A, 23-C, 24-B, 25- D, 26- B.

⊙ State True or False

1. Marginal costing is a system of costing
2. Key factor is important in ascertaining the profitability
3. Under marginal-costing technique, fixed costs are charged off to revenue fully during the period in which they are incurred but not taken into account for valuing inventories
4. Plant and machinery may depreciate more quickly when kept idle than when being used.
5. When a new product is introduced in the market, the selling price is fixed below the marginal cost in order to make the new product more popular.

6. Sometimes, the government allows import quota against foreign exchange earned. Profit t may be more in such cases.
7. Maximum use or absorption of fixed costs will be the ultimate aim of any business.
8. The problem whether to use a machine or produce by hand labour or use any combination of machine and labour can be best solved by the usage of marginal-costing technique.
9. The management is often confronted with the problem of product pricing.
10. Price under normal circumstances for a longer period should be based on the total costs.
11. The decision on the closure of a department or discontinuance of a product or a section of a business can be made by applying marginal-costing technique.
12. Marginal-costing technique is also used in planning the profit level of the business.

Answers:

1-False, 2- True, 3- True, 4- True, 5- True, 6- True, 7- True, 8- True, 9- True, 10- True, 11-True, 12-True.

⊙ Fill in the Blanks

1. When there is no idle (unused) capacity and at the same time the component part is manufactured in (instead of buying) the factory by replacing the other work, the ……. from the displaced work has to be considered along with the marginal cost of production.
2. Quite often the management of a manufacturing company will face the problem whether a component or a product should be---------- from an outside source (suppliers) or manufactured by the company itself
3. If there is any----------, care should be taken before arriving at a decision.
4. ----------is the main criteria to decide the profitability of any business concern.
5. ---------- are classified into fixed and variable in marginal costing.
6. The ----------statement of each month will show the same amount of fixed costs irrespective of the volume of sales.
7. ----------Costing is also termed as Relevant Costing or Incremental Analysis.
8. ----------does not provide any standard for the evaluation of performance which is provided by standard costing and budgetary control.
9. ----------also known as decision model, is the process of evaluating two or more alternatives leading to a final choice, known as Alternative Choices Decisions.
10. ----------decision making is a process of making choices.
11. ----------revenue is the amount of increase or decrease in revenue expected from a particular course of action as compared with an alternative.
12. ----------factors are difficult to quantify in monetary terms.
13. Make or buy decision is also referred to as ----------decision.
14. The decision to eliminate an ----------product is a special case of product profitability evaluation.
15. The decision whether a product should be sold at the ---------- or processed further is faced by many manufacturers.

Answers:

1- loss of contribution, 2- Purchased, 3- limiting factor, 4- "Contribution", 5- Costs, 6- income, 7- Differential, 8- Marginal Costing, 9- Decision-making, 10- Managerial, 11- Relevant (differential), 12- Qualitative, 13- outsourcing, 14- unprofitable, 15- split-off point.

⊙ Short Essay Type Questions

1. Provide examples of how Cost Volume Profit Analysis can be used for decision-making.
2. Explain what is meant by the term 'Relevant Range'.
3. Define the term 'Contribution Margin'.
4. Describe the assumptions underlying Cost–Volume–Profit Analysis.
5. How can sensitivity analysis be used in conjunction with Cost–Volume–Profit Analysis?
6. Write short notes on:

   (a) Margin of safety

   (b) Angle of incidence

   (c) Cash break-even point

   (d) CVP Analysis

⊙ Essay Type Questions

1. Define the term 'profit–volume ratio' and explain how it can be used for cost–volume–profit analysis.
2. Describe and distinguish between the three different approaches to presenting cost–volume–profit relationships in graphical format.
3. How can a company with multiple products use cost–volume–profit analysis?
4. Explain why the break-even point changes when there is a change in sales mix.

Practical Problems

⊙ Multiple Choice Questions

1. PQR Ltd. manufactures a single product which it sells for ₹ 40 per unit. Fixed cost is ₹ 60,000 per year. The contribution to sales ratio is 40%. PQR Ltd.'s Break Even Point in units is

   A. 3500
   B. 3700
   C. 3750
   D. 4000

2. The break-even point of a manufacturing company is ₹1,60,000. Fixed cost is ₹48,000. Variable cost is ₹12 per unit. The PV ratio will be:

   A. 20%
   B. 40%

C. 30%

D. 25%

3. Product A generates a contribution to sales ratio of 40%. Fixed cost directly attributable to Product A amounted to ₹60,000. The sales revenue required to achieve a profit of ₹15,000 is

A. ₹ 2,00,000

B. ₹ 1,85,000

C. ₹1,87,500

D. ₹ 2,10,000

4. XYZ Ltd. makes a special gadget for the car it manufactures. The machine for the gadget works to full capacity and incur ₹15 Lakhs and ₹40 Lakhs respectively as Variable and Fixed Costs. If all the gadgets were purchased from an outside supplier, the machine could be used to produce other items, which would earn a total contribution of ₹ 25 Lakhs. What is the maximum price that XYZ Ltd. should be willing to pay to the outside supplier for the gadgets, assuming there is no change in Fixed Costs?

A. ₹40 Lakhs

B. ₹65 Lakhs

C. ₹25 Lakhs

D. ₹15 Lakhs

5. Zee Products Ltd. manufactures four products e.g. Product E, Product F, Product G and Product H using same raw materials. The input requirements for Products E, F, G and H are 1kg, 2kgs, 5kgs and 7kgs, respectively. Product-wise Selling Price and Variable Cost data are given hereunder:

Products	E	F	G	H
Selling Price (₹)	100	150	200	300
Variable Cost (₹)	50	70	100	125

Assuming raw material availability is a limiting factor, the correct ranking of the products would be:

A. E, F, G & H

B. E, F, H & G

C. F, E, G & H

D. F, E, H & G

6. X Ltd. has 1000 units of an obsolete item which are carried in inventory at the original price of ₹ 50,000. If these items are reworked for ₹ 20,000, they can be sold for ₹ 36,000. Alternatively, they can be sold as a scrap for ₹6,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as

A. ₹16,000

B. ₹6,000

C. ₹30,000

D. ₹20,000

7. The sales and profit of a firm for the year 2021 are ₹1,50,000 and ₹20,000 and for the year 2022 are ₹1,70,000 and ₹ 25,000 respectively. The P/V Ratio of the firm is

A. 15%

B. 20%

C. 25%

D. 30%

8. A company has a break-even point when sales are ₹ 3,20,000 and variable cost at that level of sales are ₹2,00,000. How much would contribution margin increase or decrease if variable expenses are dropped by ₹30,000?

A. Increase by 27.5%

B. Increase by 9.375%

C. Decrease by 9.375%

D. Increase by 37.5%

9. A radio manufacturer finds that while it costs ₹16.25 per unit to make a component, the same is available in the market at ₹5.75 each. Continuous supply is also fully assured. The break-up of costs per unit is as follows:

Materials: ₹ 2.75

Labour: ₹ 1.75

Other variable expenses: ₹ 0.50

Depreciation & other fixed costs: ₹ 1.25

The best option for the manufacturer will be

A. To make

B. To buy

C. To sell

D. None of the above

10. Dec 2021: In a purely competitive market, 10,000 pocket transistors can be manufactured and sold and certain profit is generated. It is estimated that 2.0 pocket transistors need to be manufactured and sold in a monopoly market to earn the same profit. Profit under both conditions is targeted at ₹ 2,00,000. The variable cost per transistor is ₹ 100 and total fixed costs are ₹ 37,000. Unit selling price per transistor under monopoly condition will be:

A. ₹ 218.50

B. ₹ 234.50

C. ₹ 267.25

D. ₹ 274.35

11. Mr. Mahesh has a sum of ₹ 3,00,000 which invested in a business. He wishes for a 15% return on his fund. It is revealed from the present cost data analysis that the variable cost of operation is 60% of sales and fixed costs are ₹ 1,50,000 p.a. On the basis of this information, you are required to find out the sales volume to earn a 15% return.

A. ₹ 4.875 Lakhs

B. ₹ 4.675 Lakhs

C. ₹ 4.775 Lakhs

D. ₹ 5.875 Lakhs

12. A radio manufacturer finds that it costs ₹ 6.25 per unit to make component M-140 and the same is available in the market at ₹ 5.75 each. Continuous supply is also fully assured. The break-down cost per unit as follows: Materials ₹ 2.75, Labour ₹ 1.75 other variable expenses ₹ 0.50, Depreciation and other fixed cost ₹ 1.25. What would be your decision, if the supplier offered the component at ₹ 4.85 per unit?

A. Make
B. Buy
C. Sell
D. None of the above

13. A firm has given the following data:

Fixed expenses at 50% ₹ 15,000, Fixed expenses when factory is close down ₹ 10,000, Additional expenses in closing down ₹ 1,000, Production at 50% capacity 5,000 units, contribution per unit ₹ 1. Advise whether to run the factory or close it down:

A. Close
B. Run
C. Continue
D. None of the above

14. A company manufactures and sells three types of product namely A, B and C. Total sales per month is ₹ 80,000 in which the share of these three products are 50%, 30% and 20% respectively. The variable cost of these products is 60%, 50% and 40% respectively. The combined P/V Ratio will be:

A. 49%
B. 48%
C. 47%
D. 50%

Answers:

1-C, 2-C, 3-C, 4-A, 5-B, 6- B, 7- C, 8- B, 9- A, 10- A, 11- A, 12- B, 13- B, 14-C.

⊙ Comprehensive Numerical Questions

1. The following results of a company for the last two years are as follows:

Year	Sales (₹)	Profit (₹)
2021	1,50,000	1,70,000
2022	20,000	25,000

You are required to calculate:

(i) P/V Ratio

(ii) B.E.P

(iii) The sales required to earn a profit of ₹40,000

(iv) Profit when sales are ₹ 2,50,000

(v) Margin of safety at a profit of ₹50,000 and

(vi) Variable costs of the two periods.

2. B Ltd. has a factory which manufactures a product whose sales have declined to ₹ 40,000 per annum. Special purpose machinery is employed to make the product and there is no hope of using this for any other purpose, nor there do any hope of stimulating demand of the existing product.

The estimated life of the factory plant is 5 years and sales should continue at the same level for the whole period. Total variable costs per annum for the expected sales are ₹ 20,000. Fixed costs per annum ₹15,000 including ₹7,000 as depreciation.

All sales and expenses accrue at the end of the year.

If the factory is sold "lock, stock and barrel" immediately, ₹30,000 may be obtained. On the other hand, if it is operated for 5 years, ₹ 4,000 is the estimated residual value.

Presuming 10% as the cost of capital, you are required to advise whether it will be appropriate to operate the factory or close it down immediately. The present value of an annuity of ₹ 1 at 10% discount for 5 years may be taken as 3.791 and the present value of ₹1 received after 5 years at 10% discount is 0.62.

3. Present the following information to show to the management (a) the marginal product cost and the contribution per unit; (b) the contribution and profit resulting from each of the following sales mixtures:

Particulars	Product	Per unit ₹
Direct Materials	P	10.00
	Q	9.00
Direct Wages	P	3.00
	Q	3.00
Fixed Expenses:	P	800
	Q	2.00
Sales Price	P	20.00
	Q	15.00

(Variable expenses are allocated to products as 100% of direct wages)

Sales Mix:

(i) 1,000 units of product P and 2,000 units of Q.

(ii) 1,500 units of product P and 1,500 units of Q.

(iii) 2,000 units of product P and 1,000 units of Q.

Recommend which of the sales mix should be adopted.

4. From the following data you are required to present to the management:

(i) The marginal cost of product A and B and the contribution per unit.

(ii) The total contribution and profit resulting from each of the suggested sales mix.

Direct Materials per unit	₹
Product A	10.50
Product B	8.50
Direct Wages: per unit	₹
Product A	3.00
Product B	2.00
Variable Expense 100% of direct wages per product	
Fixed Expenses (Total)	₹800
Selling price:	per unit ₹
Product A	20.50

Product B	15.50
Suggested Sales Mix No. of units	
Product A	Product B
(a) 100	200
(b) 150	150
(c) 200	100

5. If labour costs and material cost are likely to go up by 10% and 5% respectively per unit, what is the percentage increase necessary in selling price to keep the P/V of 20% as before, assuming that the ratio between material and labour is 3:2, and variable overheads is nil.

6. The Strong co. owns and operates six outlets in and around Bangalore City.

Particulars	₹
Revenue	1,00,00,000
Fixed Costs	17,00,000
Variable Costs	82,00,000

Variable costs change with respect to the number of units sold.

Required:

Compute the budget operating income for each of the following deviations from the original budget data. (Consider each case independently.)

i. A 10% increase in contribution margin, holding revenues constant.

ii. A 10% decrease in contribution margin, holding revenues constant.

iii. A 5% increase in fixed costs.

iv. A 5% decrease in fixed costs.

v. A 8% increase in units sold.

vi. A 8% decrease in units sold.

vi. A 10% increase in fixed costs and 10% increase in units sold.

viii. A 5% increase in fixed costs and 5% decrease in variable costs.

7. You are given the following corporate budget data for next year:

The projected capacity of a plant, when sold, would return ₹70,000 in sales income to the company. The variable costs for this production volume were determined to be ₹ 30,000. The fixed costs are ₹ 20,000. Determine the following:

(1) the break-even point of the business

(2) the profit or loss to the business on sales of ₹ 49,000; ₹28,000

(3) the amount of sales that will enable the business to earn a net profit of ₹28,000.

8. A company budgets for a production of 1,50,000 units. The variable cost per unit is ₹14 and fixed cost is ₹2 per unit. The company fixes its selling price to fetch a profit of 15% on cost.

   (a) What is the break-even point?

   (b) What is the profit-volume ratio?

   (c) If it reduces its selling price by 5%, how the revised selling price affect the break-even point and the profit-volume ratio?

   (d) If a profit increase of 10% is desired more than the budget, what should be the sales at the reduced prices?

9. A company is producing two products 'A' and 'B' from a joint manufacturing process. The joint costs are ₹2,00,000 and it has given a production of 1 lakh kilograms of 'A' having a selling price ₹1 per kilogram and 2 lakh kilograms of 'B' having a selling price of ₹1.50 per kilogram.

   The company is considering a proposal to process product 'A' into a new product 'Z' which sells at ₹ 3 per kilogram. The processing cost would amount to ₹1,75,000 for converting one lakh kilograms of product 'A' to product 'Z'.

   You are required to advise the company about the acceptance or rejection of the above proposal.

10. The following information regarding the operations of 2022 has been made available from the records of the B & Company:

Particulars	**₹**
Sales	1.00,000
Direct materials used	40,000
Direct labour	15,000
Fixed manufacturing overheads	20,000
Fixed selling and administrative expenses	10,000
Gross profit	20,000
Net loss	5,000

   There are no openings or closing inventories. It is required to calculate:

   (1) Variable selling and administrative expenses

   (2) Contribution Margin in rupees

   (3) Variable factory overhead

   (4) Breakeven point in rupee sales

   (5) Factory cost of goods sold

11. A audio manufacturing company finds that while it costs ₹ 6.25 each to make component P 273 Q, the same is available in the market at ₹5.75 each, with an assurance of continued supply. The breakdown of costs is:

Materials	₹2.75 each
Labour	₹1.75 each
Other variable costs	₹0.50 each
Depreciation and other fixed cost	₹1.25 each
	₹6.25 each

(a) Should you make or buy?

(b) What would be your decision if the supplier offered the component at ₹4.85 each?

12. Auto Parts Ltd. has an annual production of 90,000 units for a motor component. The component's cost structure is as given below:

Particulars	₹ per unit
Materials	270
Labour (25% fixed)	180
Expenses:	
Variable	90
Fixed	135
Total	675

(a) The Purchase Manager has an offer from a supplier who is willing to supply the component at ₹ 540. Should the component be purchased?

(b) Assume the resources now used for this component's manufacture are to be used to produce another new product for which the selling price is ₹485.

In the latter case material price will be ₹ 200 per unit. 90,000 units of this product can be produced, at the same cost basis as above for labour and expenses. Discuss whether it would be advisable to divert the resources to manufacture that new product, on the footing that the component presently being produced would, instead of being produced, be purchased from the market.

13. Two businesses AA Ltd and AB Ltd sell the same type of product in the same market. Their budgeted profits and loss accounts for the year ending 30th June, 2022 are as follows:

Particulars		AA Ltd (₹)		AB Ltd (₹)
Sales		1,50,000		1,50,000
Less: Variable costs	1,20,000		1,00,000	
Fixed Cost	15,000	1,35,000	35,000	1,35,000
Profit		15,000		15,000

You are required to calculate the B.E.P of each business and state which business is likely to earn greater profits in the following conditions:

(a) Heavy demand for the product

(b) Low demand for the product.

14. The availability of Material A is limited to 8,000 kgs.

Product	P	Q	R
Demand (units)	2,000	2,500	4,000
Variable cost –making per unit (₹)	10	12	14
Purchase price per unit (₹)	13	17	16
Kgs per unit of Material A	3	2	1

Determine which product the company should make or buy?

15. A company manufactures a product and sells it at ₹ 3,000 each. An increase of 17% in cost of materials and of 20% of labour cost is anticipated. The increased cost in relation to the present sales price would cause at 25% decrease in the amount of the present gross profit per unit. At present, material cost is 50%, wages 20% and overhead is 30% of cost of sales.

    You are required to:

    (a) Prepare a statement of profit and loss per unit at present and;

    (b) Compute the new selling price to produce the same percentage of profit to cost of sales as before.

⊙ Unsolved Cases

1. Following data are in respect of a firm manufacturing a single product for a particular period:

	₹
Sales (20000 units)	2,00,000
Cost of production (20000 units)	1,20,000
Selling and distribution expenses	30,000

    Maximum capacity 25000 units

    Fixed costs included in cost of production are ₹ 40,000 and only variable cost included in selling and distribution expenses are commission @ 10% on sales and packing expenses @ 20 p. per unit.

    (1) An offer for purchase of 4000 units is received from outside India. No sales commission is payable on such foreign order but packing costs will be 80 p. per unit.

    What minimum price may be quoted for the foreign offer?

    (2) What should be the minimum price had the offer size been 8000 units instead of 4000 units?

2. A company has an installed production capacity of 1,00,000 units and presently it is working at 70% capacity utilisation. As production capacity utilisation increases, cost per unit decreases as follows:

Capacity utilisation	Cost per unit
70%	₹97
80%	₹92
90%	₹87
100%	₹82

    The company has received three export orders from different sources as under:

    Source A 5000 units at ₹55 per unit

    Source B 10000 units at ₹52 per unit

    Source C 10000 units at ₹51 per unit

    Advise the company whether any or all the export orders should be accepted or not.

3. A Company has the option to procure a particular material from two sources:

    Source I assures that defectives will not be more than 2% of supplied quantity.

    Source II does not give any assurance, but on the basis of past experience of supplies received from it, it is observed that defective percentage is 2.8%.

The material is supplied in lots of 1,000 units. Source II supplies the lot at a price, which is lower by ₹100 as compared to Source I. The defective units of material can be rectified for use at a cost of ₹5 per unit.

You are required to find out which of the two sources is more economical.

4. XYZ Company is considering hiring a machine at an annual charge of ₹12,000 to increase the output of a product from its present level of 6,000 units. It is anticipated that with the introduction of the machine the variable cost per unit will be reduced by ₹1.00 due to savings in labour cost. The new machine will not affect fixed cost in total, except for the hiring charges. The selling price of the product is ₹12 per unit. The present cost structure of the product is Variable cost ₹9 per unit and fixed cost ₹1.00 unit.

   You are required to calculate the number of extra units, which must be produced and sold to justify hiring the machine, (that is the cost indifference point for the new machine).

5. A factory produces 24000 units. The cost sheet gives the following information:

Direct material	₹1,20,000
Direct wages	84,000
Variable overheads	48,000
Semi-variable overheads	28,000
Fixed overheads	80,000
Total Cost	3,60,000

   The product is sold at ₹20 per unit. The management proposed to increase the production by 3000 units for sales in the foreign market. It is estimated that semi-variable overheads will increase by ₹1,000, but the product will be sold at ₹14 per unit in the foreign market. However, no additional capital expenditure will be incurred. The management seeks your advice as cost accountant.

   What will you advise them?

6. AB & Co., a Cost firm, has been asked to bid on a contract to perform audits for three units in its home state. Should the firm be awarded the contract, it must hire one new staff member at a salary of ₹ 41,000 to handle the additional workload. (Existing staff are fully scheduled.) The managing partner is convinced that obtaining the contract will lead to additional new profit-oriented clients. Expected new work (excluding the three units) is 800 hours at an average billing rate of ₹ 60.00 per hour. Other information follows about the firm's current annual revenues and costs:

Firm's volume in hours (normal):	30,750
Fixed costs:	₹ 4,70,000
Variable costs	₹ 20.00/hr

   Should the firm win the contract, these audits will require 900 hours of expected work.

   Assume you are the managing partner of the firm.

   If your expectations are correct, then what is the lowest bid that your firm can submit and still expect to increase annual net income?

   If the contract is obtained at a price of ₹ 30,000, what is the minimum number of hours of new business in addition to the present work that must be obtained for the firm to break even on total new business?

Key Terms
Pricing Decision - The price to be charged for a product or service.
Make or Buy decisions - This kind of decision typically arises when the product being manufactured has a component part that can either be made within the factory or brought from an outside supplier.
Opportunity cost - Opportunity cost represents the lost contribution to profits arising from the best alternative foregone.
Accept an Order or Reject- When a business is operating at something lower than its normal value, such a special order can prove attractive depending on the effect of incremental revenues and costs on overall profits of the business.
Key Factor/Limiting Factor- The limiting factor decision therefore involves the determination of the contribution earned per unit of limiting factor by each different product.
Replacement Decision - One of the more important decisions involving alternative choices is whether or not to buy new capital equipment.
Alternative Choices- A major part of decision making involves the analysis of a defined set of alternatives against selection criteria.
Expansion of Business- While considering a new plant design or the redesign or expansion of an existing system, a high level decision regarding the production capacity is called for.
Shutdown point- Shutdown point occurs exactly when the marginal profit of the business reaches a negative scale.
Capacity Decisions: While considering a new plant design or the redesign or expansion of an existing system, a high level decision regarding the production capacity is called for.
Alternative Methods of production- The alternative which involves the minimum cost is to be selected as the most economical alternative.
Decision to Drop a Product Line- The firm can consider the economies of dropping the unprofitable products, and adding a more remunerative product(s).
Equipment Replacement - One of the more important decisions involving alternative choices is whether or not to buy new capital equipment.
Product Diversification- to find out whether it is economical and profitable to introduce a new product or not.
Sell or Further Process Decision- management has to decide whether to sell joint products at the split off point or to sell them after further processing.
Evaluation of Capital Expenditure Proposals- relevant cost and revenue is very much considered while making an evaluation of capital expenditure proposal.
Optimal Level of Activity- This deals with the economies of large-scale production and sales.
Temporary Shut Downs- Such a situation is forced on the business because it is expensive in many cases to shut down the business for a short time only.
Additional Shifts- the operation of one or more shifts by a business having only one shift.
Product Mix Decision- Produce the maximum of the item with the highest contribution margin per unit under a particular constraint.

Transfer Pricing 5

This Module includes:

Transfer Pricing

SLOB Mapped against the Module

To attain detailed knowledge of measures to improve divisional performance and appreciate various methods of transfer pricing to ensure goal congruence and profit optimisation at entity level. (CMLO 3c, 4c)

Module Learning Objectives:

After studying this module, the students will be able to

- Gather fundamental knowledge of various methods and techniques of fixation of transfer price.
- Understand how the selection of a particular transfer price impacts the profitability of the entity.
- Appreciate the problem of goal congruence and its impact on divisional performance.
- Note some fundamental aspect of international transfer price.

Concept

5.1

Transfer pricing is concerned with the price one profit centre charges another profit centre within the company for products or services provided. Since the supplying profit center's revenue becomes the receiving profit center's cost, the transfer price chosen can have a significant impact on the evaluation of a profit center's performance.

Transfer pricing technique is a major issue in the current business world. As the scope of business is increasing day by day, it is not possible for upper level managers to manage such a large organisation. Organisations have a system of transfer pricing, therefore, in order to assess the efficiency and effectiveness of its department and divisional managers. This maybe in spite of the fact that transfer prices may be artificial in the sense that it is felt that there is no rationale for "selling" between departments and divisions. So for the purpose of better management and control organisations are divided in to smaller divisions, each having an independent divisional manger. Sometimes, performance of divisional mangers is linked with the profits earned by their respective divisions.

Divisional managers are therefore responsible for all operations (production, sales and so on) relating to their product, the functional structure being applied to each division. It is possible, of course, that only part of a company is divisionalized and activities such as administration are structured centrally on a functional basis with the responsibility of providing services to all divisions.

Transfer pricing plays a very important in international taxation also, as by fixing fair transfer prices one can avoid a lot of tax burden.

In general, a large organisation can be structured in one of two ways: functionally (all activities of a similar type within a company, such as production, sales, research, are under the control of the appropriate departmental head) or divisionally (split into divisions in accordance with the products or services made or provided).

Transfer pricing is a topic that one is need to know from both a theoretical standpoint and a numerical standpoint. The questions may require understanding the issues that a company faces in establishing the transfer price as well as be able to calculate an acceptable transfer price under certain situations.

As the transfer price chosen can impact performance evaluation, it is important that the transfer price is perceived as equitable to all parties involved. When there is a market price for the transferred good or service, market price is the appropriate transfer price. However, transfer pricing is often an issue for intermediate products that have no market value.

When one division of a company sells to another division, both divisions as well as the company as a whole are affected. The price charged for the transferred good affects the costs of the buying division and the revenues of the selling division.

Thus, the profits of both divisions, as well as the evaluation and compensation of their managers, are affected by the transfer price. Since profit-based performance measures of the two divisions are affected (for example, ROI and

Residual Income), transfer pricing can often be a very emotionally charged issue.

Advantages of Transfer Pricing

The main advantages are as follows:

(1) Top managers have more time to devote to general planning since they are not burdened with routine daily decisions.

(2) The decision-making task is distributed among more personnel so that each person has enough time to give matters sufficient attention.

(3) Better control can be achieved, as the manager can move quickly to make needed corrections.

(4) Managers are better motivated, as they have more control over those matters on which their performance is measured.

(5) Managers are more likely to exercise initiative in such matters as "comparison shopping" in order to reduce costs of outside materials. Comparison of internal and external costs tends to keep internal costs, such as transfer pricing of intercompany goods or services, in line.

(6) As managers become more proficient in decision making, they become more qualified for higher management positions.

Disadvantages of Transfer Pricing

The principal disadvantages are as follows:

(1) The extent of authority and responsibility to be decentralized is difficult to determine.

(2) Managers needed to head the decentralized units must be selected and trained, a process that is often time-consuming and expensive.

(3) The varied activities of decentralized units must be coordinated, a difficult task.

(4) Evaluating the performance of the units and the individual managers is often problematic.

Selection of Transfer Price

Any transfer-pricing system should aim to:

- Ensure that resources are allocated in an optimal manner;
- Promote goal congruence;
- Motivate divisional managers;
- Facilitate the assessment of management performance;
- Retain divisional autonomy.

Why do transfer-pricing systems exist?

1. To communicate data that will lead to goal-congruent decisions.
2. To evaluate segment performance and thus motivate managers toward goal congruence decisions.

3. Multinational companies use transfer pricing to minimize their worldwide taxes, duties, and tariffs. Ideally, the chosen transfer-pricing method should lead each sub-unit manager to make optimal decisions for the organisation as a whole.

The three specific criteria that can help in choosing a transfer-pricing method are:

(a) Promotion of Goal Congruence:

Goal congruence exists when each divisional or sub-unit manager acting in his or her own best interest takes actions that automatically result in achieving the organisation goals established by top management.

(b) Promotion of a Sustained High Level of Management Effort:

Effort is defined as exertion towards a goal, for example, sellers are motivated to hold down costs of supplying product or service, and buyers are motivated to acquire and use inputs efficiently. The environment in the organisation should be such that a sustained high level of management effort is promised.

(c) Promotion of a High Level of Subunit Autonomy in Decision-making:

Autonomy is the degree of freedom a division manager can exercise in decisions making. If top management favors a high degree of decentralization, this criterion is of particular importance.

Objectives of Transfer Pricing

A question arises as to how the transfer of goods and services between divisions should be priced. The price charged to the interdivisional transfer of goods and services is revenue to the selling division and cost to the buying division. Therefore, the price charged will affect the profit of both divisions; benefit (revenue) to one division can be created only at the expense of the other division. For example, the selling division will benefit from charging higher prices for such transfers of goods and services. However, for the buying division, this will result into higher costs. The transfer prices, thus, can have impact on the evaluation of each division's performance and measures applied for such measurements of performance.

While determining transfer prices, a number of criteria (objectives) should be fulfilled:

(i) Transfer prices should help in the accurate measurement of divisional performance (profitability).

(ii) Transfer prices should motivate the divisional managers into maximizing the profitability of their divisions and making decisions that are in the best interests of the organizations as a whole.

(iii) Transfer prices should ensure that divisional autonomy and authority is preserved. The main purpose of decentralization is to enable divisional managers to exercise greater autonomy and to measure the overall results achieved on a profit centre or investment centre. It is, therefore, not proper to give divisional managers authority by one hand by placing those in charge of divisional operations and to remove that authority by dictating transfer prices that affect the performance of the division.

(iv) Transfer prices should allow goal congruence to take place, which in effect means that the objectives of divisional managers are compatible with the objectives of overall company.

(v) A transfer pricing system, if properly established, can check multinational companies and international groups which may try to manipulate transfer prices between countries in order to minimize the overall tax burden.

Problems with transfer pricing

1. **Maintaining the right level of divisional autonomy:**

   Transfer prices are particularly appropriate for profit centres because if one profit centre does work for another the size of the transfer price will affect the costs of one profit centre and the revenues of another. However, a danger with profit centre accounting is that the business organisation will divide into a number of self-interested segments, each acting at times against the wishes and interests of other segments. Decisions might be taken by a profit centre manager in the best interests of his own part of the business, but against the best interests of other profit centres and possibly the organisation as a whole.

2. **Ensuring divisional performances are measured fairly:**

   Profit centre managers tend to put their own profit performance above everything else. Since profit centre performance is measured according to the profit they earn, no profit centre will want to do work for another and incur costs without being paid for it. Consequently, profit centre managers are likely to dispute the size of transfer prices with each other, or disagree about whether one profit centre should do work for another or not. Transfer prices affect behaviour and decisions by profit centre managers.

3. **Ensuring corporate profits are maximized:**

   When there are disagreements about how much work should be transferred between divisions, and how many sales the division should make to the external market, there is presumably a profit-maximizing level of output and sales for the organisation as a whole. However, unless each profit centre also maximizes its own profit at this same level of output, there will be inter-divisional disagreements about output levels and the profit-maximizing output will not be achieved.

Methods and Techniques

5.2

Transfer pricing methods may be classfied as under:

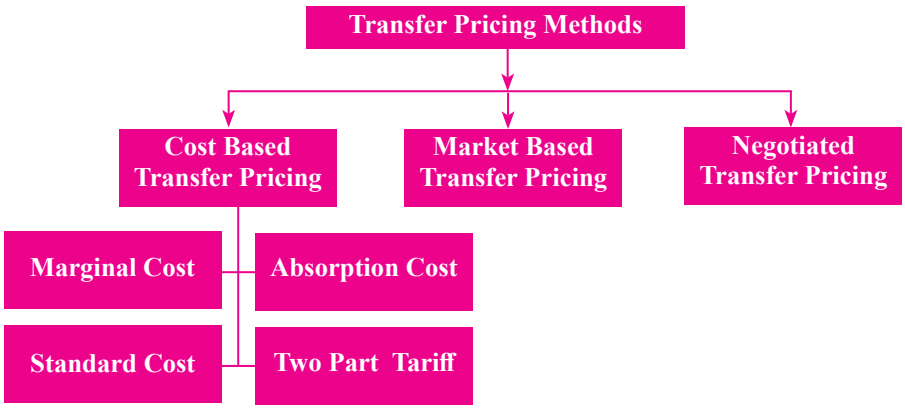


Figure : 5.1 Transfer Pricing Methods

1. Cost-based Prices

Four versions of 'cost' are commonly used, marginal cost, absorption cost, standard cost, and marginal cost plus a fixed charge. Actual costs will vary with volume, seasonal and other factors; furthermore, if actual costs are used as a basis for transfer prices, any inefficiency in the producing department will be passed on in the form of increased cost to the receiving department. The use of standard costs is therefore recommended, so that all of the supplying division's efficiencies and inefficiencies are reflected in its own accounts.

When to use Cost Based Transfer Prices:

- When market prices are unavailable, this is common for intermediate products.
- When the transferring division is treated as a cost centre. In this case, a profit is not necessary, as performance evaluation is based on cost control.

Various types of Cost Based Transfer Pricing System are:

(i) Marginal Cost:

Let us explore the transfer pricing method based on marginal cost, through the following example:

ABC Company Limited has two divisions – X and Y. Division X manufactures advanced computer microchips, and most of its production is taken up by division Y, which assembles computers. Data for division X are:

Standard unit production cost per unit	Amount (₹)	Amount (₹)
Direct materials		35
Direct labour		10
Variable manufacturing overhead		15
(A)		60
Fixed Overhead	20	
Fixed selling and administration	5	
(B)		25
Total cost (A+B)		85
Mark-up: 40%		30
List price to outside buyers		115
Note on Fixed Cost:		
Fixed costs are allocated on the basis of estimated volume Estimated production (units):		
Internal transfers		300
External sales		200
Total production		500

If we assume that variable cost can be used as marginal cost, then the transfer price based thereon would be ₹60. If costs, revenues and volume are as expected, the use of this price will result in a 'loss' for the selling division to ₹1,500, as calculated below:

	Amount (₹)
Internal transfers: 300 @ ₹60	18,000
External sales: 200 @ ₹ 115	23,000
	41,000
Total costs: 500 @ ₹85	42,500
Loss	1,500

However, if no more than the current 200 units could be sold externally, and the capacity represented by the production on chips for internal transfer would otherwise remain idle, there is no opportunity cost associated with a transfer at marginal cost, other things being equal, and division X would be indifferent to the production and transfer.

Obviously, if more than the current 200 units could be sold externally, X 's indifference may change, depending on whether a price in excess of marginal cost is offered. If no excess is offered, X would have a strong disincentive to supply Y.

(ii) Absorption Cost

Let us now proceed with the Absorption cost method, taking into account the previous example:

Using this variant of cost gives a transfer price of ₹70 (variable costs ₹50, fixed manufacturing cost ₹20) and a rather happier income statement:

	Amount (₹)
Internal transfers: 300 @ ₹70	21,000
External sales: 200 @ ₹105	21,000
	42,000
Total costs – as above	(37,500)
Profit	4,500

Although the new transfer price does not generate the same level of profit as a sale of that quantity to an outside party, nevertheless a contribution towards fixed costs is provided thereby, thus modifying the disincentive noted above. However, as the level of the transfer cost is increased, its effect on the buying division, B, could lead to problems of sub-optimization for the firm as a whole. For example, suppose Y could buy the same components from an outside supplier at a cost of ₹65. An internal transfer price of ₹70 would force Y to buy in a product at ₹65 that could be manufactured in-house for a variable cost of ₹ 50. Although the buying division would 'save' ₹5 per chip (₹70 – ₹65), the firm would lose ₹4,500 thereby:

	Amount (₹)
Marginal cost to produce	50
External purchase cost	(65)
Loss, if buy in	(15)
300 units × ₹15 =	4,500

This loss assumes that the opportunity cost of the released capacity is less than 15 per unit. If alternative goods generating more than this could be produced with the spare capacity – if, for example, the marginal 300 units could be sold externally at the list price – then ABC would be optimizing its resources by buying in the components:

	Amount (₹)
List price	115
Marginal cost	(50)
Contribution	65
Loss if buy in	(15)
Incremental profit	50
300 units × ₹50 =	**15,000**

We can see here a clear application of the minimum/maximum rule noted above, the sum of the selling division's marginal cost and the opportunity cost of the resources used (at list price) is ₹115, the minimum transfer price that the selling division could change without making a loss for the firm, which exceeds the ₹65 maximum transfer price dictated by the prevailing market price. ABC should not transfer the components internally as long as the market price is less than ₹115.

(iii) Standard Cost

One of the problems of cost-based systems is that they allow a transferor division to pass on cost inefficiencies to a transferee division. Such inefficiencies can result from anything as simple as high fixed overheads per unit arising from low output levels in the current period, or high unit material costs resulting from machine defects in the current period.

One variant on the absorption cost method is standard cost. Such standards are used irrespective of what actual costs were, with the result that the impact of adverse or favorable cost variances rests with the transferor division. Many business managers would consider that this gives the most equitable distribution of profit.

(iv) Two-part tariff

Under this variant, the selling division transfers at marginal cost (including any opportunity cost), but raises a fixed annual fee on the buying division for the privilege of receiving transfers at that price. The theory underlying this approach is that the buying division will have a correct understanding of the selling division's cost behaviour patterns.

The buying division will be able to correctly identify the appropriate marginal cost when calculating the optimum output level. The fixed fee is designed to cover a share of the selling division's fixed costs and provide a return on the capital employed in it, and thus both selling and buying divisions should be able to record a profit on intra-company transfers.

Drawbacks of this system include:

- The supplying division has no incentive to supply units swiftly, because individual units do not generate a profit.
- A profit is made when the fixed fee is transferred.

Advantages and disadvantages of Cost Based Transfer Pricing:

Advantages:

- Costs are likely available since they will be computed for other purposes.
- For organisations, units that do not control investment or revenues, cost based transfer prices are consistent with the appropriate performance measure for those units.

Disadvantages:

- Using actual costs transfers inefficiencies.
- Can lead to sub-optimal decisions as divisional managers make decisions that are beneficial for their unit, but detrimental to the company as a whole. This is particularly the case in absorption or full cost based transfer prices. Even if there is idle capacity, a manager may refuse a special order if it does not meet the absorption or full cost transfer price. This can result in the buying manager purchasing externally, resulting in lower overall company profit.

2. Market-based Prices

The price of a comparable product or service in the market can be seen as an objective basis for the transfer price between divisions. In most circumstances, where there is a perfectly competitive market for an intermediate product, the current market price is the most suitable basis for setting the transfer price. When transfers are recorded at market prices divisional performance is more likely to represent the real economic contribution of the division to total company profits. If the supplying division did not exist, the intermediate product would have to be purchased on the outside market at the current market price.

Alternatively, if the receiving division did not exist, the intermediate product would have to be sold on the outside market at the current market price. Divisional profits are therefore likely to be similar to the profits that would be calculated if the divisions were separate organisations. Consequently, divisional profitability can be compared directly with the profitability of similar companies operating in the same type of business. It is the price that reflects the autonomous nature of divisionalization, in as much as it simulates the price that would be offered and paid by fully independent entities. If the selling division is operating efficiently relative to its competitors, it would be expected to show a profit at such a price, and, similarly, a market-based price should not cause problems for an efficiently managed buying division, as the only alternative to an internal transfer would be to buy the goods of

services in the open market at that price.

However, it is not always easy to determine the appropriate market price to use:

- A comparable product might not be available in the market.
- Different suppliers will quote different initial prices.
- Different buyers command different discounts and credit terms, depending on the order size and their status.
- Current market prices may reflect temporary aberrations in trading conditions, and thus might not prevail in the longer term.
- An internal transfer of goods may involve savings in advertising, packaging and delivery costs, and thus an external market price would not be entirely appropriate.

When to use Market Based Transfer Prices:

- When a competitive external market for the product exists.
- When managers have the autonomy to purchase externally or internally.
- When transferring and receiving divisions are treated as a profit or investment centre and, therefore, are evaluated on profit based measures, such as ROI or residual income.

Advantages and disadvantages of Market Based Transfer Pricing:

Advantages:

- As the transfer price is based on competitive market conditions, managers are motivated to become more efficient – the market sets the price; therefore, to increase profit, costs must be reduced.
- Easy to use when market prices are readily available.

Disadvantages:

- A market price may not exist for the exact product.
- In some industries, market prices can fluctuate widely creating uncertainties in planning for both the supplying and receiving profit centre managers.

3. Negotiated Transfer Prices

The transfer prices may be determined by various means, including the use of mathematical formulae based on opportunity cost and by determining the correct transfer price to encourage all divisions to operate at the profit-maximizing output level.

Alternatively, transfer prices could be set through a process of negotiation between the buying and selling divisions. It could be argued that this is the correct procedure in a truly autonomous system, with no interference whatsoever from central management or head office. The resulting transfer price should be acceptable to both the buying and selling division since the relevant managers have been directly responsible for the negotiations.

However, there are disadvantages to the use of negotiated transfer prices.

- The negotiations may be protracted and time-consuming.
- The managers may find it impossible to reach agreement. In this case central management may need to intervene. If a transfer price is imposed as a consequence, then this may cause behavioural problems and would negate the objective of giving autonomy to divisions.

- On the other hand, central managers might act simply as arbitrators in any dispute during negotiations, providing a mediation service to assist the negotiations to reach a conclusion that is acceptable to all concerned.
- The managers may not be negotiating from an equal basis. For example, one of the managers may be more experienced than the other with the result that the outcome of negotiations may be unfair. This could lead to poor motivation and consequent behavioural problems.

When to use Negotiated Transfer Pricing:

- When an external market does not exist and market prices are not available.
- When divisions are forced to purchase internally.
- Where there is not an excessive number of transfers subject to negotiation.

Advantages and Disadvantages of Negotiated Transfer Pricing:

Advantages:

- Of all transfer pricing methods, negotiated transfer pricing provides managers with the greatest control over divisional profits.

Disadvantages:

- Negotiations may be time consuming and require a great deal of data, which can be costly to accumulate.
- The bargaining parties may not be able to resolve disputes; to counter this, an organisation needs a mediation or arbitration mechanism.
- Disputes can result in conflict and hostility between divisions.
- Focus is on divisional results, not the company as a whole.

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:**

The dual price method of transfer pricing was introduced in order to overcome the problems caused by using marginal cost, namely poor morale in the selling division, and lack of motivation by the receiving division to maximize the group's profit. The dual pricing method uses two prices:

The supplying division is credited with a price based on total cost plus a mark-up. The receiving division is debited with marginal cost.

(ii) **Two-Part Transfer Pricing System:**

Under this variant, the selling division transfers at marginal cost (including any opportunity cost), but raises a fixed annual fee on the buying division for the privilege of receiving transfers at that price.

Divisional Performance and Problem of Goal Congruence

5.3

Transfer pricing system should accomplish the following objectives:

1. It should motivate the divisional manager to make sound decisions, and it should communicate information that provides a reliable basis for such decisions. This will happen when actions those divisional managers take to improve the reported profit of their divisions also improve the profit of the company as a whole.
2. It should result in a report of divisional profits that is a reasonable measure of the managerial performance of the division.
3. It should ensure that divisional autonomy is not undermined. One of the purposes of is to allow managers to exercise greater autonomy. There is little point in granting additional autonomy and then imposing transfer prices that will affect the profitability of the division.

Each divisional manager wants to increase profits of his respective division. Now a problem arises where output of a particular division can be the input for a particular division, in this situation the problem is to decide proper transfer price as improper price may impact the profitability of both the divisions and give birth to various conflicts. Divisional mangers may not be interested to transfer goods internally; instead they can choose to deal with external parties and may adversely impact the profitability of organisation as a whole. That's why it is very important to decide fair transfer prices.

When goods are transferred from one division to another, a portion of the revenue of the supplying division becomes a portion of the cost of the receiving division. Consequently, the prices at which goods are transferred can influence each division's reported profits, and there is a danger that, an unsound transfer price will result in a misleading performance measure that may cause divisional managers to believe that the transfer price is affecting their performance rating unfairly. This may lead to disagreement and negative motivational consequences.

In some situations, the decision-making and the performance evaluation objectives required for establishing a transfer pricing system may conflict with each other. For example, in some situations the transfer price that motivates the short-run optimal economic decision is marginal cost. If the supplier has excess capacity, this cost will equal variable cost. The supplying division will fail to cover any of its fixed costs when transfers are made at variable cost, and will therefore report a loss. Furthermore, if a transfer price equal to marginal cost is imposed on the manager of the supplying division, the concept of divisional autonomy is undermined. On the other hand, a transfer price that may be satisfactory for evaluating divisional performance may lead divisions to make sub-optimal decisions when viewed from the overall company perspective.

In the absence of a competitive market for the intermediate product, the theoretically correct transfer price can be established only when the information for all the divisions is gathered together to give a composite picture. This is likely to result in staff at the central H.O. gathering together the information and setting the transfer prices.

When transfer prices are set by central H.O., there is a loss of divisional autonomy. It can be argued that if divisions are not free to set their own transfer prices, central headquarters might just as well dictate the types and volumes of products to be transferred instead of dictating the prices at which transfers are to pass between them. However, even though imposed transfer prices from central H.O. are likely to be an infringement of divisional autonomy, they are likely to be less objectionable to divisions than direct interference with production and marketing plans.

Determination of Inter-Departmental or Inter-Company Transfer Price

5.4

Rules for Transfer Pricing:

The limits within which transfer prices should fall are as follows:

- The minimum- the sum of the supplying division's marginal cost and opportunity cost of the item transferred.
- The maximum- the lowest market price at which the receiving division could purchase the goods or services externally, less any internal cost savings in packaging and delivery.

The minimum results from the fact that the supplying division will not agree to transfer if the transfer price is less than the marginal cost + opportunity cost of the item transferred (because if it were the division would incur a loss).

The maximum results from the fact that the receiving division will buy the item at the cheapest price possible.

Example:

Division X produces product L at a marginal cost per unit of ₹100. If a unit is transferred internally to division Y, ₹25 contribution is foregone on an external sale. The item can be purchased externally for ₹150.

- The minimum- Division X will not agree to a transfer price of less than ₹(100 + 25) = ₹125 per unit.
- The maximum- Division Y will not agree to a transfer price in excess of ₹150.

The difference between the two results (₹25) represents the savings from producing internally as opposed to buying externally.

In most cases where the transfer price is at market price, internal transfers should be expected, because the buying division is likely to benefit from a better quality of service, greater flexibility, and dependability of supply. Both divisions may benefit from cheaper costs of administration, selling and transport. A market price as the transfer price would therefore result in decisions which would be in the best interests of the company or group as a whole.

Conclusion:

Since transfer prices are set according to motives other than performance evaluation of divisional managers, the transfer price could result in hostility, a lack of managerial effort towards goals such as profit maximization or goal incongruent decisions. The potential negative consequences are particularly strong if divisional managers are evaluated based on profit performance evaluation measures. To resolve this situation an organisation could use dual transfer prices, one for performance evaluation purposes and one for financial reporting purposes. The result is divisional managers are not penalized for transfer pricing decisions that are beyond their control.

The disadvantage is two sets of records must be kept, which can be time consuming and costly.

International Transfer Pricing

5.5

Globalization and the rapid growth of international trade has made inter-company pricing an everyday necessity for the vast majority of businesses. However, the growth of national treasury deficits and the frequent use of the phrase 'transfer pricing' in the same sentence as 'tax shelters' and 'tax evasion' on the business pages of newspapers around the world have left multinational enterprises at the centre of a storm of controversy. The creation of foreign subsidiaries and bases of operation for cross-border flow of products, services, trademarks, funding and technology is having a significant impact on the issue of transfer pricing in today's international business scenario. The transfer pricing problem for multinationals is of great significance. There are different income tax rates in different countries. So, it becomes desirable from the view point of overall corporate strategy to show higher profits in low-tax countries and lower profits in high-tax countries. One way to do so is through transfer prices.

While domestic transfer pricing is concerned with fairly compensating an internal division for products it has produced and supplied to another division, international transfer pricing is usually set according to another purpose, such as lowering a company's worldwide taxes. For example, a company can choose a transfer price to locate profit in a division in a country with a low corporate tax rate. Transfer pricing guidelines set down by international bodies, such as the, Organisation for Economic Co-operation and Development (OECD), are intended to result in transfer prices that reflect the underlying economic characteristics of the goods or products being transferred. In these settings, the international transfer price is consistent with the objectives of internal transfer pricing. However, if the international transfer price reflects other considerations, such as negotiations between tax authorities about sharing tax revenues, international transfer prices will no longer be consistent with the objectives of internal transfer prices and the resulting profits reported by the profit centres will no longer reflect the principle of controllability.

Factors influencing international transfer pricing decisions:

- tax rates
- income repatriation restriction
- dividend repatriation restrictions
- duties and tariffs
- exposure to foreign exchange rate fluctuations
- political climate
- the need to maintain cash flows in the foreign division
- competitive position of the foreign division
- trade treaties that restrict transfer pricing

There are two basic issues relating to transfer prices in case of multinational companies having divisions in different countries. It is important to note that it is the substance of the situation that always determines whether a transaction has taken place, rather than whether an invoice has been rendered. For instance, management services may be

delivered through the medium of a telephone call between executives of a parent company and its subsidiary. In this example, a service has been performed that the provider had to finance in the form of payroll costs, phone charges, overheads, etc. and the service itself is of value to the recipient in the form of the advice received. As a result, a transaction has taken place for transfer pricing purposes even though, at this stage, no charge has been made for the service. Transfer pricing rules typically require related entities to compensate each other appropriately so as to be commensurate with the value of property transferred or services provided whenever an inter-company transaction takes place. The basis for determining proper compensation is, almost universally, the arm's-length principle.

Simply stated, the arm's-length principle requires that compensation for any intercompany transaction conform to the level that would have applied had the transaction taken place between unrelated parties, all other factors remaining the same.

Although the principle can be simply stated, the actual determination of arm's-length compensation is notoriously difficult. Important factors influencing the determination of arm's-length compensation include the type of transaction under review as well as the economic circumstances surrounding the transaction. In addition to influencing the amount of the compensation, these factors may also influence the form of the payment.

One of the important aspects of management accounting in multinational firm's is that of transfer pricing. Transfer prices may be set with the following objectives in mind:

Minimization of import duties:

If import duties are levied on the price of the import (rather than, say, on its volume-specific composition), then a low transfer price will reduce the import duties of the group as a whole if its goods enter a high-import-duty economy.

Management of direct taxation:

By being aware of the respective government's legislation concerning domestic tax neutrality, withholding taxes the firm may plan effectively to minimize their global tax charge.

Management of indirect taxation:

Most countries have indirect tax regimes involving a value-added tax. This requires that the firm effectively pays the tax on its purchases (input tax) and then recoups the taxes in the price of its sales (output tax). In competitive markets it may be hard to pass on the indirect tax to the price of the good and so its input tax will not be wholly recovered. To avoid this, it may transfer some goods to itself at very low prices which can then be sold on at high prices to recover the indirect tax paid on other lines of product.

Repatriation of profits in kind:

Where a country operates currency controls it may be difficult (or of low worth) for the Multinational enterprise (MNE) to repatriate profits in local currency, yet it is unable to exchange its local currency profits for a world currency. In this situation, the firm seeks to export product (either manufactured by itself or purchased with the local currency) at a low price for sale at home to gain the revenue in its home currency. This can likewise avoid local restrictions on the amount of dividend that can be declared or repatriated.

To win host-country approval:

To avoid accusations of overcharging locals for product or of exporting unfair amounts of value from the country, the MNE may set a transfer price that seems fair to the authorities.

To disguise profitability of a subsidiary:

The MNE may deliberately declare low profits in an operating country to prevent local businesses setting up in competition.

To enable penetration pricing:

The MNE may allow an operating subsidiary to receive inputs at low prices in order that these may be passed on in the local market as low final good prices. This will help the MNE to destroy local competitors without the subsidiary's low profits provoking the authorities to accuse it of tax avoidance.

Solved Illustrations & Cases

Illustration 1

The Production Director of PQ Company is concerned with the problem of measuring the efficiency of process managers. In the production department there are six processes and all products processed pass through a combination of these processes. One specific area of investigation is the measurement of output values which involves the use of transfer prices.

You as a Management Accountant of the Company have been asked by the production director to make a report on advantages and disadvantages of using each of the following systems of transfer pricing as related to process costing:

(i) Variable Cost;

(ii) Actual Full Cost;

(iii) Full Cost Plus Profit Margin;

(iv) Standard cost.

Solution:

The report will cover the following points:

(i) Variable Cost

Variable cost-based pricing approach is useful when the transferor / selling division is operating below capacity. The manager of the transferor division will generally not like this transfer price because it yields no profit to that division. The obvious problem is that selling division is left holding all its fixed costs and operating expenses. The profit center concept will be vitiated.

(ii) Actual Full Cost

When full cost is used for transfer pricing, the transferor division cannot realise a profit on the goods transferred. Further, full cost transfer pricing can provide perverse incentives and distort performance measures.

(iii) Full Cost Plus Profit Margin

With such a system, the transferor division obtains a profit contribution on units transferred and hence, benefits if performance is measured on the basis of divisional operating profits. However, the manager of the buying/ transferee division would naturally object that his costs (and hence reported performance) are adversely affected.

(iv) Standard cost

To promote responsibility in the selling division and to isolate variances within divisions, standard costs are usually used as a basis for transfer pricing in cost-based systems.

Illustration 2

In a meeting with the Director Finance of your company, he had pointed out that there might be some disadvantages in taking divisions as a profit centres. As a Management Accountant of the company you are required to state the various disadvantages in taking divisions as a profit centres.

Solution:

As a Management Accountant, the following points are considered to be of importance:

(i) Divisions may compete with each other and may take decisions to increase profits at the expense of other divisions thereby overemphasizing short term results.

(ii) It may adversely affect co-operation between the divisions and lead to lack of harmony in achieving organizational goals of the company. Thus, it is hard to achieve the objective of goal congruence.

(iii) It may adversely affect co-operation between the divisions and lead to lack of harmony in achieving organizational goals of the company. Thus, it is hard to achieve the objective of goal congruence.

(iv) The cost of activities, which are common to all divisions, may be greater for decentralized structure than centralized structure. It may thus result in duplication of staff activities.

(v) Top management loses control by delegating decision making to divisional managers. There are risks of mistakes committed by the divisional managers, which the top management, may avoid.

(vi) Series of control reports prepared for several departments may not be effective from the point of view of top management.

(viii) It may underutilize corporate competence.

(ix) It leads to complications associated with transfer pricing problems.

(x) It becomes difficult to identity and defines precisely suitable profit centres.

(xi) It confuses division's results with manager's performance.

Illustration 3

BC Company fixes the inter-divisional transfer prices for its products on the basis of cost, plus a return on investment in the division. The Budget for Division for Alpha for the year 2021-22 appears as under:

	₹
Fixed Assets	5,00,000
Current assets	3,00,000
Debtors	2,00,000
Annual Fixed Cost of the Division	8,00,000
Variable Cost per unit of Product	10

Budgeted Volume 4,00,000 units per year

Desired ROI 28% on ₹10,00,000

Determine the transfer Price for Alpha.

Solution:

Computation of the Transfer Price per unit for the Product Alpha

Particulars	₹
Variable Cost per unit of Product	10.00
Annual Fixed Cost per unit (₹8,00,000 ÷ 4,00,000 units)	2.00
Desired Return (@ 28% on ₹10,00,000) ÷ 4,00,000 units)	0.70
Transfer price	12.70

Illustration 4

Aurthor company is a multidivisional company and its managers have been delegated full profit responsibility and autonomy to accept or reject transfers from other divisions.

Division X produces a sub-assembly with a ready competitive market. This sub-assembly is currently used by Division Y for a final product that is sold outside at ₹1,200. Division X Charges Division Y market price for the sub-assembly which is ₹700 per unit. Variable costs are ₹520 and ₹600 for Divisions A and B respectively.

The manager of Division Y feels that Division X should transfer the subassembly, at a lower price than market because at this price, Division Y is unable to make a profit.

Required:

1. Compute Division Y's profit contribution if transfers are made at the market price and also the total contribution to profit for the company.
2. Assume that Division A can sell all its production in the open market. Should Division X transfer goods to Division Y? If so, at what price.
3. Assume that Division X can sell in the open market only 500 units at ₹700 per unit out of 1,000 units that it can produce every month and that a 20 per cent reduction in price is necessary to sell at full capacity. Should transfers be made? If so, how many units should it transfer and at what price? Submit a schedule showing comparisons of contribution margins under three different alternatives to support your decision.

Solution:

Calculation for Division Y's contribution Margin	₹	₹
1. Selling Price of Final Product		1,200
Less: Division Y's variable cost	600	
Division Y's purchase cost	700	1,300
Division Y's loss		(100)
Calculation for Company's contribution Margin		
Selling price of final product		1,200
Less: Division Y's variable cost	600	
Division X's variable cost	520	1,120
Company's Contribution margin		80
2. Selling price of sub-assembly		700
Less: Division X's variable cost		520
Company's contribution margin		180

The company contribution is₹100 greater if the sub-assembly is sold on the intermediate market rather than to Division B. Thus, it should be sold in the intermediate market. The market price would be the appropriate transfer price if transfers were made:

3. Alternative 1: Transfer 1,000 units to Division Y.

   Alternative 2: Sell 500 units in the intermediate market at ₹700 and transfer 500 units to Division Y.

   Alternative 3: Sell 1,000 units on the intermediate market at 20% reduced price.

Alternative 1:	₹
Company sales: (1000 units × ₹1200)	12,00,000
Less: Variable costs (1000 units @ ₹520 + 1,000 units @ ₹600)	11,20,000
Contribution margin	80,000

Alternative 2:	₹
Company sales:	9,50,000
(500 units @ ₹700 + 500 units @ ₹1,200)	
Variable costs: (1000 units @ ₹520 + 500 units @ ₹600)	8,20,000
Contribution margin	1,30,000

Alternative 3:	₹
Company sales:	
1000 units @ ₹560 (700 – 140)	5,60,000
Variable costs: (1000 units @ ₹520)	5,20,000
Contribution Margin	40,000

Conclusion:

Transfers should be made, 500 units should be transferred to Division Y. The transfer price should be set at a price greater than the variable cost of Division X (₹520) and less than the marginal revenue to Division Y (₹ 600). Division Y's marginal revenue will be ₹600 (₹1,200 market price - division Y's own variable cost ₹600).

Illustration 5

The WEBEL Ltd. manufactures and sells television sets. The Assembly Division assembles the television sets. It buys the Picture tubes for the television sets from the Picture tubes Division. The Picture tubes division is operating at capacity. The incremental cost of manufacturing the Picture tube is ₹700 per unit. The Picture tubes Division can sell as many Picture tubes as it wants in the outside market at a price of ₹1,100 per picture tube. If it sells Picture tube in the outside market, the Picture tubes Division will incur variable marketing and distribution costs of ₹40 per unit. Similarly, if the Assembly Division purchases Picture tube from outside suppliers, it will incur variable purchasing costs of ₹20 per screen.

Required:

(i) Using the general guideline on transfer pricing policy what is the minimum transfer price at which the Picture tubes Division will sell Picture tube to the Assembly Division?

(ii) Suppose division managers act autonomously to maximize their own division's operating income, either by transacting internally or buying and selling in the market. If the two division managers were to negotiate a transfer price, what is the range of acceptable transfer prices?

Solution:

(i) If the Picture tubes division sells Picture tube in the outside market, it will receive, for each tube, the market price of the tube minus variable marketing and distribution costs per tube = ₹1,100 – ₹40 = ₹1,060. The

incremental cost of manufacturing each tube is ₹700. The Picture tubes Division is operating at capacity. Hence, the opportunity cost per tube of selling the tube to the Assembly Division rather than in the outside market is the contribution margin, the Picture tubes Division would forego, if it transferred Picture tube internally rather than sold them in the outside market. Contribution margin per tube = ₹1,060 – ₹700 = ₹360.

Minimum transfer price per tube = Incremental costs per tube + Opportunity costs per tube up to the point of transfer to the selling division.

That is, Minimum transfer price per tube = ₹ 700 + ₹360 = ₹1,060

(ii) If the two division managers were to negotiate a transfer price, the range of possible transfer prices is between ₹1,060 and ₹1,120 per tube. As calculated in requirement (i), the Picture tubes Division will be willing to supply Picture tube to the Assembly Division only if the transfer price equals or exceeds ₹1,060 per tube.

If the Assembly Division were to purchase the Picture tube in the outside market, it will incur a cost of ₹1,120, the cost of the tube equal to ₹1,100 plus variable purchasing costs of ₹20 per tube. Hence, the Assembly Division will be willing to buy Picture tube from the Picture tubes Division only if the price does not exceed ₹1,120 per tube. Within the price range of ₹1,060 and ₹1,120 per tube, each division will be willing to transact with the other. The exact transfer price between ₹1,060 and ₹1,120 will depend on the bargaining strengths of the two divisions.

Illustration 6

Division A is a profit centre, which produces four products P, Q, R and S. Each product is sold in the external market also. Data for the period is as follows:

	P	Q	R	S
Market Price per unit (₹)	350	345	280	230
Variable Cost of Production per unit (₹)	330	310	180	185
Labour hours required per unit	3	4	2	3

Product S can be transferred to Division B but the maximum quantity that might be required for transfer is 2,000 units of S.

The maximum sales in the external market are:

P	3,000 units
Q	3,500 units
R	2,800 units
S	1,800 units

Division B can purchase the same product at a slightly cheaper price of ₹ 225 per unit instead of receiving transfers of products S from Division A.

What should be transfer price for each unit for 2,000 units of S, if the total labour hours available in Division A are:

(i) 24,000 hours?

(ii) 32,000 hours?

Solution:

Statement Showing Contribution per unit and per labour hour

Particulars	P	Q	R	S
Selling Price per unit (₹)	350	345	280	230
Variable Cost per unit (₹)	330	310	180	185
Contribution per unit (₹)	20	35	100	45
Labour Hours per unit	3	4	2	3
Contribution per labour hour (₹)	6.67	8.75	50	15
Ranking	IV	III	I	II

Statement Showing Production Plan

Total Hours	Products	Hours/unit	Allocation of Hours
24,000	P	3	-
	Q	4	13,000
	R	2	5,600
	S	3	5,400
			24,000

Statement Showing Transfer Price per unit of the product S

Total labour hours required for S (2000 units × 3 hours per unit)	6,000
Hours diverted from Product Q (1,500 units × 4 hours per unit)	6,000
Variable Manufacturing cost for Product 'S' (2000 × ₹ 185) =	₹ 3,70,000
Contribution foregone/ Opportunity Cost of Product Q (1500 × ₹35)	₹ 52,500
	₹ 4,22,500

(i) Hence, Transfer Price per unit (₹4,22,500 ÷ 2,000 units) = ₹211.25

Statement Showing Production Plan

Total Hours	Products	Hours/unit	Allocation of Hours
32,000	P	3	7,000
	Q	4	14,000
	R	2	5,600
	S	3	5,400
			32,000

Statement Showing Transfer Price per unit of the product S

Total labour hours required for Product S (2000 × 3 hours per unit)	6,000
Hours diverted from Product P (2,000 × 3 hours per unit)	6,000
Variable Manufacturing cost for Product S (2000 × ₹ 185) =	₹ 3,70,000
Contribution foregone /Opposition cost for Product P (2000 × ₹ 20) =	₹ 40,000
	₹ 4,10,000

(ii) Hence, Transfer Price per unit (₹4,10,000 ÷ 2,000 units) = ₹205.00

Illustration 7

A company has two divisions, X and Y. Division X manufactures a component which is used by Division B to produce a finished product. For the next period, output and costs have been budgeted as follows:

Particulars	Division X	Division Y
Component units	50,000	-
Finished units	-	50,000
Total variable costs	₹2,50,000	₹6,00,000
Fixed Costs	₹1,50,000	₹2,00,000

The fixed costs are separable for each division. You are required to advise on the transfer price to be fixed for Division X's component under the following circumstances:

(i) Division X can sell the component in a competitive market for ₹10 per unit. Division B can also purchase the component from the open market at that price.

(ii) As per the situation mentioned in (i) above, and further assume that Division Y currently buys the component from an external supplier at the market price of ₹10 and there is reciprocal agreement between the external supplier and another Division Z, within the same group. Under this agreement, the external supplier agrees to buy one product unit from Division Z at a profit of ₹4 per unit to that division, for every component which Division Y buys from the supplier.

Solution:

(i) Transfer price decisions can be taken on the following basis.

Transfer Price = Marginal Cost + Opportunity Cost i.e. ₹ (5 + 5) = ₹10

Note: Marginal Cost = ₹2,50,000 / 50,000 units = ₹5

Opportunity cost ₹5 is computed on the basis that the Division A will sacrifice ₹ 5 if they sell the product to Division Y.

(ii) In this situation, the transfer price will be worked out as under:

Transfer price = Marginal Cost + Contribution + Profit foregone by Division Z

= ₹(5 + 5 + 4) = ₹14

In situation (ii), if Division Y purchases from Division X, it will not purchase from external supplier.

Hence, the supplier will stop purchasing from Division Z, which will result in a loss of profit to Division Z @₹4 per unit, and therefore this amount will be recovered from the transfer price.

Illustration 8

XYZ Ltd which has a system of assessment of Divisional Performance on the basis of residual income has two Divisions, X and Y. X has annual capacity to manufacture 15,00,000 numbers of a special component that it sells to outside customers, but has idle capacity. The budgeted residual income of Y is ₹ 1,20,00,000 while that of X is ₹1,00,00,000. Other relevant details extracted from the budget of X for the current year were as follows:

Sale (outside customers) 12,00,000 units @ ₹180 per unit

Variable cost per unit₹ 160

Divisional fixed cost ₹ 80,00,000

Capital employed ₹ 7,50,00,000

Cost of Capital 12%

Y has just received a special order for which it requires components similar to the ones made by X. Fully aware of the idle capacity of X, Y has asked X to quote for manufacture and supply of 3,00,000 numbers of the components with a slight modification during final processing. X and Y agree that this will involve an extra variable cost of ₹5 per unit.

You are required to calculate,

(i) The transfer price which X should quote to Y to achieve its budgeted residual income.

(ii) Also indicate the circumstances in which the proposed transfer price may result in a sub-optimal decision for the Company as a whole.

Solution:

(i) **Contribution required at Budgeted Residual Income:**

Fixed cost ₹ 80,00,000

Profit on ₹7,50,00,000 × 12 % = ₹ 90,00,000

Residual Income = ₹ 1,00,00,000

Total Contribution required = ₹ 2,70,00,000

Contribution derived from existing units = 12,00,000 × ₹20 = ₹2,40,00,000

Contribution required on 3,00,000 units = ₹ 2,70,00,000 – ₹ 2,40,00,000 = ₹ 30,00,000

Contribution per unit = ₹ 30,00,000 / 3,00,000 units = ₹10

Increase in Variable Cost = ₹5

∴ Transfer price = Variable Cost + Desired Residual Income + Increase in Variable Cost

= ₹ 160 + ₹ 10 + ₹ 5

= ₹175

Illustration 9

A company has two profit centres, X and Y. X sells half of its output on the open market and transfers the other half to Y. Costs and external revenues in an accounting period are as follows.

	X	Y	Total
	₹	₹	₹
External sales	8,000	24,000	32,000
Costs of production	12,000	10,000	22,000
Company profit			10,000

Required

What are the consequences of setting a transfer price at market value?

Solution:

If the transfer price is at market price, X would be happy to sell the output to Y for ₹ 8,000

	X	Y	Total
	(₹)	(₹)	(₹)
External Sales	8,000	24,000	32,000
Transfer sales	8,000	–	–
Transfer costs		8,000	–
Own costs	12,000	10,000	22,000
Profit	4,000	6,000	10,000

The transfer sales of X are self-cancelling with the transfer cost of Y, so that the total profits are unaffected by the transfer items. The transfer price simply spreads the total profit between X and Y.

Consequences:

(i) A earns the same profit on transfers as on external sales. Y must pay a commercial price for transferred goods, and both divisions will have their profit measured in a fair way.

(ii) A will be indifferent about selling externally or transferring goods to Y because the profit is the same on both types of transaction. B can therefore ask for and obtain as many units as it wants from X.

X division's market-based transfer price therefore seems to be the ideal transfer price.

Illustration 10

Mineral Ltd. has two profit centres, A and B. A transfers all its output to B. The variable cost of output from A is ₹5 a unit, and fixed costs are ₹ 1,200 a month. Additional processing costs in B are ₹ 4 a unit for variable costs, plus fixed costs of ₹ 800 a month. Budgeted production is 400 units a month, and the output of B sells for ₹15 per unit.

Required

Determine the range of prices for which the transfer price (based on standard full cost plus) should be selected, in order to motivate the managers of both profit centres to both increase output and reduce costs.

Solution:

Any transfer price based on standard cost plus will motivate managers to cut costs, because favourable variances between standard costs and actual costs will be credited to the division's profits. Managers of each division will also be willing to increase output (above the budget) provided that it is profitable to do so.

(a) The manager of A will increase output if the transfer price exceeds the variable cost of ₹ 5 a unit.

(b) The manager of B will increase output if the transfer price is less than the difference between the fixed selling price (₹ 15) and the variable costs in B itself. This amount of ₹ 11 (₹ 15 – ₹ 4) is sometimes called net marginal revenue.

The range of prices is therefore between ₹ 5.01 and ₹ 10.99.

Illustration 11

The Domino Company has two decentralized divisions, A and B. Division A has always purchased certain units from Division B at ₹ 75 per unit, because Division B plans to raise the price to ₹100 per unit, Division A desires to purchase these units from outside suppliers for ₹ 75 per unit. Division B's costs follow:

Division B's variable costs per unit ₹ 70

Division B's annual fixed costs ₹ 15,000

Division A's purchase 1,000 units

If Division A buys from an outside supplier, the facilities Division B uses to manufacture these units will remain idle. Would it be more profitable for the company to enforce the ₹ 100 transfer price than to allow Division A to buy from outside suppliers at ₹ 75 per unit?

Solution:

Total purchase costs ₹ 75,000

Total outlay costs if purchased inside ₹ 70,000

Net advantage to the company as a whole ₹ 5,000

Therefore, it would be more profitable for the company to enforce the ₹ 100 transfer price.

Alternatively,

Division A's Action

	Buy Inside	Buy Outside
Total purchase costs	-	₹75,000
Total outlay costs	₹ 70,000	-
Net cash outflow to the company as a whole	₹70,000	₹ 75,000

Illustration 12

The A division of G Corporation, operating at capacity, has been asked by the D division of G to supply it with electrical fitting no. 26. A sells this part to its regular customers for ₹ 7.50 each. D which is operating at 50 percent capacity is willing to pay ₹ 5 each for the fitting. D will put the fitting into a brake unit that it is manufacturing on essentially a cost-plus basis for a commercial airplane manufacturer.

A has a variable cost of producing fitting no. 26 of ₹ 4.25. The cost of the brake unit as being built by D follows:

Purchased parts (outside vendors)	₹ 22.50
A's fitting no. 26	₹ 5.00
Other variable costs	₹ 14.00
Fixed overhead and administration	₹ 8.00
	₹ 49.50

D believes the price concession is necessary to get the job.

The company uses return on investment and profits in the measurement of division and division manager's performance.

1. Assume that you are the division controller of A. Would you recommend that A supply fitting no. 26 to D? Why or why not? (Ignore any tax issues.)
2. Would it be to the short-run economic advantage of the G Corporation for the A division to supply the D division with fitting no. 26 at ₹5 each? (Ignore any tax issues.)
3. Discuss the organizational and manager-behavior difficulties, if any, inherent in this situation.

As the G's controller, what would you advise the G Corporation president do in this situation?

Solution:

1. The division controller should not recommend that A supply D with fitting no. 26 for the ₹5.00 per unit price. A is operating at capacity and would lose ₹2.50 (₹7.50 - ₹5.00) for each fitting sold to D. The management performance of A is measured by return on investment and profits; selling to D ₹5.00 per unit would adversely affect those performance measures.
2. G would be ₹5.50 better off, in the short run, if A supplied D the fitting for ₹5.00 and the brake unit was sold for ₹49.50. Assuming the ₹8.00 per unit for fixed overhead and administration represents an allocation of cost D incurs regardless of the brake unit order, G would lose ₹2.50 in cash flow for each fitting sold to D but gain ₹8.00 from each brake unit sold by D.
3. In the short run there is an advantage to the company as a whole of transferring the fitting at the ₹ 5.00 prices and thus selling the brake unit for ₹49.50. In order to make this happen, G will have to overrule the decision of the A's management.

This action would be counter to the purposes of decentralized decision making. If such action were necessary on a regular basis, the decentralized decision making inherent in the divisionalized organisation would be a sham. Then the organisation structure is inappropriate for the situation.

On the other hand, if this is an occurrence of relative infrequency, the intervention of corporate management will not indicate inadequate organisation structure. It may, however, create problems with division managements. In the case at hand, if G' s management requires that the fitting be transferred at ₹5.00, the result will be to enhance D's operating results at the expense of A. This certainly is not in keeping with the concept that a manager's performance should be measured on the results achieved by the decisions he or she controls.

In this case, it appears that A and D serve different markets and do not represent closely related operating units. A operates at capacity, D does not; no mention is made of any other inter-divisional business. Therefore, the G controller should recommend that each division be free to act in accordance with its best interests. The company is better served in the long run if A is permitted to continue dealing with its regular customers at the market price of ₹7.50. If D is having difficulties, the solution does not lie with temporary help at the expense of another division, but with a more substantive and long-term course of action.

Illustration 13

Mother Co. Ltd has two business units, viz. X unit engaged into telemarketing, and Y unit focusing on business analytics. Recently the CEO was reviewing the half yearly financial data which had the following key indices:

Turnover of X unit at 90% capacity utilization ₹250 Lakhs. Turnover of Y unit at 60% capacity utilization ₹550 Lakhs. Profit Margin of X and Y units respectively 18 % and 15 % respectively

Present number of shared employees from the X unit to the Y unit on requirement basis 10 employees. Number of hours required on cross training of one employee and the rate per hour Approx. 10 hours at ₹3,000 per hour.

The CEO's next half year overall target for the company is ₹1,200 Lakhs with a profit margin of 18% for the company as a whole. However, the X unit head has told categorically to the CEO that he cannot spare any additional employee as the X is working at optimum capacity. The Y unit head, on the other hand, finds it cost effective to cross train employees of the X for specific tasks instead of hiring directly from the market.

Required

(i) Analyze the strategic problem that Mother Co Ltd is facing.

(ii) List few suggestions in brief.

Solution:

(i) The present position of the units and the overall company is as under:

	X	Y	Combined
Turnover (in ₹ Lakhs)	250	550	800
Capacity	90%	60%	67%
Turnover at full capacity (in ₹ Lakhs)	278	916	1,194
Profit Margin	18%	15%	16%
Present Profit (in ₹ Lakhs)	45	83	128
Profit at full capacity (in ₹ Lakhs)	50	138	188

In Mother Co. Ltd., both unit heads are focusing only on their respective unit performances rather than strategizing on the company's performance growth as a whole.

Calculations revealed that the X unit is a low margin high manpower-oriented unit as its overall contribution is just 35% share of the overall company, whereas the Y is a high margin low manpower-oriented unit as its share is 65%.

It is clear that the strategic problem being faced by Mother Co. Ltd is concerned with divisional performance measures in terms of goal congruence. The CEO's target for the next half yearly is really ambitious, and this can be achieved only if goal congruence is met by the heads of both units.

(ii) Few brief suggestions are given below:

- Overall revenue target of 1,200 thousand to be achieved by cranking up the utilization for each division at 100% (still there will be a gap of ₹ 6 thousand).
- Company's profit margin of 16% calculated at full capacity, to be increased by 2% through means of cost cutting techniques.
- Cross training can be helpful in proper utilization of work force.
- The Y should focus on further cost reduction and improve its % of profit margin.

Illustration 14

Simens Ltd. has two Divisions A and B with profit centre concept. The Division A produces Component 'Alpha' which it sells to 'outside' customers only. The Division B produces a product called the Beta which incorporates Component 'Alpha' in its design.

B Division is currently purchasing required units of Component 'Alpha' per year from an outside supplier at market price.

New Director of Cost has analyzed that A Division has enough capacity to meet entire requirements of Division B and accordingly he requires internal transfer between the divisions at marginal cost from the overall company's perspective.

Manager of Division A claims that transfer at marginal cost are unsuitable for performance evaluation since they don't provide an incentive to the division to transfer goods internally. He has given preference on a transfer price based on Cost-plus-mark up.

New Cost Director having opinion that transfer price suggested by the manager of Division A will not induce managers of both the Divisions to arrive at optimum plan.

You are the Management Accountant of the Company and are requested to help him to solve the problem.

Solution:

Marginal Cost based price is not acceptable to the Manager of Division A. Hence, as a Management Accountant of the Company the following alternatives are suggested:

1. Dual-Rate Transfer Pricing System:

Dual-rate transfer pricing uses two separate transfer prices to price each inter-divisional transaction.

For example, the supplying division may receive the full cost plus a mark-up on each transaction and the receiving division may be charged at the marginal (variable) cost of the transfers. The former transfer price is intended to approximate the market price of the goods or services transferred.

2. Two-part transfer pricing system:

A solution that has been proposed where the market for the intermediate product is imperfect or non-existent, and where the supplying division has no capacity constraints, is to price all transfers at the short run marginal cost (assumed to be equivalent to variable cost per unit of output) and for the supplying division to also charge the receiving division a fixed fee for the privilege of obtaining these transfers at short-run variable cost. This approach is sometimes described as a two-part transfer pricing system.

With this system, the receiving division acquires additional units of the intermediate product at the variable cost of production. Therefore, when it equates its marginal (variable) costs with its net marginal revenues to determine the optimum profit-maximizing output level, it will use the appropriate variable costs of the supplying division. The supplying division can recover its fixed costs and earn a profit on the inter-divisional transfers through the fixed fee charged each period. The fixed fee is intended to compensate the supplying division for tying up some of its fixed capacity for providing products or services that are transferred internally. The fixed fee should cover a share of fixed costs of the supplying division and also provide a return on capital.

Illustration 15

AB Ltd has two Operating Divisions – A and B. A manufactures the Unit (marginal cost ₹5, market selling price ₹ 10), while B manufactures the Product (each requiring 1 Unit, a marginal cost of ₹3 and a market selling price of ₹12). In the absence of any considerations, other than those stated, is the manufacture of the Product to the advantage of AB Ltd and will a transfer pricing system, based on market price, induce the manager of B to manufacture the Product?

Solution:

The manufacture of the Product incurs a total marginal cost of ₹ 8 to AB Ltd and generates sales revenue of ₹12.

Clearly, it is to the advantage of AB Ltd to manufacture and sell the Product.

However, if units are transferred from A to B at the market price of ₹10, then the manager of B might reject product manufacture, on the ground that each product gives division B a loss of ₹1 i.e.,₹12 sales revenue less the ₹13 marginal cost to the division (₹10 transfer price + ₹3 marginal cost).

EXERCISE

Theoretical Questions

⊙ Multiple Choice Questions

1. Which one of the following is not considered as a method of Transfer Pricing?

   A Negotiated Transfer Pricing

   B Market Price Based Transfer Pricing

   C Fixed Cost Based Transfer Pricing

   D Opportunity Cost Based Transfer Pricing

2. Method of pricing, when two separate pricing methods are used to price transfer of products from one subunit to another, is called:

   A Dual pricing

   B Functional pricing

   C Congruent pricing

   D Optimal pricing

3. The Eastern division sells goods internally to the Western division of the same company. The quoted external price in industry publications from a supplier near Eastern is ₹200 per ton plus transportation. It costs ₹ 20 per ton to transport the goods to Western. Eastern's actual market cost per ton to buy the direct materials to make the transferred product is ₹100. Actual per ton direct labour is ₹50. Other actual costs of storage and handling are₹ 40. The company president selects a ₹220 transfer price. This is an example of:

   A Negotiated transfer pricing.

   B Cost plus 20% transfer pricing.

   C Cost-based transfer pricing.

   D Market-based transfer pricing.

4. Division P transfers its output to Division Q at variable cost. Once a year P charges a fixed fee to Q, representing an allowance for P's fixed costs. This type of transfer pricing system is commonly known as:

   A Dual pricing

   B Negotiated transfer pricing

   C Opportunity cost based transfer pricing

   D Two-part tariff transfer pricing

5. In which of the following circumstances is there a strong argument that profit centre accounting is a waste of time?

   A When the transferred item is also sold on an external market

   B When the supplying division is based in a different country to head office

C. If the transferred item is a major product of the supplying division

D. If there is no similar product sold on an external market and the transferred item is a major product of the supplying division

6. Popular method of transfer pricing is the _____.

A. Opportunity cost pricing

B. Negotiated pricing

C. Market based pricing

D. Cost based pricing

7. Division under transfer pricing system is treated as …….

A. Profit centre

B. System centre

C. Investment centre

D. Cost centre

8. Which of the following is/are not method of transfer pricing?

A. Total cost method

B. Marginal cost method

C. Market price method

D. Skimming price method

Answers:

1-C, 2-A, 3-D, 4-D, 5-D, 6-C, 7- A, 8- D.

⊙ State True or False

1. Transfer pricing technique is a major issue in the current business world.
2. Transfer pricing plays a very important in international taxation also, as by fixing fair transfer prices one can avoid a lot of tax burden.
3. Transfer prices should not help in the accurate measurement of divisional performance (profitability).
4. Profit centre managers tend to put their own profit performance above everything else.
5. The price of a comparable product or service in the market can be seen as an objective basis for the transfer price between divisions.
6. Globalization and the rapid growth of international trade has made inter-company pricing an everyday necessity for the vast majority of businesses.
7. There are two basic issues relating to transfer prices in case of multinational companies having divisions in different countries.
8. Cross training cannot be helpful in proper utilization of work force.
9. A Profit Centre is a company's department that is responsible for the profits of the company.
10. Divisional Autonomy is the degree of freedom a division manager can exercise in decisions making.

Answers:

1- True, 2- True, 3- False, 4- True, 5- True, 6- True, 7-True, 8-False, 9- True, 10-True.

Fill in the Blanks

1. Many firms use ……. negotiated transfer prices even though they do not lead to optimal results for individual products.
2. Transfer Pricing is not considered as a method of Transfer Pricing
3. There are different ……. rates in different countries.
4. In the absence of a ……. for the intermediate product, the theoretically correct transfer price can be established.
5. While ……transfer pricing is concerned with fairly compensating an internal division for products it has produced and supplied to another division, ……. transfer pricing is usually set according to another purpose, such as lowering a company's worldwide taxes.
6. The ……principle requires that compensation for any intercompany transaction conform to the level that would have applied had the transaction taken place between unrelated parties, all other factors remaining the same.
7. The ……. may deliberately declare low profits in an operating country to prevent local businesses setting up in competition.
8. ……. are therefore responsible for all operations (production, sales and so on) relating to their product, the functional structure being applied to each division.
9. ……is a topic that one is need to know from both a theoretical standpoint and a numerical standpoint.
10. As managers become more proficient in…… they become more qualified for higher management positions.
11. Market value as a transfer price has certain disadvantages:

    (A) The market price might be ……., induced by adverse economic conditions, say.

    (B) There might be an ……. external market, so that if the transferring division tried to sell more externally, it would have to reduce its selling price.

    (C) Many products do not have …….
12. Transfer prices based on full cost are appropriate if top management treats the divisions like.....
13. Many firms base transfer prices on..... since they are easy to understand and convenient to use.
14. When ..... is used to measure divisional performance, the objective is to maximize the total amount of ..... not to maximize the overall ..... figure.
15. A ..... transfer price is one agreed upon between the buying and selling divisions that reflects unusual or mitigating circumstances.
16. If the selling division has, ... a transfer price based on ..... would be an appropriate transfer price, although it would hurt the performance of the selling division.

Answers:

1- Cost plus, 2- Fixed Cost Based, 3- Income tax, 4- Competitive market, 5- Domestic, International, 6- arm's-length, 7- MNE, 8- Divisional managers, 9- Transfer pricing, 10- Decision making, 11- (A) temporary, (B) imperfect, (C) an equivalent market price, 12- cost centers, 13- cost, 14- RI, residual income, profit, 15-negotiated, 16-excess capacity, variable cost.

Short Essay type Questions

1. Explain the opportunity cost approach to transfer pricing.
2. When is the negotiated pricing preferred over the market price approach in setting transfer prices?
3. Why are market based transfer prices considered optimal under many circumstances?
4. Why do companies often use prices other than market prices for interdivisional transfers?
5. What properties should transfer pricing policies have?
6. Under what conditions is a market-based transfer price optimal?
7. Write a note on transfer pricing in multinational companies.
8. Write explanatory notes on 'Cost-based and market-based transfer prices'.
9. What are the objectives of transfer pricing? Under what conditions are market-based prices and negotiated prices optimal?
10. What are the advantages and disadvantages of top management's direct intervention in a transfer pricing dispute?
11. What is the general transfer-pricing rule?
12. What are the limitations to market based transfer prices?
13. Discuss the advantages and disadvantages of negotiated transfer prices.
14. When using the negotiated price approach to transfer pricing, within what range should the transfer price be established?
15. What are some goals of a transfer pricing system in a decentralized organization?

Essay Type Questions

1. What is a transfer price? Under what conditions are transfer prices necessary?

   (i) Market prices (ii) Full Cost (iii) Full cost plus mark up (iv) Opportunity Cost (v) Negotiated price
2. Explain a dual transfer price. What are the advantages and disadvantages of using such a pricing system?
3. What is the disadvantage of negotiated transfer prices when no intermediate market exists for the producing division?
4. Identify three cost based transfer prices. What are the disadvantages of cost-based transfer prices? When might it be appropriate to use cost-based transfer prices?
5. Division A has no external markets. It produces a product that is used by Division B. Division B cannot purchase this product from any other source. What transfer pricing system would you recommend for the inter-divisional sale of the product? Why?
6. "Under the general guidelines for transfer pricing, the minimum transfer price will vary depending on whether the supplying division has idle capacity or not." Do you agree? Explain.
7. What are the objectives of transfer pricing? What are the requisites of a sound transfer pricing system?

8. Discuss the essential guidelines for the success of transfer pricing system.
9. Explain the effect of import duties, or tariffs, on the transfer-pricing policies of multinational companies.
10. Many firms use cost plus negotiated transfer prices even though they do not lead to optimal results for individual products. Why?
11. "In setting transfer prices for multinational companies, tax considerations can be the tail that wags the dog." Explain.
12. "Variable-cost transfer prices ensure that we make no dysfunctional decisions". Comment.
13. What are the objectives of sound transfer pricing system? How do market based prices and negotiated prices help in achieving these objectives?
14. "Transfer pricing is confined to profit centres." Do you agree? Explain.
15. "An action that is optimal for a division may not be optimal for the company as a whole." Explain.
16. When is the negotiated price approach preferred over the market price approach in setting transfer prices?
17. Why would standard cost be a more appropriate transfer price between cost centers than actual cost?
18. Using the criteria for evaluating transfer prices, evaluate each of the following transfer prices.
19. How does the choice of a transfer price affect the operating profits of both divisions involved in an intercompany transfer?
20. Why might income tax laws affect the transfer pricing policies of multinational companies?

Practical Problems

⊙ Multiple Choice Questions

1. M Group has two divisions, Division P and Division Q. Division P manufactures an item that is transferred to Division Q. The item has no external market and 6,000 units produced are transferred internally each year. The costs of each division are as follows?

	Division P	Division Q
Variable Cost	₹ 100 per unit	120 per unit
Fixed cost each year	₹1,20,000	90,000

Head Office management decided that a transfer price should be set that provides a profit of₹ 30,000 to Division P. What should be the transfer price per unit?

A. ₹ 145

B. ₹ 125

C ₹ 120

D ₹ 135

2. Minimax Ltd. fixes inter - divisional transfer prices for its products on the basis of cost plus a return on investment in the division. The budget for division X for 2022 – 23 appears as under -

	₹
Fixed Assets	8,00,000
Current Assets	5,00,000
Debtors	2,00,000
Annual fixed cost of the division	8,00,000
Variable cost per unit of the product	10

Budgeted volume 4,00,000 units per year

Desired ROI 28%

Transfer price for division X is

(A) ₹ 13.05

(B) ₹ 10.70

(C) ₹ 8.70

(D) ₹ 14.70

Answers:

1-B, 2-A

⊙ Comprehensive Numerical Questions

1. M/s. Bright Star has two divisions Bright and Star. Bright 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	20,0000
800	30,000
700	40,000
600	50,000
500	60,000

The cost of each division are as follows:

	Bright	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 maximizes profit for the Bright 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 maximize the Company's profit under a divisional organisation.

2. The following information is available:

	Division A	Division B
	₹ per unit	₹ per unit
Variable cost	10	15
Transfer price at market value	-	20
Fixed costs	5	10
Profit	5	25
Transfer price/selling price	20	70

Division A can sell externally ₹20 per unit or transfer internally to Division B at ₹20 per unit. Division B receives an offer from a customer of ₹30 per unit for its final product.

Requirements

(a) Would Division B accept the offer of ₹30 per unit given the existing transfer price?

(b) Is this the correct decision from the company's point of view?

(i) Division A has surplus capacity?

(ii) Division A is operating at full capacity?

Give proper explanations.

3. Division M is a profit centre, which produces four products A, B, C and D. Each product is sold in the external market also. Data for the period as follows:

		A	B	C	D
Market Price per unit	(₹)	150	146	140	130
Variable Cost of Production per unit	(₹)	130	100	90	85
Labour Hours Required per unit		3	4	2	3

Production D can be transferred to division Y, but the maximum quantity that might be required for transfer is 2500 units of D.

The maximum sales in the external market are:

A = 2,800 units

B = 2,500 units

C = 2,300 units

D = 1,600 units

Division Y can purchase the same product at a slightly cheaper price of ₹ 125 per unit instead of receiving

transfers of product D from division M.

What should be the transfer price for each unit for 2500 units of D, if the total labour hours available in division M are:

(i) 20000 hours?

(ii) 30000 hours?

4. X Ltd. a manufacturing company has two divisions: Division A and Division B. Division A produces one type of product X which it transfers to Division B and also sells externally. Division B has been approached by another company which has offered to supply 2500 units of Product X for ₹ 35 each.

The following details for Division A are available:

	Amount (₹)
Sales revenue:	
Sales to Division B @ ₹ 40 per unit	4,00,000
External sales @ ₹ 45 per unit	2,70,000
Less:	
Variable cost @ ₹ 22 per unit	3,52,000
Fixed costs	1,00,000
Profit	2,18,000

If Division B decides to buy from the other company, what will be the impact of the decision on the profits of Division A and X Ltd. assuming external sales of Product X cannot be increased.

5. Division A transfers 1,00,000 units of a component to Division B each year. The market price of the component is ₹25. Division A's variable cost is ₹15 per unit. Division A's fixed costs are ₹5,00,000 each year.

What price would be credited to Division A for each component that it transfers to Division B under:

(i) Dual pricing (based on marginal cost and market price)?

(ii) Two-part tariff pricing (where the Divisions have agreed that the fixed fee will be ₹2,00,000)?

6. M Ltd has been offered supplies of special ingredient B at a transfer price of ₹15 per kg by H Ltd which is part of the same group of companies. H Ltd processes and sells special ingredient Z to customers external to the group at ₹15 per kg. H Ltd bases its transfer price on cost plus 25 per cent profit mark-up. Total cost has been estimated as 75 per cent variable and 25 per cent fixed.

Required:

Discuss the transfer prices at which H Ltd should offer to transfer special ingredient B to M Ltd in order that group profit maximizing decisions may be taken on financial grounds in each of the following situations:

(i) H Ltd has an external market for all of its production of special ingredient B at a selling price of ₹15 per kg. Internal transfers to M Ltd would enable ₹1.50 per kg of variable packing cost to be avoided.

(ii) Conditions are as per (i) but H Ltd has production capacity for 3000 kg of special ingredient B for which no external market is available.

7. The AB group comprises two divisions – A and B. Each divisional manager is paid a salary and bonus linked to divisional profit. A produces the X and B produces the Y. There is a 'perfect' outside market for the X with a going market price of ₹ 20 over which A has no influence. One unit of the X is incorporated in each unit of the Y.

The marginal cost of an X is ₹ 10 and the marginal cost of a Y (excluding the cost of the component X) is ₹10.

At unit selling price ₹ 50 no Y are sold but demand for Y rises by 100 units per period with each ₹ 5 reduction in the unit selling price.

Required:

(a) Assuming that there is no production constraint in division A, tabulate the contribution generated by AB Ltd. from sales of Y ranging from nil to 500 units per period in 100- unit increments. Use this tabulation to identify the optimum unit selling price and output of the Y.

(b) Tabulate the contribution generated by division Y from sales of Y ranging from nil to 500 units per period at 100-unit increments with the X being transferred from A to B at market price. Use this tabulation to identify the unit selling price and output of the Y that is likely to be induced if X is transferred from A to B at market price.

8. Assume that Division X, which is part of the XYZ group, manufactures a single product A. Division X's maximum capacity is 4,50,000 units a year. It sells 4,20,000 units to external customers at a price of ₹75.95 a unit. This gives Division A, a contribution of ₹30.50 a unit.

Division Y is also part of the XYZ group but is situated in a different place to Division X. Division Y purchases 1,20,000 units of product A, each year from a local company Z (which is not part of the group) at a local currency price which is equivalent to ₹65.33 a unit.

It has been suggested that, in the interests of maximizing the group's profit, Division Y should purchase A from Division X. As there are no marketing costs involved when transferring goods to Division Y, Division X would set the transfer price for an A at ₹ 69.60.

This would give Division X the same contribution as an external sale, i.e.₹30.50 per unit. Division X would give Division Y's orders priority and so some external customer orders could no longer be met.

Requirements

Should Division Y continue to purchase from company Z or switch to Division X in order to maximize the group's profit if:

(a) The tax rate in the country in which Division X operates is 25 per cent and the tax rate in Division Y's country is 30 per cent;

(b) The tax rate in the country in which Division X operates is 40 per cent and the tax rate in Division Y's country is 20 per cent?

(Assume that changes in the contribution can be used as a basis for calculating changes in tax charges and that Division Y generates sufficient profit from other activities to absorb any tax benefits).

9. Division A has costs of ₹15 p.u., and transfer goods to Division B which has additional costs of ₹5 p.u. Division B sells externally at ₹ 30 p.u.

The company has a policy of setting transfer prices at Cost + 20%.

Calculate:

(a) The transfer price

(b) The profit made by the company overall

(c) The profit reported by each division separately

10. Division A has costs of ₹20 p.u., and transfer goods to Division B which has additional costs of ₹8 p.u. Division B sells externally at ₹30 p.u.

The company has a policy of setting transfer prices at Cost + 20%.

Calculate:

(a) The transfer price

(b) The profit made by the company overall

(c) The profit reported by each division separately

Determine the decisions that will be made by the managers and comment on whether or not goal congruent decisions will be made.

11. The materials used by the X Division of XYZ Company are currently purchased from outside suppliers at ₹40 per unit. These same materials are produced by XYZ's Y Division. The Y Division can produce the materials needed by the X Division at a variable cost of ₹28 per unit. The division is currently producing 80,000 units and has capacity of 1,00,000 units. The two divisions have recently negotiated a transfer price of ₹35 per unit for 20,000 units. By how much will each division's income increase as result of this transfer?

⊙ Unsolved Cases

1. The Finance Director of Hind & Co. is currently overloaded with work due to changes in financial accounting policies that are being considered at board level. As a result, he has been unable to look at certain management accounting aspects of the business and has asked you to do a review of the transfer pricing policy between the components and assembly divisions.

As a Cost Management Accountant of the Company you are required to express your views.

2. From an organizational point of view, two approaches to transfer pricing are (a) to let the managers of profit centers bargain with one another and arrive at their own transfer prices (negotiated transfer pricing) and (b) to have the firm's top management set transfer prices for transactions between the investment centers. Identify the advantages and disadvantages of each approach.

Key Terms

Transfer pricing: Transfer pricing is concerned with the price one profit centre charges another profit centre within the company for products or services provided.

Cost-based transfer price: Four versions of 'cost' are commonly used marginal cost, absorption cost, standard cost, and marginal cost plus a fixed charge.

Decentralized organisation: A company with a decentralized organizational structure is one where mid- and lower-level managers make most of the decisions, rather than the senior management team.

Divisional Autonomy: Divisional Autonomy is the degree of freedom a division manager can exercise in decisions making

Dual-rate Transfer Pricing: Dual-rate transfer pricing uses two separate transfer prices to price each inter-divisional transaction.

Goal Congruence: The transfer price will achieve this if the decisions which maximize divisional profit also happen to maximize group profit – this is known as goal congruence.

International Transfer Pricing: International Transfer pricing refers to the pricing strategy in play when there is transfer of goods/ services between associated enterprises, in International Transactions.

Market based Transfer Price: The price of a comparable product or service in the market can be seen as an objective basis for the transfer price between divisions.

Negotiated Transfer Price: Transfer Price could be set through a process of negotiation between the buying and selling divisions.

Opportunity Cost approach to Transfer Pricing: It represents the opportunity which has been foregone by following one course of action rather than another. Thus, if goods are transferred internally the organisation could lose a contribution to profit which could have been obtained from an external sale. Generally, an opportunity cost approach will be used to establish a range of transfer prices in situations where the market is imperfect

Operating Profits: A Company's operating profit is its total earnings from its core business functions for a given period, excluding the deduction of interest and taxes.

Profit Centre: A Profit Centre is a company's department that is responsible for the profits of the company.

Two-part transfer Pricing System: Under this variant, the selling division transfers at marginal cost (including any opportunity cost), but raises a fixed annual fee on the buying division for the privilege of receiving transfers at that price.

SECTION - D

STANDARD COSTING AND VARIANCE ANALYSIS

Standard Costing and Variance Analysis

6

This Module includes:

Standard Costing and Variance Analysis

SLOB Mapped against the Module

To gather in-depth knowledge of techniques and tools for profit planning, variance analyses, optimal utilization of resources and responsibility accounting. (CMLO 3b, 5a, 5b).

Module Learning Objectives:

After studying this module, the students will be able to

- Understand the fundamental aspect of standard cost and standard costing.
- Acquire in-depth knowledge of various cost variances and sales variances.
- Create understanding of the inferences that can be drawn from the variance analysis and its impact on profitability of the entity.

Introduction

6

The most important objective of cost accounting is effective cost ascertainment and cost control. Historical Costing is not an effective method of exercising cost control because it is not applied according to a planned course of action and also it does not provide any yardstick that can be used for evaluating actual performance. Based on the limitations of historical costing it is essential to know before production begins what the cost should be so that exact reasons for failure to achieve the target can be identified and the responsibility are fixed. For such an approach to the identification of reasons to evaluate the performance, suitable measures may be suggested and taken to correct the deficiencies.

One of the most important phases of responsibility accounting is establishing standard costs and evaluating performance by comparing actual costs with the standard costs. The difference between the actual costs and the standard costs, called the variance, is calculated for individual cost centers. The variance analysis is a key tool for measuring performance of a cost center.

Standard costing has been defined as the ascertainment and use of standard costs and the measurement of analysis of variances. 'Standard' is a yardstick against which actuals are measured to ascertain the degree of achievement made.

Standard costing determines what the cost should be. Standard costs are used as a device for measuring efficiency. The standards are predetermined and a comparison of standards with actual costs enables to determine the efficiency of the concern.

Standard Costs are the scientifically predetermined cost of manufacturing a single unit, or a number of units of product, during a specified period in the immediate future. A standard cost, as the word implies, consists of two parts: a standard and a cost. The standard is the carefully determined method or measurement of executing a task.

Standard costing is most suited to an organisation whose activities consist of a series of common or repetitive operations, where the input required to produce each unit of output can be specified. It is therefore relevant in manufacturing companies, since the processes involved are often of a repetitive nature.

Standard Costing is a system in which cost of each unit of batch or job is predetermined on the basis of normal levels of activity and efficiency. The technique of standard costing involves the determination of cost before occurring. The standard cost is based on technical information after considering the impact of current conditions. With the change in condition, the cost also can be modified so as to make it more realistic. The standard cost is divided into standards for materials, labour and overheads. The actual cost is recorded when incurred. The standard cost is compared to the actual cost. The difference between the two costs is known as variance. The variances are calculated element wise. The management can take corrective measures to set the things right on the basis of different variances.

The basic purpose of standard costing is to determine efficiency or inefficiency in manufacturing a particular product. This will be possible only if both standard costs and actual costs are given side by side. Though standard

costing system will be useful for all types of commercial and industrial undertakings but it will be more useful in those undertakings where production is standardized. It will be of less use in job costing system because every job has different specifications and it will be difficult to determine standard costs for every job.

Standard Costing vs. Budgetary Control

In budgetary control, budgets are used as a means of planning and control. The targets of various segments are set in advance and actual performance is compared with predetermined objects. In this way management can assess the performance of different departments. On the other hand, standard costing also set standards and enables to determine efficiency on the basis of standards and actual performance. Budgetary control is essential to determine standard costs, whereas, the standard costing system is necessary for planning budgets. In budgetary control the budgets are prepared for the concern as a whole whereas in standard costing the standards are set for producing a product or for providing a service. In standard costing, unit concept is used while in budgetary control total concept is used. The budgets are fixed on the basis of past records and future expectations. Standard costs are fixed on the basis of technical information. Standard costs are planned costs and these are expected in future. As far as scope is concerned, in case of budgetary control it is much wider than standard costing. Budgets are prepared for incomes, expenditures and other functions of the departments such as purchase, sale, production, finance and personnel department. In contrary, standards are set up for expenditures only and, therefore, for manufacturing departments standards are set for different elements of cost i.e., material, labour and overheads.

Further, in budgetary control, the targets of expenditure are set and these targets cannot be exceeded. In this system the emphasis is on keeping the expenditures within the budgeted figures. In standard costing the standards are set and an attempt is made to achieve these standards. The emphasis is on achieving the standards. Actual costs may be more than the standard costs and there can be no such thing in budgetary control. The budgetary control system can be applied partly or wholly. Budgets may be prepared for some departments and may not be prepared for all the departments. If a concern is interested in preparing production budget only, it is free to do so.

Standard costing cannot be used partially; it will have to be used wholly. The standards will have to be set for all elements of cost. In fact, the systems operate in two different fields and both are complimentary in nature.

Standard Cost

CIMA defines standard cost as "a standard expressed in money. It is built up from an assessment of the value of cost elements. Its main uses are providing bases for performance measurement, control by exception reporting, valuing stock & establishing selling price."

The word "Standard" means a "Yardstick" or "Bench Mark." The term "Standard Costs" refers to Pre-determined costs. According to Brown and Howard, Standard Cost is a Pre-Determined Cost which determines what each product or service should cost under given circumstances. This definition states that standard costs represent planned cost of a product.

Para 4.32 of CAS 1 (Classification of Cost) defines standard cost as a predetermined cost of a product or service based on technical specifications and efficient operating conditions.

The same definition is reiterated in para 4.11 of CAS 6 (Material Cost) and para 4.15 of CAS 7 (Employee cost). However, the explanations provided by CAS, are different and elucidates two significant aspects of the notion of standard cost. In CAS 1 the following explanation to the definition is provided;

Standard costs are used as scale of reference to compare the actual cost with the standard cost with a view to determine the variances, if any, and analyse the causes of variances and take proper measure to control them.

While in CAS 6, the following explanation to the definition is provided:

The standard cost serves as a basis of cost control and as a measure of productive efficiency when ultimately posed with an actual cost. It provides management with a medium by which the effectiveness of current results is measured and responsibility for deviation is placed. Standard costs are used to compare the actual costs with the standard cost with a view to determine the variances, if any, and analyze the causes of variances and take proper measure to control them.

From the above it is obvious that standard costs are predetermined costs used for estimation. The following three points regarding standard cost are noteworthy:

1. It is used as a scale of reference
2. It is used as a basis of cost control and
3. It naturally fit in an integrated system of responsibility accounting.

CIMA Official Terminology[1] defines standard cost as planned unit cost of a product, component or service.

Concept of Standards

Standards are generally fixed for each of the following:

(a) Units to be produced.

(b) Standard quantity required to produce one unit of finished output, the Standard price for each grade of material.

(c) Standard time required to produce one unit of finished product, Standard labour rate per hour for each grade of labour.

(d) Classification of overheads into fixed and variable elements and fixation of Standard overhead rate per hour or per unit for the Standard output.

It is very much necessary to review the Standards frequently and these should be changed according to the changing conditions.

Standard Costing

Standard costing is an accounting system used by some manufacturers to identify the differences or variances between:

- The actual costs of the goods that were produced, and
- The costs that should have occurred for the actual goods produced

The costs that should have occurred for the actual good output are known as standard costs, which are likely integrated with budgets and profit plan.

CIMA Official Terminology[1] standard costing is a control technique that reports variances by comparing actual costs to pre-set standards so facilitating action through management by exception.

Standard costing therefore involves the following steps:

1. The establishment of predetermined estimates of the costs of products or services
2. The collection of actual costs
3. The comparison of the actual costs with the predetermined estimates.

The predetermined costs are known as standard costs and the difference between standard and actual cost is known

[1]. Certificate Paper C1 Fundamentals of Management Accounting, Chartered Institute of Management Accounting (CIMA).

as a variance. The process by which the total difference between standard and actual results is analyzed is known as variance analysis.

Two primary use of standard costing are:

1. To value inventories and cost production for cost accounting purposes. It is an alternative method of valuation to methods like FIFO and LIFO.
2. To act as a control device by establishing standards (planned costs), highlighting (via variance analysis which we will cover in the next chapter) activities that are not conforming to plan and thus alerting management to areas which may be out of control and in need of corrective

Important consideration for establishing Standard Costing System

The establishment of a standard costing system involves the following steps:

1. **Determination of Cost Centre:** A cost centre may be a department or part of a department or item of equipment or machinery or a person or a group of persons in respect of which costs are accumulated and one where control can be exercised. Cost centres are necessary for determining the costs.
2. **Classification of Accounts:** Classification of accounts is necessary to meet a required purpose i.e., function, asset or revenue item. Codes can be used to have a speedy collection of accounts. A standard is a predetermined measure of material, labour and overheads. It may be expressed in quantity and its monetary measurements in standard costs.
3. **Types of Standards:** The standards are classified into three categories:

   (i) **Current Standard:** A current standard is a standard which is established for use over a short period of time and is related to current condition. It reflects the performance which should be accomplished during the current period. The period for current standard is normally one year. It is supposed that the conditions of production will remain unchanged. In case there is any change in price or manufacturing condition, the standards are also revised. Current standard may be ideal standard and expected standard.

   (a) **Ideal Standard:** The standard represents a high level of efficiency. It is fixed on the assumption that favourable conditions will prevail and management will be at its best. The price paid for materials will be lowest and wastages cost of labour and overhead expenses will be minimum possible.

   (b) **Expected Standard:** This standard is based on expected conditions. It is the target which can be achieved if expected conditions prevail. All existing facilities and expected changes are taken into consideration while fixing these standards. An allowance is given for human error and normal deficiencies. It is realistic and an attainable and it is used for fixing efficiency standard.

   (ii) **Basic Standard:** A basic standard is established for use for an indefinite period or a long period. These standards are revised only on the changes in specification of material and technology production.

   (iii) **Normal Standard:** Normal standard is a standard which is anticipated can be attained over a future period of time, preferably long enough to cover one trade cycle.

   This standard is based on the conditions which will cover a future period, say 5 years, concerning one trade cycle. If a normal cycle of ups and downs in sales and production is 10 years then standard will be set on average sales and production which will cover all the years.

4. **Organisation for Standard Costing:** In a business concern a standard costing committee is formed for the purpose of setting standards. The committee includes production manager, purchase manager, sales manager,

personnel manager, chief engineer and cost accountant. The Cost Accountant acts as a coordinator of this committee. He supplies all information for determining the standard and later on coordinates the costs of different departments. He also informs the committee about the change in price level, etc. The committee may revise the standards in the light of the changed circumstances.

5. **Setting of Standards:** The standard for direct material, direct labour and overhead expenses are fixed. The standards for direct material, direct labour and overheads should be set up in a systematic way so that they can be used as a tool for cost control easily.

Summary of Steps in Standard Costing

(i) Setting/fixing Standard,

(ii) Ascertainment of actual results.

(iii) Comparison of Standard and actual cost, highlighting variances, adverse or favourable.

(iv) Variances are investigated and remedial actions are taken.

Standard costing and Management by Exception (MBE)

Standard costs are average expected unit costs, because they are only averages and not a rigid specification actual results will vary to some extent. Standard costs can therefore be viewed as benchmarks for comparison purposes. Variances (the differences between standard costs and actual costs) should only be reported and investigated if there is a significant difference between actual and standard. The problem is in deciding whether a variation from standard should be considered significant and worthy of investigation. Tolerance limits can be set and only variances that exceed such limits would require investigation. Standard costing therefore enables the principle of management by exception.

CIMA Official Terminology[1] defines management by exception as 'the practice of concentrating on activities that require attention and ignoring those which appear to be conforming to expectations. Typically, standard cost variances or variances from budget are used to identify those activities that require attention.'

Standard Costs and Estimated Costs

Before proceeding with the intricacies it is important to distinguish between standard Costs and estimated costs. Though both are predetermined costs, there are various differences, some of which are taken up for discussion, point wise.

1. Estimated Costs are intended to determine what the costs 'will' be. Standard Costs aim at what costs 'should' be.
2. Estimated cost is used in budgetary control system and historical costing system. Standard cost is ascertained and applied is standard costing system.
3. Estimated cost is used in decision making and selection of alternative with maximum profitability. It is also used in price fixation. Standard cost is used for analysis of variances and cost control purposes.
4. Estimated costs are based on average of past actual figures adjusted for anticipated changes in future. Anticipated wastes, spoilage and inefficiencies, all of which tend to increase costs are included in estimated costs. Standard costs are planned costs determined on a scientific basis and they are based upon certain assumed conditions of efficiency and other factors.
5. In estimated costing systems, stress is not so much on cost control, but costs are used for other purposes such

[1] Certificate Paper C1 Fundamentals of Management Accounting, Chartered Institute of Management Accounting (CIMA).

as fixation of prices to be quoted in advance. Standard costs serve as effective tools for cost control.

Setting of Standard Costs

Setting of standard cost is an elaborate process which is sensitive as well. Exclusive operational knowledge is essential for setting standard costs. While setting production costs standards, the following preliminaries should be considered:

1. Study of the technical and operational aspects of the concern, such as methods of manufacture and the processes involved, management of organisation and line of assignment of responsibilities, division of the organisation into cost centres, units of measurement of input and output, anticipation of wastes, rejections and losses, expected efficiency, and capacity likely to be utilized.
2. Review of the existing costing system and the cost records and forms in use.
3. The type of standard to be used, i.e, whether current, basic, or normal standard costs are to be set. The choice of a particular type of standard will depend upon two factors, viz. which type would be most effective for cost control in the organisation, and whether the standards will be merged in the accounting system or kept outside the accounts as statistical data.
4. Proper classification of the accounts so that variances may be determined in the manner desired.
5. Fixation of responsibility for setting standards. As definite responsibility for variances from standards is ultimately to be laid on individuals or departments, it is but natural that all those individuals or departments should be associated with the setting of standards.
6. Further, two specific aspects need to be noted:
    a. It is important to note that standards for each cost element are made up of a monetary component and a resources requirement component.
    b. Though standard costs may be used in both absorption costing and in marginal costing systems it is generally designated to marginal costing systems.

Monetary Parts of Standards

Standard direct material prices - Direct material prices will be estimated by the purchasing department from their knowledge of the following:

a. Purchase contracts already agreed

b. Pricing discussions with regular suppliers

c. The forecast movement of prices in the market

d. The availability of bulk purchase discounts

Price inflation can cause difficulties in setting realistic standard prices. Suppose that a material costs ₹ 10 per kilogram at the moment and during the course of the next twelve months it is expected to go up in price by 20% to ₹12 per kilogram. What standard price should be selected?

- If the current price of ₹ 10 per kilogram were used in the standard, the reported price variance will become adverse as soon as prices go up, which might be very early in the year. If prices go up gradually rather than in one big jump, it would be difficult to select an appropriate time for revising the standard.
- If an estimated mid-year price (The average expected price for the year, say ₹ 11 per kilogram) were used, price variances should be favourable in the first half of the year and adverse in the second half of the year, again assuming that prices go up gradually throughout the year.

Standard direct labour rates - Direct labour rates per hour will be set by discussion with the personnel department and by reference to the payroll and to any agreements on pay rises with trade union representatives of the employees.

a. A separate hourly rate or weekly wage will be set for each different labour grade/type of employee.

b. An average hourly rate will be applied for each grade (even though individual rates of pay may vary according to age and experience).

Similar problems when dealing with inflation to those described for material prices can be met when setting labour standards.

Standard Resource Requirements

There are three aspects of standard resource requirement which are as follows:

a. To estimate the materials required for making each product (material usage) and also the labour hours required (labour efficiency), technical specifications must be prepared for each product by production experts (either in the production department or the work study department).

b. The 'standard product specification' for materials must list the quantities required per unit of each material in the product. These standard input quantities must be made known to the operators in the production department so that control action by management to deal with excess material wastage will be understood by them.

c. The 'standard operation sheet' for labour will specify the expected hours required by each grade of labour in each department to make one unit of product. These standard times must be carefully set (for example by work study) and must be understood by the labour force. Where necessary, standard procedures or operating methods should be stated.

Taking account of wastage and losses

If, during processing, the quantity of material input to the process is likely to reduce (due to wastage, evaporation and so on), the quantity input must be greater than the quantity in the finished product and a material standard must take account of this.

Suppose that the fresh raspberry juice content of a litre of Purple Pop is 100ml and that there is a 10% loss of raspberry juice during process due to evaporation. The standard material usage of raspberry juice per litre of Purple Pop will be:

$$100 \text{ ml} \times \frac{100\%}{(100 - 10)\%} = 100 \text{ ml} \times \frac{100\%}{90\%} = 111.11 \text{ ml}$$

Problems in setting standards

The standard setting process is encountered with some difficulties in the stage of implementation. The below mentioned are some of the problems in the standard setting process:

1. Inflation needs to be incorporated into planned unit costs. The standard setting process must ensure the inclusion of methods to mitigate the issue inflation and rising prices into the planned costs.
2. It is an important issue that a performance standard is agreed upon by all who are instrumental in working with the performance standard which should be attainable and not too idealistic.
3. The quality of materials to be used is to be decided upon before a set of standard costs is agreed upon as a better quality of material will cost more, but perhaps reduce material wastage.
4. Estimating materials prices where seasonal price variations or bulk purchase discounts may be significant.
5. Finding sufficient time to construct accurate standards as standard setting can be a time-consuming process.
6. Incurring the cost of setting up and maintaining a system for establishing standards.

7. Dealing with possible behavioural problems, managers responsible for the achievement of standards possibly resisting the use of a standard costing control system for fear of being blamed for any adverse variances.

Concept of Standard Cost Card

The standard cost card shows the standard cost per unit of a product that should be manufactured, highlighting the requirements of material, labour, variable and fixed overhead per unit and this can be used as a yardstick, for measuring the performance by comparing the actuals with standards, termed as variance analysis.

Standard Cost Card

		Per unit ₹
Direct Material:	2 kg @ ₹ 6 per kg	12
Direct Labour:	5 hrs @ ₹4 per hr	20
Overhead:	5 hrs @ ₹2 per hr	10
Standard Cost		**52**

Advantages of Standard Costing

The following are the important advantages of standard costing:

(1) It guides the management to evaluate the production performance.

(2) It helps the management in fixing standards.

(3) Standard costing is useful in formulating production planning and price policies.

(4) It guides as a measuring rod for determination of variances.

(5) It facilitates eliminating inefficiencies by taking corrective measures.

(6) It acts as an effective tool of cost control.

(7) It helps the management in taking important decisions.

(8) It facilitates the principle of "Management by Exception."

(9) Effective cost reporting system is possible.

Limitations of Standard Costing

Besides all the benefits derived from this system, it has a number of limitations which are given below:

(1) Standard costing is expensive and a small concern may not meet the cost.

(2) Due to lack of technical aspects, it is difficult to establish standards.

(3) Standard costing cannot be applied in the case of a- concern where non-standardized products are produced.

(4) Fixing of responsibility is 'difficult'. Responsibility cannot be fixed in the case of uncontrollable variances.

(5) Frequent revision is required while insufficient staff is incapable of operating this system.

(6) Adverse psychological effects and frequent technological changes will not be suitable for standard costing system.

Costs of production are effected by internal factors over which management has a large degree of control. An important job of executive management is to help the members of various management levels understand that all

of them are part of the management team. Standard costs and their variances are an aid to keeping management informed of the effectiveness of production effort as well as that of the supervisory personnel. Supervisors who often handle two thirds of three fourth of the dollar cost of the product are made directly responsible for the variance which, show up as materials variances (price, quantity, mix, and yield) or as direct labour variances (rate and efficiency). Materials and labour variances can be computed for each materials item, for each labour operation, and for each worker. Factory overhead variances (spending, controllable, idle capacity, volume, and efficiency) indicate the failure or success of the control of variable and fixed overhead expenses in each department.

Variances are not ends in themselves but springboards for further analysis, investigation, and action. Variances also permit the supervisory personnel to defend themselves and their employees against failures that were not their fault. A variance provides the yardstick to measure the fairness of the standard, allowing management to redirect its effort and to make reasonable adjustments. Action to eliminate the causes of undesirable variances and to encourage and reward desired performance lies in the field of management, but supervisory and operating personnel rely on the accounting information system for facts which facilitate intelligent action toward the control of costs.

Types of Standard

A standard is a norm against which the actual performance can be measured. The objective of setting standards is to measure efficiency and to monitor costs by assigning responsibility for deviations from the standards. Also, a standard can motivate employees by providing a goal for achievement, but the moot question that often arises is, ''What is the proper standard to use?'' A company can estimate materials, labour, and factory overhead usage and costs, but what about the unforeseen costs, such as spoilage, lost time, and equipment breakdowns? Should these items be considered in determining the standard cost to manufacture a product? This issue is attempted to be solved if the types of standards are discussed. As such two specific type of standard may be set which depends on the top management. The two basic type of standards are:

- Ideal standard
- Attainable standard

Ideal standard

Some companies set their standards at the maximum degree of efficiency. Using such an ideal standard, they determine costs by considering estimated materials, labour, and overhead costs; the condition of the factory and machinery; and time for rest periods, holidays, and vacations—but make no allowances for inefficient conditions such as lost time, waste, or spoilage. This ideal standard can be achieved only under the most efficient operating conditions; therefore, it is practically unattainable, generally giving rise to unfavourable variances. Companies using this type of standard feel that it provides a maximum objective for which to strive in the attempt to improve efficiency. There is, however, a psychological disadvantage —factory personnel may become discouraged and lose their incentive to meet standards that are usually impossible to attain except under perfect operating conditions.

Attainable standards

From the potential problems of the ideal standard as discussed in the previous paragraph most companies set attainable standards that include such factors as lost time and normal waste and spoilage. These companies realize that some inefficiencies cannot be completely eliminated, so they design standards that can be met or even bettered in efficient production situations. The primary concern of the manufacturer should be to set standards that are high enough to provide motivation and promote efficiency, yet not so high that they are unattainable and, thus, bad for worker morale.

The following types of standards are noted by some authors:

Ideal standards are based on the most favourable operating conditions, with no wastage, no inefficiencies, no idle time and no breakdowns. These standards are likely to have an unfavourable motivational impact, because

employees will often feel that the goals are unattainable and not work so hard.

Attainable standards are based on efficient (but not perfect) operating conditions. Some allowance is made for wastage, inefficiencies, machine breakdowns and fatigue. If well-set they provide a useful psychological incentive, and for this reason they should be introduced whenever possible. The consent and co-operation of employees involved in improving the standard are required.

Current standards are standards based on current working conditions (current wastage, current inefficiencies). The disadvantage of current standards is that they do not attempt to improve on current levels of efficiency, which may be poor and capable of significant improvement.

Basic standards are standards which are kept unaltered over a long period of time, and may be out-of-date. They are used to show changes in efficiency or performance over an extended time period. Basic standards are perhaps the least useful and least common type of standard in use.

Criticisms of Standard Costing

Critics of standard costing have argued that standard costing is not appropriate in the modern business environment. They have put forward various reasons in favour their argument, some of those are listed in the next few lines.

a. The use of standard costing relies on the existence of repetitive operations and relatively homogeneous output. Nowadays many organisations are forced continually to respond to customers' changing requirements, with the result that output and operations are not so repetitive.

b. Standard costing systems were developed when the business environment was more stable and less prone to change. The current business environment is more dynamic and it is not possible to assume stable conditions.

c. Standard costing systems assume that performance to standard is acceptable. Today's business environment is more focused on continuous improvement.

d. Standard costing was developed in an environment of predominantly mass production and repetitive assembly work. It is not particularly useful in today's growing service sector of the economy.

Use of Standard Costing

In the previous section a list of criticisms of standard costing are produced which may lead the reader to believe that such systems have little use in today's business environment. However standard costing systems can be adapted to remain useful. The following are some of the important reasons standard costing is relevant in the new business environment which is often termed as the VUCA world:

1. Even when output is not standardized, it may be possible to identify a number of standard components and activities whose costs may be controlled effectively by the setting of standard costs and identification of variances.
2. The use of computer power enables standards to be updated rapidly and more frequently, so that they remain useful for the purposes of control by comparison.
3. The use of ideal standards and more demanding performance levels can combine the benefits of continuous improvement and standard costing control.
4. Standard costing can be applied in service industries, where a measurable cost unit can be established.

Standard Costing and Budgetary Control

Budgetary control and standard costing have the common objective of cost control by establishing pre-determined targets. These two techniques are similar in certain respects but differ in respect of other points. Budgetary control is a system of planning and controlling costs. It involves the establishment of budgets, measurement of actual performance, comparison of actual performance with budgeted performance to develop the deviations and the analysis of the causes of variations for taking appropriate remedial steps.

Points of similarity between standard costing and budgetary control

It is important to note that both are control mechanisms and have the same principles – setting targets, comparing actual performance with pre-set targets, analysing and reporting of variances. The points of similarities between the two are identified as:

1. The establishment of predetermined targets of performance.
2. The measurement of actual performance.
3. The comparison of actual performance with the predetermined targets to find out variations, if any.
4. Analysis of variations between actual and predetermined performance.
5. To take remedial action, where necessary.

Conceptual difference between standard costing and budgetary control

Though both the systems aim at controlling the business operations by means of predetermined standards with the objects of having better efficiency and of reducing costs, there are some significant differences. Six key differences are listed below for the purview of the reader.

1. Budgetary control deals with the operation of a department or business as a whole while standard costing mainly applies to manufacturing of a product or providing a service. As such budgetary control system is more extensive as it relates to the operations of the business as a whole and covers capital, sales and financial expenses in addition to production, but standard costing is more intensive and is concerned with controlling amount involved in various elements of cost.
2. Standard costing can be adopted in a business without any particular policy. Sole object of standard costing is to maximise efficiency in operation by determining standard costs before the start of operations, but in case of budgetary control it is necessary to lay down the objective or the policy of the firm for the period for which budgets are being laid down.
3. Budgetary control is exercised by putting the budgets and actuals side by side. Variances are not revealed through the accounts. Under the Standard Costing system, actuals are recorded in accounts and the variances are revealed through different accounts.
4. Budgetary control system can be employed in parts such as budget for cash, selling and distribution expenses, research and development expenses, but partial application of standard costing system is not possible.
5. In budgetary control system, the variances are revealed in total but detailed analysis in accordance with the originating causes is not feasible, but in standard costing, the different variances are analysed in detail according to their originating causes.
6. Budgetary control is the projection of financial accounts, whereas standard costing is the projection of cost accounts.

Variances and their Analysis

The deviations of the actual from the standard is known as 'variances'. When actual results are better than expected, a favourable (F) variance arises, when; they are not up to standard an adverse (A) variance arises. Variances help to pinpoint responsibilities in that management can ascertain where the blame lies when results are poor.

Variance Analysis

Once the standards are set, the next step is to compare the set standard with the actual results of a reporting period (week, month, quarter, year). The actual results achieved by an organisation during a reporting period will, in all likelihood, be different from the expected results (costs and revenues). Such differences may occur between individual items, such as cost of material, cost of labour, volume of sales etc., and between the total expected contribution and the total actual contribution.

It is important to note that the top management have spent considerable time and trouble setting standards. Thus, after the actual results turn out to be different from the standards, the top management is interested to investigate into the variances between the actual and the standard for control purpose, but prior to any investigation of the variances or fixation of responsibility the wise manager will consider the differences that have occurred and use the results of these considerations to assist in attempts to attain the standards.

Variances measure the difference between actual results and expected results. The process by which the total difference between standard and actual results is analyzed is known as variance analysis. The first step after finding out the deviations is to calculate the deviations which are either variances in sales revenue or variances in costs.

CIMA Official Terminology[1] defines variance as the difference between a planned, budgeted, or standard cost and the actual cost incurred. The same comparisons may be made for revenues.

CIMA Official Terminology[1] defines Variance analysis as the evaluation of performance by means of variances, whose timely reporting should maximize the opportunity for managerial action.

Explanation to the definition of standard cost in para 4.32 of CAS 1 (Classification of Cost) states that Standard costs are used as scale of reference to compare the actual cost with the standard cost with a view to determine the variances, if any, and analyse the causes of variances and take proper measure to control them.

Thus, the main purpose of standard costs is comparison with actual costs and their analysis of causes of variance. This enable the management to take proper measure to control the variances.

It is obvious that variances must be measured before they are analysed and managed[2]. In the following chart a comprehensive classification of variances is considered:

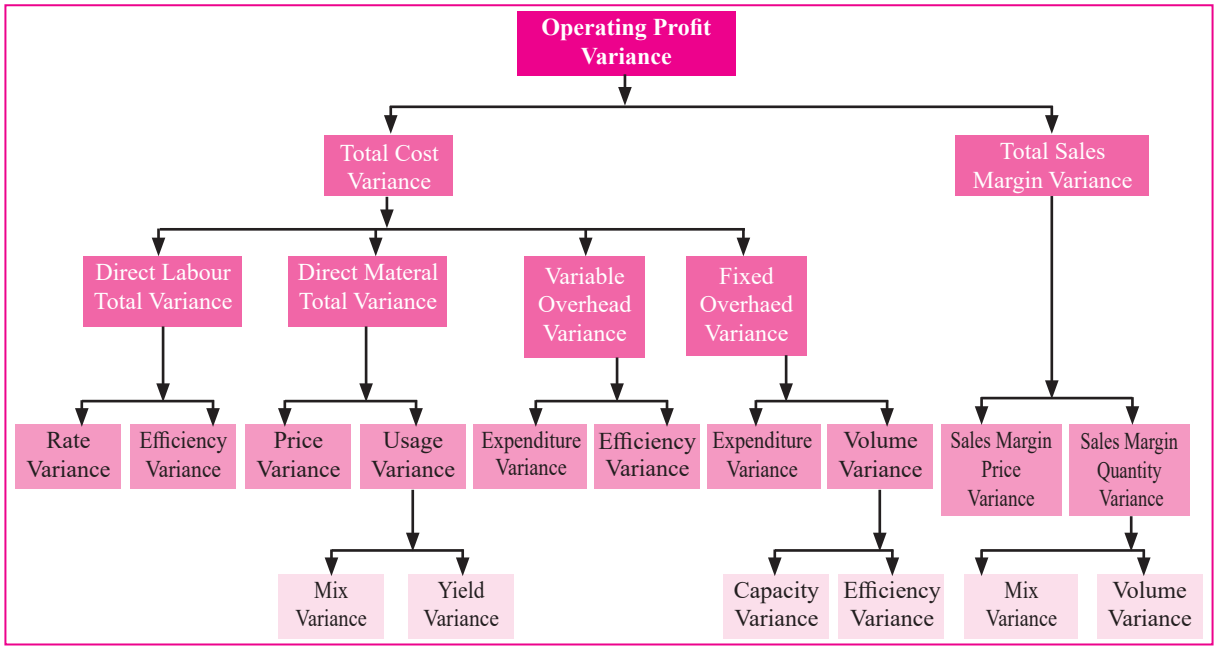


Figure 6.1: Chart of common variance, adapted from Lucey, T. [(1996). Costing, 5th ed.]

[2] A conceptual understanding of variance analysis is available at https://corporatefinanceinstitute.com/resources/knowledge/accounting/variance-analysis/

Variances are, as such, are either:

- **Favourable** - A favourable variance is achieved when the actual performance is better than the expected results.
- **Adverse** - An adverse variance is achieved when the actual performance is worse than the expected results.

In terms of cost, when the actual cost is less than the standard cost it is favourable to the management and is thus termed favourable variance. On the other hand, when actual cost is more that standard cost it is disadvantageous to the management and is referred as adverse variance.

Classification of Variances (At a Glance):

Table showing various variances and their causes, holding person(s) responsible for the same.

Type	Name of variance	Reasons	Person responsible
1. Material	Usage Variance	Difference between Standard and Actual Consumption of material	Production Manager
	Price Variance	Mainly caused by difference between standard and actual price per kg of raw material	Purchase Manager
	Cost Variance	It is the combined effect of usage and Price Variance.	Purchase Manager
	Yield Variance	This caused due to difference in Standard and Actual output	Purchase Manager
	Mix Variance	Concerned with the increase or decrease due to the ratio of materials used, different with Standard.	Production Manager
2. Direct Labour	Rates of Pay Variance	Mainly due to the difference between Standard rate of labour and Actual rate.	Personnel Manager
	Efficiency Variance	It is caused by difference due to Standard labour hours for Actual production and Actual hours taken to complete the job.	Personnel Manager
	Idle Time Variance	Mainly concerned with idle hours for which production limit is made.	Production Manager
	Calendar Variance	It is the Standard wages Cost of paid hours not worked due to holidays.	Uncontrollable
	Labour Mix Variance	Caused by changes in the mix of labour employed, Compared with the Standard	Production Manager
3. Variable Overhead	Expenditure Variance	Caused due to difference in Standard and Actual rate	Chief Accountant cum-Controller (Cost)
	Efficiency Variance	Variance due to difference in Standard and Actual hours.	Production Manager
	Cost Variance	Combined effect of Expenditure and Efficiency Variance	Production Manager
4. Fixed Overhead	Expenditure Variance	An increase or decrease in the Fixed overhead expenditure.	Chief Accountant cum-Controller (Cost)
	Efficiency Variance	An increase or decrease in the budgeted rate of output for the hours worked.	,,
	Capacity Variance	An increase or decrease in the output.	,,

	Idle Time Variance	The standard fixed overhead (being unabsorbed)	,,
	Calendar Variance	Due to difference between Budgeted and Actual Number of Working Days.	Uncontrollable
5. Sales Variances	Value Variance	It is the difference between the value of Budgeted sales and Actual sales.	Sales Manager
	Price Variance	Difference between Actual, sales and Standard sales.	,,
	Volume Variance	Difference between Budgeted sales and Standard sales.	,,
	Mix Variance	Difference between Revised Standard Sales and Standard Sales.	,,

Material and Labour Variances

6.1

Material Variances

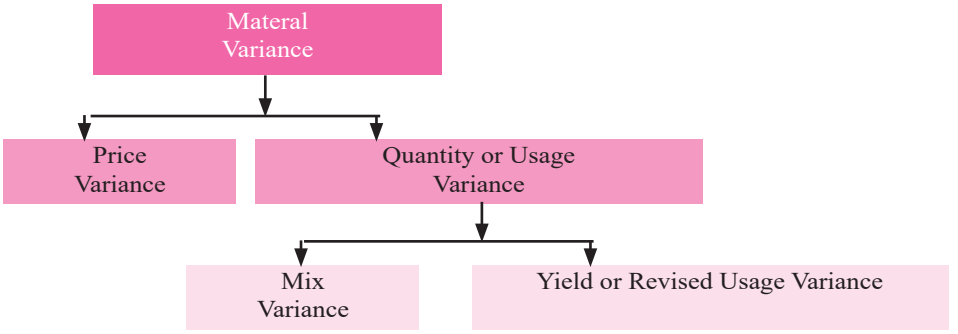


Figure 6.2 Material Variance and their Classifications

1. Material Cost Variance

Direct Material Variances are also termed as Material Cost Variances. The Material Cost Variance represents the difference between the Standard cost of materials for the Actual Output and the Actual Cost of materials used for producing actual output.

Material Cost Variance = Standard Materials Cost for Actual Output Produced - Actual Cost of Materials used

= (Standard Quantity for Actual Output × Standard Price) – (Actual Quantity × Actual Price)

MCV = (SQ × SP) – (AQ × AP)

Material Cost Variance consists of:

a) Material Price Variance

b) Material Quantity or Usage Variance

Illustration 1

ABC Co. uses a standard cost system and manufactures product Z. Standard cost per 1000 kg of output is as under:

In March 2022, the company produced 2,00,000 kg of output. Actual consumption was:

Material	Quantity (in kg)	Price (in ₹)
A	800	2.50
B	200	4.00
C	200	1.00

Material:

A – 1,57,000 kg @ ₹ 2.40

B – 38,000 kg @ ₹ 4.20

C – 36,000 kg @ ₹ 1.10

Calculate Material cost variance.

Solution:

Standards Material Cost of 2,00,000 kg of output

		Standard Quantity (in kg)	Standard Price (in ₹)	SQ × SP (₹)
A	800 × 200 =	1,60,000	2.50	4,00,000
B	200 × 200 =	40,000	4.00	1,60,000
C	200 × 200 =	40,000	1.00	40,000
		2,40,000		6,00,000

Actual Material Cost of 2,00,000 kg of output

Particulars	AQ (kg)	AP (₹)	AQ × AP (₹)
A	1,57,000	2.40	3,76,800
B	38,000	4.20	1,59,600
C	36,000	1.10	39,600
	2,31,000		5,76,000

Material cost variance = (SQ × SP) – (AQ × AP) = 6,00,000 – 5,76,000 = ₹ 24,000 (F)

Illustration 2

Standard output	500 units
Actual output	400 units
Standard price	₹ 2 per kg
Actual price	₹ 3 per kg
Actual quantity	2,000 kg
Standard quantity	4 kg per unit

Calculate the material cost variance.

Solution:

First write down the formula:

Material cost variance = (Standard price × Standard quantity for the actual output) – (Actual price × Actual quantity)

Substituting the values in the formula, we get

Material cost variance = (₹ 2 × 400 × 4) – (₹ 3 × 2000)
= (₹ 3,200 – ₹ 6,000)
= ₹ 2,800 (Adverse)

2. **Material Price Variance:**

Material Price Variance is that portion of the material cost variance which is due to the difference between the Standard Price specified and the Actual Price paid for purchase of materials. The knowledge of this variance may prompt the management to change product price, use substitute materials or find other offsetting sources of cost reduction.

Material Price Variance = (Standard Price - Actual Price) × Actual Quantity

MPV = (SP – AP) × AQ

Causes for Material Price Variance: The differenced in Standard price and actual price of material may arise due to a number of reasons which include:

(i) Change in Market price in materials.

(ii) Chnage in bulk purchase.

(iii) Changes in the quality of materials pruchased.

(iv) Carriage inward on materials being higher or lower than that estimated originally.

(v) Increase or decrease in import duties (in case materials are imported).

(vi) Loss of cash discounts due to tight money condition.

(vii) Inefficient purchase system.

(viii) Shortages and surpluses of materials in the market.

(ix) Ordering uneconomic Purchase size than planned.

(x) Use of cheaper substitutes.

Some of the above factors are controlled by the management while many others are not within managerial control, e.g., market fluctuations in prices. Focus of management is on controllable factors.

Responsibility for Material Price Variance: Responsibility for Material price Variance is mainly of purchase department.

- Purchase department should be held responsible for adverse material price variance due to factors controllable by the pruchase department, such as, excess carriage inward paid, delays in purchasing, wrong timings of purchases, uneconomic order quantity, failure to tap available cheaper substitutes, frauds in purchasing, etc.
- Production department (say production supervisor) is to be held responsible if they delayed in making purchase of unnecessarily expensive substitutes.
- No one can be held accountable for adverse material price variance due to uncontrollable factors, e.g., increase in excise duty or import duty on materials, market shortages or increase in the price of materials due to any other reason beyond the control of any one within the organisation.

Illustration 3

Standard Material Cost Per Unit : Material A @ ₹ 1.00, Material B @ ₹ 2.00

Material Issued: Material A = 2050 pieces, Material B = 2980 pieces

Material A was purchased at the rate of ₹1.00 and Material B was purchased at the rate of ₹2.10

Calculate Material Price Variance.

Solution:

The Material Price Variance will be as follows:

Materials price variance	= (Standard price – Actual price) × Actual quantity	
Material A	= (1.00 - 1.00) × 2,050	= Nil
Material B	= (2.00 - 2.10) × 2,980	= ₹ 298 (Unfavourable)

3. **Material Quantity or Usage Variance:**

Material Usage Variance is that part of Material Cost Variance which is due to the difference between the standard quantity for actual output and the actual quantity used. It measures efficiency in the use of material and indicates whether or not material was properly utilised.

Material Usage Variance = (Standard Quantity for actual Output - Actual Quantity) × Standard Price

MUV = (SQ - AQ) × SP

Material Usage Variance is the sum of material mix variance and materials yield variance.

Causes for Material Quantity or Usage Variance

Material Quantity or Usage Variance may arise due to the following reasons:

i. Change in material mix used for production

ii Inefficiency, improper training, lack of skill, etc. in the use of materials

iii. Incorrect setting of material consumption standards

iv. Improper and defective condition of machinery and hence production capacity

v. Defective materials / Pilferage and theft of materials

vi. Inadequate and inefficient inspection of materials

vii. Improper storage of materials adversely affecting its quality

viii. Excessive wastage, scrap and spoilage of materials

Responsibility for Material Usage Variance: It is mostly due to controllable factors and a number of departments may be responsible for such variance, though in larger number of cases the responsibility lies with production department.

- In case wasteful use of materials is due to poor training and placement of workers, the responsibility may be shared by the Personnel Department and Production department. Production Department is responsible for all sub-optimal uses, spoilage, pilferage, wastage, and mishandling of materials in the factory. They are also accountable for making purchase requisition for sub standard or inappropriate materials, and inefficiencies and carelessness in production process.
- In case the pruchase department has pruchased sub-standard materials and receiving and inspection department has failed to perform inspection with desired efficiency and depth, then these two departments are responsible for adverse Material Usage Variance.
- Adverse Material Usage Variance is due to poor selection of machinery and equipment, determination of sub-optimal production method, plant layout and poor maintenance and repair of plant and machinery may be attributed to Engineering department and Repair and Maintenance gang.

Illustration 4

Compute the materials usage variance from the following information:

Standard material cost per unit	Materials issued
Material A 2 pieces @ ₹ 1.00 = 2.00	Material A 2050 pieces
Material B 3 pieces @ ₹ 2.00 = 6.00	Material B 2980 pieces
₹ 8.00	
Units completed 1000	

Solution:

Materials usage variance = (Standard quantity – Actual quantity) × Standard price

Material A = (2000* – 2050) × ₹ 1.00 = ₹ 50 (Adverse or Unfavourable)

Material B = (3000** – 2980) × ₹ 2.00 = ₹ 40 (Favourable)

Total = ₹ 10 (Unfavourable)

* 2 pcs. × 1000 units = 2000 Standard units

** 3 pcs. × 1000 units = 3000 Standard units

4. **Material Mix Variance:**

It arises only when two or more types of materials are used for producing a product. It is the portion of the material usage variance which is due to the difference between the Standard and the actual composition of mix.

If the actual ratio of materials used remain same as the standard ratio, there will not be any material mix variance, even though the actual quantity of materials used is more or less than the total standard quantity.

(i) When the ratio of mix is different but the total quantities of standard mix and the total quantities of actual mix are the same.

Material Mix Variance = (Revised Standard Quantity - Actual Quantity)× Standard price

Revised Standard Quantity = Standard Quantity for Total Actual Mix

(MMV) = (RSQ - AQ) × SP

where, SQ = Standard Quantity

AQ = Actual Quantity

SP = Standard Price

(ii) When the total actual quantity and total standard quantity and the ratio of mix are different, then the standard quantity of each material will be revised and will be called 'RSQ'.

Material Mix Variance (MMV) = (RSQ - AQ) × SP

Where, RSQ = Revised Standard Quantity

AQ = Actual Quantity

SP = Standard Price

Where, Revised Standard Quantity (RSQ) = Total Quantity of Actual Mix ÷ Total Quantity of Standard Mix × Standard Quantity of each grade of material

Material Sub-Usage Variance = (RSQ - SQ) × SP

Where, RSQ = Revised Standard Quantity

SQ = Standard Quantity

SP = Standard Price

Causes for Direct Material Mix Variance

It may arise due to the following reasons:

(i) Non-availability of certain material,

(ii) Sudden rise or fall in the price of materials,

(iii) Availability of a new substitute of a material,

(iv) Changes in production requiring greater use of some material and lower use of another material,

(v) Short supply of a particular material is, often the most common reason for material mix variance,

(vi) Non-purchase of certain materials at a right time due to fault of purchase department,

(vii) Delay in supply,

(viii) Inefficiency of stores management,

(ix) Inefficiency of production department in a proper mix of materials.

Responsibility for Material Mix Variance

Dominantly the responsibility for material mix variance lies with the officer in Production department.

- Generally, the production engineer, who has been entrusted with the task of determining the most appropriate mix and then ensuring that this pre-determined mix is adhered to. The incidence and the cause of deviations from the standard mix are to be carefully investigated.
- In case the change in materials mix has occasioned due to inappropriate purchasing, careless storage, poor training of workers, poor maintenance of plant and machinery, then to that extent purchase department, stores department, personnel department and maintenance department are respectively responsible.

Illustration 5

A product is made from two raw materials, material A and material B. One unit of finished product requires 10 kg of material. The following is standard mix:

Material A	20%	2 kg @	₹ 2.00	= ₹ 4.00
Material B	80%	8 kg @	₹ 1.00	= ₹ 8.00
	100%	10 kg	₹ 1.20	₹ 12.00

During a period one unit of product was produced at the following costs:

Material A	8 kg @	₹ 2.00	= ₹ 16.00
Material B	4 kg @	₹ 1.25	= ₹ 15.00
	12 kg	₹ 1.75	₹ 21.00

Compute the materials mix variance.

Solution:

Materials mix variance = (Revised standard proportion of actual input – Actual proportion) × Standard price
Revised standard proportion:

$$\frac{\text{Standard proportion of a particular mix}}{\text{Total Standard Quantiy}} \times \text{Actual input}$$

Revised standard proportion:

Material A = $\frac{2}{10} \times 12 = 2.40$ kg

Material B = $\frac{8}{10} \times 12 = 9.60$ kg

Materials mix variance:

Material A	= (2.40 kg – 8 kg) × 2.00
	= (– 5.60) × 2.00 = ₹ 11.20 (Unfavourable)
Material B	= (9.60 kg – 4 kg) × 1.00
	= 5.60 × 1.00 = ₹ 5.60 (Favourable)
Total mix variance	= ₹ 5.60 (Unfavourable)

Illustration 6

Standard Mix

Material X = 60 kgs @ ₹ 5 per kg

Y = 40 kgs @ ₹ 10 per kg

Actual Mix

Material X = 80 kgs @ ₹ 4 per kg

Y = 40 kgs @ ₹ 11 per kg

You are required to compute the usage variance.

Solution:

Step 1: Calculation of revised standard quantity

(i) Formula:

$$\text{Revised standard quantity} = \frac{\text{Total weight of actual mix}}{\text{Total weight of standard mix}} \times \text{Standard quantity}$$

(ii) For Material X $= \frac{40 + 80 \text{ kg}}{60 + 40} \times 60 = 72$ kgs

For Material Y $= \frac{80 + 40 \text{ kg}}{60 + 40} \times 40 = 48$ kgs

Step 2: Mix variance is to be calculated as follows:

(i) Formula:

Mix variance = Standard price × (Revised standard quantity – Actual quantity).

(ii) Substituting the values in the formula, we get

For Material X = ₹ 5 (72 – 80) = ₹ 40 (A)

For Material Y = ₹ 10 (48 – 40) = ₹ 80 (F)

Total = ₹ 40 (F)

5. **Material Yield Variance:**

It is the portion of Material Usage Variance. This variance arises due to spoilage, low quality of materials and defective production planning etc. Materials Yield Variance may be defined as "the difference between the Standard Yield Specified and the Actual Yield Obtained."

(i) When actual and standard outputs are different, but 'total standard mix' and 'total actual mix' are the same.

Material Yield Variance (MYV) = (AY - SY) × SC

Where, AY = Actual Yield

SY = Standard Yield

SC = Standard Cost Per Unit (Effective)

or, MYV = (SL - AL) × SC

SL = Standard Loss

AL = Actual Loss

For calculating standard cost per unit total standard cost is divided by total standard quantity after deducting normal loss.

(ii) When actual and standard outputs are different and total quantity of standard mix and total quantity of actual mix are also different:

Material Yield Variance = (Standard Quantity for actual output - Revised Standard Quantity)×Standard Price

= (Actual Output - Standard output for actual mix)×Standard Cost Per unit of Output

MYV = (AY - RSY) × SC

Where, AY = Actual Yield; RSY = Revised Standard Yield; SC= Standard Cost per Unit

The above formula should be modified as follows: Material Yield Variance (MYV) = (AY - SY) × SC

Where, SY = Original Standard Yield.

Causes and Responsibility for Material Yield Variance

Material Yield Variance may arise due to the following reasons:

(i) Lack of due care in handling.

(ii) Lack of proper subversion.

(iii) Defective methods of operation.

(iv) Improper equipment, tools etc.

(v) Sub-standard quality of materials-fault of purchase department.

Illustration 7

Standard input = 100 kg, standard yield = 90 kg, standard cost per kg of output = ₹ 20. Actual input 200 kg, actual yield 182 kg. Compute the yield variance.

Solution:

Standard yield for the actual input = $\frac{90}{100} \times 200 \text{ kg} = 180 \text{ kg}$

Yield variance = (Actual yield – Standard yield for the input) × Standard cost per unit.

= (182 – 180) × ₹ 20

= 2 × 20 = 40 (Favourable)

The above yield variance can be computed by using another formula also, for example:

Yield variance = (Standard loss on actual input – Actual loss) × Standard cost per unit

= (20 kg – 18 kg) × ₹ 20

= ₹ 40 (Favourable)

Illustration 8

Standard price of material ₹ 10 per unit

Standard quality 10 units of materials per unit of output

Standard production 1000 units

Actual production 900 units

Solution:

(i) Calculation of standard cost per unit:

Standard cost per unit = Standard price × Standard quantity

= ₹10 × 10 units = ₹100.

(ii) Material-yield variance is to be computed as:

(a) Material-yield variance = Standard cost per unit (Actual output – Standard output)

= ₹ 100 (900 units – 1,000 units)

= ₹ 100 × (– 100 units)

= ₹ 10,000 (A).

Labour Variances

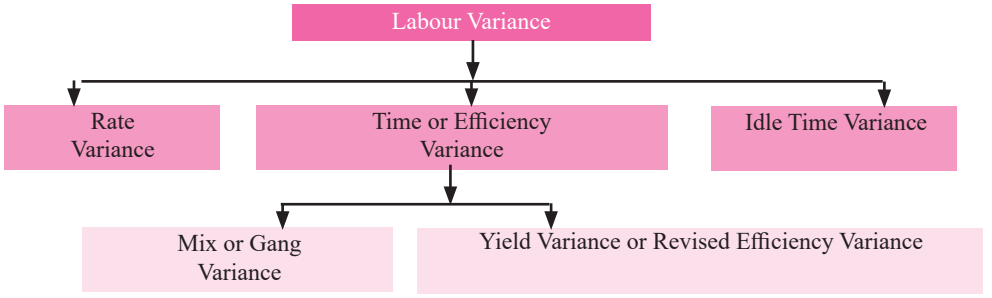


Figure 6.3 : Labour Variance and their Classifications

1. **Labour Cost Variance**

Labour Cost Variance is the difference between the Standard Cost of labour allowed for the actual output achieved and the actual wages paid. It arises due to variation in rate and efficiency of labour.

Labour Cost Variance = (Standard Labour Cost for actual output produced - Actual Cost of labour paid for)

= (Standard Hours for actual output × Standard Rate) - (Actual Hours × Actual Rate)

LCV = (SLC - ALC)

Where, SLC = Standard Labour Cost = (Standard Hours × Standard Rate)

ALC = Actual Labour Cost = (Actual Hours × Actual Rate)

Direct Labour Cost Variance consists of:

a) Direct Labour Rate Variance,

b) Direct Labour Efficiency variance, and

c) Idle Time Variance.

Illustration 9

Actual hours 5,800

Actual direct wages ₹1,800

Standard rate per hour ₹0.35

Standard hours 6,000

Solution:

Labour cost variances = Std. Wage - Actual Wage = (6000 × 0.35) - 1800 = 2100 - 1800 = ₹300 (F)

Illustration 10

Calculate the direct labour cost variance from the following:

Standard output = 500 units

Actual output = 400 units

Standard time per unit = 5 hrs

Total actual time taken = 2,200 hrs

Standard rate of wages = ₹20 per hour

Actual rate of wages = ₹25 per hour

Solution:

(i) Labour cost variance = (Std rate × Std time for actual output) – (Actual rate × Actual time).

(ii) Substituting the values in the formula, we get

= (₹20 × 400 units × 5 hrs) – (₹25 × 2,200 hrs)

= (₹20 × 2,000) – (₹25 × 2,200)

= ₹40,000 – ₹55,000

= ₹15,000 (Adverse)

2. **Labour Rate Variance**

It is that part of labour cost variance which is due to the difference between the standard rate specified and the actual rate paid for actual hours. it represents difference between:

i) Actual payment to worker for actual hours worked, and

ii) Payment involved, if worker had been paid at standard rate.

Labour Rates of Pay Variance = (Standard Rate - Actual Rate) × Actual Hours paid for

LRV = (SR – AR) × AH

Where, SR = Standard Wage Rate, AR = Actual Wage Rate AH = Actual Hours (Time)

Causes of Direct Labour Rate Variances

a. Change in basic wage structure or change in piece-work rate. These will give rise to a variance till such time the standards are not revised.

b. Employment of workers of grades and rates of pay different from those specified, due to shortage of labour of the proper category, or through mistake, or due to retention of surplus labour.

c. Payment of guaranteed wages to workers who are unable to earn their normal wages if such guaranteed wages form part of direct labour cost.

d. Use of a different method of payment, e.g. payment at day-rates while standards are based on piece-work method of remuneration.

e. Higher or lower rates paid to casual and temporary workers employed to meet seasonal demands, or urgent or special work.

f. New workers not being allowed full normal wage rates.

g. Overtime and night shift work in excess of or less than the standard, or where no provision has been made in the standard. This will be applicable only if overtime and shift differential payments form part of the direct labour cost.

h. The composition of a gang as regards the skill and rates of wages being different from that laid down in the standard.

Responsibility for Labour Rate Variance: Labour rates are generally, influenced by the external factors which are beyond the control of the organisation. However, personnel manager is responsible for labour rate negotiation.

Illustration 11

Actual hours 5,800

Actual direct wages ₹1,800

Standard rate per hour ₹0.35

Standard hours 6,000

Solution:

Labour rate variance = AH (SR - AR) = 5800 (0.35 - 0.31) = ₹232 (F)

3. Labour Efficiency Variance

It measures efficiency in the use of Labour & indicates whether or not labour was properly utilised. It is that portion of the Labour Cost Variance which arises due to the difference between standard labour hours specified and the actual labour hours spent. It represents difference between: i) Payment involved, if workers had been paid at standard rate, and ii) Standard labour cost for output achieved.

Labour Efficiency Variance = (Standard Hours for actual output - Actual Hours Worked) × Standard Rate

$$LEV = (SH - AH) \times SR = (SH \text{ for Actual OP} - AH) \times SR$$

Where, SH = Standard Hours (Standard Time) AH = Actual Hours (Actual Time)

SR = Standard Rate of Wages

OP = Output

Causes for Labour Efficiency Variance

a. Lack of proper supervision or strict supervision than specified.

b. Poor working conditions.

c. Delays due to waiting for materials, tools, instructions, etc. if not treated as idle time.

d. Defective machines, tools and other equipments.

e. Machine break-down, if not booked to idle time.

f. Work on new machines requiring less time than provided for, till such time standard is not revised. e.g. Basic inefficiency of workers due to low morale, insufficient training, faulty instructions, incorrect scheduling of jobs, etc.

g. Use of non-standard material requiring more or less operation time.

h. Incorrect standards.

i. Wrong selection of workers, i.e., not employing the right type of man for doing a job.

j. Increase in labour turnover.

Responsibility for Labour Efficiency Variance: Efficiency variance may arise due to ability of the workers, inappropriate team of workers, inefficiency of production manager or foreman etc. However, production manager or foreman can be held responsible for the adverse variance which otherwise can be controlled. Labour efficiency variance is further divided into:

(i) Labour Mix Variance or Gang variance

(ii) Labour Yield Variance (or Labour Revised-efficiency Variance)

(iii) Idle Time Variance

Illustration 12

Actual hours 5,800

Actual direct wages ₹1,800

Standard rate per hour ₹0.35

Standard hours 6,000

Solution:

Labour efficiency variance = SR (SH - AH) = 0.35 (6000 - 5800) = ₹70 (F)

4. Labour Idle Time Variance

Labour Idle Time Variance arises due to abnormal situations like strikes, lockout, breakdown of machinery etc. It represents difference between:

i) Labour hours paid for and payment had been made a standard rate, and

ii) Standard labour cost of labour hours utilised.

Labour Idle Time Variance = (Idle Time in Hours × Standard Rate)

LITV = Idle Time × Standard Rate

Causes for Idle Time Variance (ITV):

ITV may be due to the following reasons:

(i) Break down of plant and machinery, Power failure.

(ii) Sub-Optimal conditions of equipments.

(iii) Inappropriate equipment.

(iv) Poor placement of workers.

(v) Delay in giving production instructions.

(vi) Changes in methods of production.

(vii) Improper supervision in the factory.

(viii) Too frequent changes in workers work.

5. **Labour Mix Variance**

It is that portion of Direct Labour Efficiency variance which is due to the difference between standard composition specified for a gang for total actual hours and actual composition of gang used. A need to change the composition of a gang may arise due to shortage of a particular grade of labour.

Labour Mix Variance = (Revised Standard hours for actual hours worked - Actual hours worked) × Standard Rate

$$LMV = (RSH - AH) \times SR$$

Where, RSH = Standard Hours Revised Standard Time

AH = Actual Hours (Actual Time), SR = Standard Rate

RSH = Total Time of Actual Workers ÷ Total Time of Standard Workers × Standard Time of each grade of Worker.

Labour Mix Variance is otherwise known as **Gang Composition Variance**. This variance arises due to the differences between the actual gang composition than the standard gang composition. Labour Mix Variance is calculated in the same way of Materials Mix Variance.

Illustration 13

The standard labour cost for producing 200 metres of cloth was predetermined as 20 skilled labour hours @ ₹15 per hour and 30 unskilled labour hours @ ₹10 per hour. 300 metres of cloth was produced with the help of 30 skilled labour hours paid @ ₹17 per hour and 30 unskilled labour hours paid @ ₹12 per hour.

Calculate:

Labour mix variance.

Solution:

Labour Mix Variance

$$A = \left(\frac{90}{100} \times 60 - 30\right) 15 = 90 \text{ (A)}$$

$$B = \left(\frac{45}{75} \times 60 - 30\right) 10 = \underline{60 \text{ (F)}}$$

$$\underline{₹\ 30 \text{ (A)}}$$

6. **Labour Yield Variance**

This variance is calculated in the same way as Material Yield Variance. Labour Yield Variance arises due to the variation in labour cost on account of increase or decrease in yield or output as compared to relative standard. It is that part of Direct labour efficiency variance which is due to the difference between actual output of workers and standard output of workers for total actual hours worked. It will be the diffference between:

i) Standard labour cost for actual output, and

ii) Standard labour cost for standard composition specified for a gang for total actual hours.

Labour Yield Variance (LYV) = (Actual Output – Standard Output for Actual Mix) × Standard Cost Per Unit

LYV = (Actual Output – Standard Output for Actual Input) × Standard Cost Per Unit

Illustration 14

In a factory 2000 workers were idle because of a power failure.

As a result of this a loss of production of 4000 units of product A and 8000 units of product B occurred. Each employee was paid his normal wage (a rate of ₹20 per hour). A single standard hour is needed to manufacture four units of product A and eight units of product B. Idle time variance will be computed in the following manner:

Standard hours lost:

Product A = $\frac{4000}{4}$ = 1000 hr

Product B = $\frac{8000}{8}$ = 1000 hr

Total hours lost = 2000 hr

Idle time variance (power failure)

2000 hours @ ₹20 per hour = ₹40,000 (Adverse)

Actual production = 950 units

Standard production = 1,000 units

Standard rate of wages = ₹25 per hour

Standard time = 4 hours per unit

Compute Labour Yield Variance.

Solution:

Step 1: Computation of standard cost per unit = Standard rate of wages × Standard time

= ₹25 × 4 hours

= ₹100.

Step 2: Computation of labour-yield variance

(i) Write the formula:

Labour-yield variance = (Actual output – Standard output) × Standard cost per unit

(ii) Substitute the values:

= (950 units – 1,000 units) × ₹100

= (50 units) ₹100

= ₹5,000 (Adverse)

Illustration 15

Standard labour cost of producing 40 units of a product is 30 hours work by skilled workers at a standard rate of ₹60 per hour and 90 hours work by unskilled workers at the standard rate of ₹20 per hour. 40 units of the product were produced for which skilled workers were paid for 20 hours at ₹55 per hour and unskilled workers were paid for 130 hours at ₹24 per hour. Due to a machine break-down both skilled and unskilled workers lost 9 hours each. They were paid even for this time.

Standard Labour Cost of 40 Units of Product				Actual labour Cost of 40 Units of Product					
	SH	SR	SH × SR		AH Paid for	Idle Hours	AH Worked	AR ₹	AH Paid × AR ₹
Skilled	30	60	1,800	Skilled	20	9	11	55	1,100
Unskilled	90	20	1,800	Unskilled	130	9	121	24	3,120
	120		₹ 3,600		150	18	132		4,220

Labour Yield Variance (LYV)

= Standard Labour Cost per unit of output (Actual output from total hrs worked – Expected total output)

$$= \frac{(SH \times SR)}{Output} \text{ that is } \frac{₹\ 3,600}{40 \text{ units}} \left(40 \text{ units} - \frac{40 \text{ units}}{120 \text{ hrs}} \times 132 \text{ hrs.}\right)$$

= ₹ 90 (40 units – 44 units) = ₹ 360 (A).

Important Terms
Standard Rate per unit = Budgeted Overheads ÷ Budgeted Outputs
Standard Rate per hour = Budgeted Overheads ÷ Budgeted Hours
Standard Hours for Actual Output = Budgeted Hours ÷ Budgeted Outputs × Actual Outputs
Standard Output for Actual Hours = Budgeted Outputs ÷ Budgeted Hours × Actual Hours
Recovered or Absorbed Overheads = Standard Rate per unit × Actual Output or, Standard Rate per hour × Actual Hours
Budgeted Overheads = Standard Rate per unit × Budgeted Outputs or, Standard Rate per hour × Budgeted Hours or, Standard Rate per hour × Standard Hours for Actual Outputs
Standard Overheads = Standard Rate per unit × Standard Outputs for Actual Time
Actual Overheads = Actual Rate per unit × Actual Outputs or, Actual Rate per hour × Actual Hours

Variable Overhead Variances

6.2

Variable Overhead Variance:

This is the difference between the standard variable overhead cost allowed for the actual output achieved and the actual variable overhead cost. The variance is represented by expenditure variance only because variable overhead cost will vary in proportion to output so that only a change in expenditure can cause such variance. Variable overhead efficiency can be calculated if information relating to actual time taken and time allowed is given.

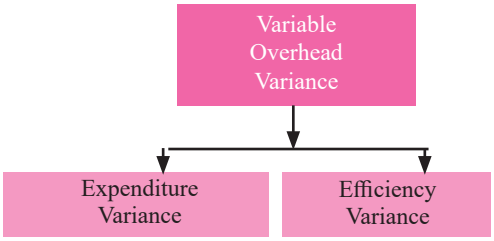


Figure 6.4 : Classifications of Variable Overhead Variances

1. Variable Overhead Cost Variance

This is the difference between standard variable overhead for actual production and the actual variable overhead incurred. It represents difference between: (i) Standard variable overhead for actual production and (ii) Actual variable overheads incurred during the period.

Variable Overhead Cost Variance = Recovered Variable Overheads – Actual Variable Overheads

= (Standard Variable Overheads Cost for Actual Output - Actual Variable Overheads)

= (Standard Hours for actual output × Standard Rate) - (Actual Hours × Actual Hours)

Variable overheads Cost Variance consists of:

a) Variable Overhead Expenditure or Spending Variance and b) Variable Overhead Efficiency Variance.

Illustration 16

Following are the data obtained from the books of a manufacturing company with respect to variable overheads:

Budgeted production: 600 units.

Budgeted variable overhead: ₹15,600.

Standard time for 1 unit: 20 hours.

Actual production: 500 units

Actual hours worked: 9,000 hrs.

Actual variable overhead: ₹14,000.

Compute Variable Overhead Cost Variance

Solution:

Step 1: Computation of standard variable cost per unit.

(i) Standard variable cost per unit = $\frac{\text{Budgeted Variable Overhed}}{\text{Budgeted Production}}$

$= \frac{₹15,600}{600 \text{ units}}$: ₹26 per unit

Step 2: Computation of standard-variable overhead cost of the actual output

= Actual production × Std. variable cost/unit

= 500 units × ₹26 = ₹13,000.

(a) Calculations of variable-overhead variance:

Variable-overhead variance = Standard cost – Actual cost.

(ii) Substituting the values, we get

(₹ 13,000 – ₹ 14,000) = ₹ 1,000 (A).

Variable Overhead Cost Variance = ₹1,000 (A)

2. Variable Overhead Rate or Expenditure Variance

It is the difference between the allowed / budgeted variable overheads based on the actual hours worked and the actual variable overheads incurred. It is that portion of variable overhead cost variance which arises due to the difference between actual variable overheads and standard variable overheads appropriate to the level of activity attempted.

Variable Overhead Rate or Expenditure Variance = (Standard Variable Overhead Rate per unit – Actual Variable Overhead Rate per unit) × Actual outputs/ units

It may be calculated as under also:

(Standard Variable Overhead Rate per hour – Actual Variable Overhead Rate per hour) x Actual hours

Illustration 17

From the following data, calculate the variable-overhead expenditure variance:

Budgeted production: 2,000 units.

Actual production: 1,500 units.

Budgeted variable overhead: ₹ 4000.

Actual variable overhead: ₹ 2,500.

Standard hours per unit: 1 hour.

Actual hours worked: 1,800 hrs.

Solution:

Step 1: Calculation of budgeted hours:

Budgeted hours = Budgeted production × Std hrs. per unit

= 2,000 units × 1 hour

= 2,000 hours.

Step 2: Computation of standard-variable overhead rate per hour.

$$\text{Std variable overhead rate per hour} = \frac{\text{Budgeted Variable Overhed}}{\text{Budgeted Hours}}$$

$$= \frac{₹\ 4{,}000}{2{,}000\ \text{hrs}} = ₹\ 2$$

(Budgeted variable overhed)/(Budgeted hours)

= (₹4,000)/(2,000 hrs) = ₹2

Step 3: Calculation of variable-overhead expenditure variance:

Variable-overhead expenditure variance = (Std-variable overhead rate per hour × Actual hours worked) – Actual variable overhead

= (₹2 × 1,800 hrs) – ₹2,500

= ₹3,600 – ₹2,500

= ₹1,100 (F).

3. Variable Overhead Efficiency Variance

This variance will be the difference between: (i) Standard variable overhead for actual output and (ii) Actual hours worked at standard variable overhead rate. It is calculated by multiplying the difference in standard hours for actual output and actual hours by the standard variable overhead rate per hour. If actual hours worked are less than standard hours, the VOEV is favourable, and vice-versa.

Variable Overhead Efficiency Variance = (Standard Hours for Actual Output – Actual Hours) × Standard Variable Rate per hour.

Alternatively, it may be calculated as under:

(Standard Outputs – Actual Outputs) × Standard Variable Overhead Rate per unit.

Illustration 18

Compute Variable Overhead Efficiency Variance from the following data:

Budgeted production: 2,000 units.

Actual production: 1,500 units.

Budgeted variable overhead: ₹4,000.

Actual variable overhead: ₹2,500.

Standard hours per unit: 1 hour.

Actual hours worked: 1,800 hrs.

Solution:

Step 1: Calculation of the actual output in terms of std. hours:

= Actual output × Std. hrs, per unit

= 1,500 units × 1 hour

= 1,500 hours

Step 2: Calculation of variable-overhead-efficiency variance:

(i) Write the formula:

Variable Overhead Efficiency Variance = Standard Variable Overhead Rate / hour (Actual output in terms of std. hrs – Actual hours worked).

(ii) Substituting the values, we get

Variable Overhead Efficiency Variance = ₹ 2 (1,500 hrs – 1,800 hrs)

= ₹ 2 (–300 hrs)

= ₹ 600 (A).

Fixed Overhead Variance

6.3

Fixed Overhead Variance:

Fixed overhead cost variance is the difference between the standard cost of fixed overhead allowed for the actual output achieved and the actual fixed overhead cost incurred.

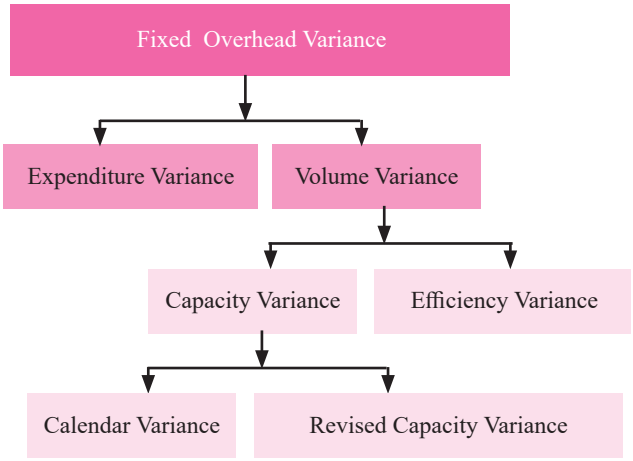


Figure 6.5 : Classifications of Fixed Overhead Variances

Based on Units or Outputs:

1. **Fixed Overhead Cost Variance**

   The variance is the difference between the standard fixed overheads allowed for the actual production and the actual fixed overheads incurred.

   Fixed Overhead Cost Variance = Recovered Fixed Overheads – Actual Fixed Overheads

   Illustration 19

   Details of fixed overhead, production hours and production for a period are:

Budgeted hours	10000 hours
Standard fixed overheads per hour	₹10
Standard hours per unit of output	5 hours
Actual production	1920 units
Actual fixed overheads	₹94,000

   Calculate Fixed overhead cost variance.

Workings:

Budgeted output $= \frac{\text{Budgeted Hours}}{\text{Budgeted Rate}} = \frac{10000}{5} = 2000$ units

Budgeted Expenditure = Budgeted Hours × Std. F/O per hour.

= 10000 × ₹10 = ₹1,00,000

Budgeted Rate per unit of output.

$₹ = \frac{1,00,000}{2000} = ₹50$ per unit

Fixed overhead cost variance = Std. Factory Overhead for Actual output – Actual Factory Overhead for Actual output

= 1920 units × ₹50 - ₹94,000 = ₹2,000 (F)

2. **Fixed Overhead Expenditure Variance**

It is the difference between the budgeted fixed overheads and the actual fixed overheads incurred during the particular period.

Fixed Overhead Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed Overheads

Causes for Fixed Overhead Budget/Expenditure variance

As the times of expenditure involved are many, the causes also may be numerous, but broadly speaking, the expenditure variance may be due to variation in price or quantity or both. Each item is analysed and corrective action is taken depending on the causes. It may be due to the following reasons:

(i) Seasonal Conditions.

(ii) Improper use of available facilities.

(iii) Use of efficient tools and equipment.

(iv) Improperly set standards.

(v) Rise in price due to inflation.

(vi) Change in methods of operation.

Illustration 20

Fixed overhead cost variance

Details of fixed overhead, production hours and production for a period are:

Budgeted hours	10000 hours
Standard fixed overheads per hour	₹10
Standard hours per unit of output	5 hours
Actual production	1920 units
Actual fixed overheads	₹94,000

Calculate Fixed Overhead Expenditure Variance.

Solution:

Fixed Overhead Expenditure Variance = Budgeted Expenditure - Actual Expenditure

= ₹1,00,000 - ₹94,000

= ₹6,000 (F)

3. **Fixed Overhead Volume Variance**

This Variance is the difference between the budgeted fixed overheads and the standard fixed overheads recovered on the actual production.

Fixed Overhead Volume Variance = (Budgeted Outputs – Actual Outputs) × Standard Fixed Overhead Rate per unit.

Causes for Fixed Overhead Volume Variance

It may be due to the following reasons:

(i) Power failure.

(ii) Machine breakdown.

(iii) Waiting for tools, work, instruments, machine, materials etc.

(iv) Idle or excess capacity.

(v) Variation in customer's demands and orders booked.

(vi) Labour strikes or lock-outs etc.

(vii) Working overtime due to rush orders, etc.

(viii)Defective scheduling and routing of production.

Illustration 21

Details of fixed overhead, production hours and production for a period are:

Budgeted hours	10000 hours
Standard fixed overheads per hour	₹10
Standard hours per unit of output	5 hours
Actual production	1920 units
Actual fixed overheads	₹94,000

Calculate Fixed Overhead Volume Variance.

Solution:

Fixed Overhead Volume Variance = (Budgeted Overhead - Actual Overhead) × Budgeted Rate

= (2000 – 1920) × 50

= ₹4,000 (A)

Illustration 22

From the following data, compute the Fixed Overhead Volume Variance:

Budget output for the year: 30,000 units.

Budget fixed overheads for the year: ₹30,000.

Standard production per hour: 15 units.

Actual output for the month: 2,550 units.

Actual overheads for the month: ₹3,000.

The year is budgeted to 50 working weeks on a 40-hour week basis. Two hours in every week are lost due to abnormal idle time. The month consists of four working weeks.

The unit has to curtail its production operation to 4 days in a week instead of the usual 5 days as a result of power cut.

Solution:

Calculation of Volume Variance:

First, the budgeted units have to be computed as follows:

$$\text{Budgeted units} = \frac{\text{Budgeted units for the year} \times 4}{\text{No of working weeks in the year}} = \frac{30{,}000 \times 4}{50} = 2{,}400 \text{ units}$$

Volume variance = Std rate (Actual units – Budgeted units)

= ₹ 1 × (2,250 – 2,400 units)

= ₹ 1 × (150 units) = ₹ 150 (F)

Fixed-Overhead Volume Variance = ₹150 (F).

Working Note:

(i) First, the standard rate has to be calculated.

$$\text{Std. rate} = \frac{\text{Budgeted Fixed Overheads}}{\text{Budgeted Production}} = \frac{₹\ 30{,}000}{30{,}000 \text{ units}} = ₹\ 1.$$

Standard rate per unit = ₹ 1.

4. **Fixed Overhead Efficiency Variance**

It is that portion of the Volume Variance which shows the lower or higher output arising from the efficiency or inefficiency of the workers.

Fixed Overhead Efficiency Variance = (Standard Quantity - Actual Quantity) × Standard Fixed Overhead Rate per unit

Causes for Fixed Overhead Efficiency variance

It arises mainly in respect of costs which vary with the matter of efficiency and time taken. FOEV may be due to the following reasons:

(i) Poor working conditions

(ii) Poor supervision

(iii) Poor scheduling of production processes

(iv) Frequent power failures

(v) Improperly set standards.

Illustration 23

ABC Company records reveal the following data for the month of June. You are required to calculate Fixed Overhead Efficiency variance variances for the month of June:

Budgeted output: 1,000 units.

Actual output: 700 units.

Budgeted fixed overhead: ₹ 4,000

Actual fixed overhead: ₹ 3,500

Standard hours per unit: 2

Hours available during June: 500

Actual hours worked: 450

Solution:

Calculation of Fixed Overhead Efficiency Variance:

(i) Efficiency variance = Std. fixed-overhead rate (Actual hours worked – Output in terms of std. hrs)

(ii) Output in terms of standard hours are not given in the problem, but it is calculated as follows:

= Actual output × Std. hrs. per unit

= 700 nos × 2 hrs

= 1,400 hrs.

(iii) Efficiency variance = ₹ 2 (450 – 1,400 hrs)

= ₹ 2 × 950 = ₹ 1,900 (A).

5. **Fixed Overhead Capacity Variance**

Fixed overhead capacity variance arising due to a particular cause, i.e., unexpected holidays, breakdown of machinery, strikes, power failure etc.

Fixed Overhead Capacity Variance = (Budgeted Output - Standard Output) × Standard Fixed Overhead Rate per unit

Causes for Fixed Overheads Capacity Variance

It may be due to the following reasons:

(i) Chance in scheduling of production process.

(ii) Power failures

(iii) Labour Troubles

(iv) Lock-out

(v) Shortage of materials

(vi) Machine break-down

(vii) Stump in customer's demand

(viii) Decline in sales volume

(ix) Inefficient supervision

(x) Defective material.

Illustration 24

From the following data, compute the Fixed Overhead Capacity Variance:

Budget output for the year: 30,000 units.

Budget fixed overheads for the year: ₹ 30,000.

Standard production per hour: 15 units.

Actual output for the month: 2,550 units.

Actual overheads for the month: ₹ 3,000.

The year is budgeted to 50 working weeks on a 40-hour week basis. Two hours in every week are lost due to abnormal idle time. The month consists of four working weeks.

Solution:

Calculation of capacty variance:

Capacity variance = Std rate (Std units – Revised budgeted units)

Standard units have to be computed:

Std. units = Actual hrs × Std production per hour

= 30 × 15 units = 450 × 4 units/week.

Std units for a month = 450 × 4 = 1,800 units

Capacity variance = ₹ 1 (1,800 units – 1,920 units)

= ₹ 1 (120 units)

= ₹ 120 (A)

Fixed-Overhead Capacity Variance = ₹ 120 (A)

6. **Fixed Overhead Calendar Variance**

This is part of Capacity Variance which is due to the difference between the actual number of working days and the budgeted working days.

Fixed Overhead Calendar Variance = (Revised Budgeted Output - Budgeted Output) × Standard Fixed Overhead rate per unit

Illustration 25

A Company has normal capacity of 100 machines working 8 hours per day of 25 days in a month. The budgeted fixed overheads of a month are ₹1,50,000. The Standard time required to manufacture one unit of product is 4 hours. In a particular month, the company worked for 24 days of 750 machine hours per day and produced 4,500 units of the product. The actual fixed overheads incurred were ₹1,45,000.

Solution:

Fixed Overhead Calendar Variance = ₹ 1,44,000 - ₹ 1,50,000 = ₹ 6,000 (Adverse)

Working Note:

Standard Cost of Budgeted Hours in actual days = 19,200 × 7.50 = ₹ 1,44,00

Budget = ₹ 1,50,000

Fixed Overhead Calendar Variance = ₹ 1,44,000 - ₹ 1,50,000 = ₹ 6,000 (A)

Calculation of Standard Rate:

Standard Rate $= \frac{1,50,000}{100 \times 25 \times 8} = \frac{1,50,000}{20,000} =$ ₹ 7.50 per hour

Actual hours worked = 750 × 24 days = 18,000 hours

Budgeted hours in actual days = 24 × 8 × 100 = 19,200 hours

Based on Hours:

1. Fixed Overhead Cost Variance = Recovered Fixed Overheads – Actual Fixed Overheads
2. Fixed Overhead Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed Overheads
3. Fixed Overhead Volume Variance = (Budgeted Hours – Actual Hours) × Standard Fixed Overhead Rate per hour.
4. Fixed Overhead Efficiency Variance = (Standard Hours for Actual Production – Actual Hours) × Standard Fixed Overhead Rate per hour.
5. Fixed Overhead Capacity Variance = (Budgeted Hours – Standard Hours) × Standard Fixed Overhead Rate per hour.
6. Fixed Overhead Calendar Variance = (Revised Budgeted Hours – Budgeted Hours) × Standard Fixed Overhead Rate per hour.

Sales Variance

6.4

Sales Variances Based on Turnover:

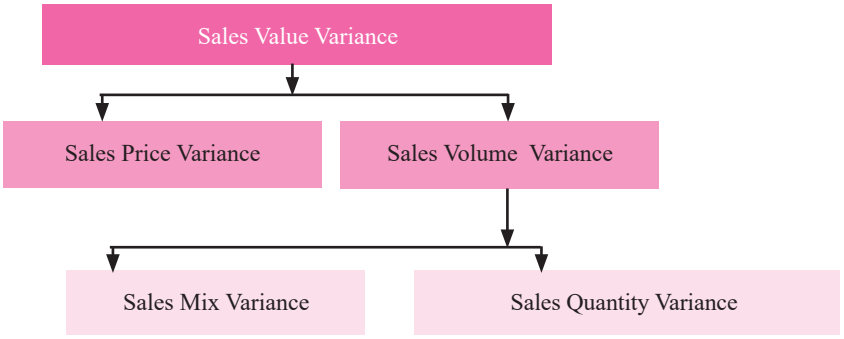


Figure 6.6 Classifications of Sales Variances Based on Turnover

Based on Turnover:

1. **Sales Value Variance**

The variance is due to the difference between budgeted sales and actual sales.

Sales Value Variance = Budgeted Value of Sales - Actual Value of Sales

or, Budgeted Sales - Actual Sales

Causes for Sales Value Variance

It may be due to the following reasons:

(i) Higher or lower selling prices charged to customers.

(ii) Sales discounts or allowances given to customers.

(iii) Variances due to volume

(iv) Variances due to sales mix of different products

(v) Finally, an account of quantity variance

Sales Value variance consists of following variance:

(a) Sales Price Variance

(b) Sales Volume Variance

2. **Sales Price Variance**

It is the portion of Sales Value Variance which is due to the difference between standard price of actual

quantity and actual price of the actual quantity of sales.

Sales Price Variance = Actual Quantity sold × (Standard Price - Actual Price)

or, = Standard Sales - Actual Sales

Illustration 26

XYZ & Co. manufactures and sells three products. It provides the following data for the month of September:

Budgeted Sales

Product	Units Sold (Units)	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,500	15	8
B	1,500	10	5
C	1,500	8	2

Actual Sales

A	1,100 units for ₹ 14,300
B	1,900 units for ₹ 17,100
C	3,000 units for ₹ 27,000

Calculate of Sales-price Variance.

Solution:

i. Sales Price Variance = Actual Quantity sold × (Standard Price - Actual Price)

ii. Substituting the values, we get:

Product A: 1,100 units (₹15 – ₹13) = 1,100 × 2 = ₹2,200 (A)

Product B: 1,900 units (₹10 – ₹9) = 1,900 × 1 = ₹1,900 (A)

Product C: 3,000 units (₹8 – ₹9) = 3,000 × 1 = ₹3,000 (F)

Sales price variance (Total) = ₹1,100 (A)

3. Sales Volume Variance

It is that part of Sales Value Variance which is due to the difference between the actual quantity or volume of sales and budgeted quantity or volume of sales.

Sales Volume Variance = Standard Price × (Budgeted Quantity - Actual Quantity);

or, = Budgeted Sales - Standard Sales.

Illustration 27

MTC manufactures and sells three products. It provides the following data for the month of October :

Budgeted Sales

Product	Units Sold (Units)	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,500	15	8
B	1,500	10	5
C	1,500	8	2

Actual Sales

A	1,100 units for ₹ 14,300
B	1,900 units for ₹ 17,100
C	3,000 units for ₹ 27,000

Calculate Sales-volume Variance.

Solution:

i. Sales Volume Variance = Standard Price × (Budgeted Quantity - Actual Quantity);

ii. Substituting the values, we get

Product A: ₹15 (1,200 – 1,500 units) = ₹15 × 400 = ₹6,000 (A)

Product B: ₹10 (1,900 – 1,500 units) = ₹10 × 400 = ₹4,000 (F)

Product C: ₹8 (3,000 – 1,500 units) = ₹8 × 1,500 = ₹12,000 (F)

Sales volume variance (Total) = ₹10,000 (F)

4. Sales Mix Variance

It is that portion of Sales Volume Variance which is due to the difference between the standard proportion of sales and the actual composition or mix of quantities sold.

Based on Quantity

Sales Mix Variance = Standard Price × (Revised Standard Quantity - Actual Quantity)

= Revised Standard Sales - Standard Sales

If actual quantity is more than the revised standard quantity, it will result in favourable variance or vice versa.

$$\text{Revised Standard Quantity} = \frac{\text{Total Quantity of Actual Mix}}{\text{Total Quantity of Standard Mix}} \times \text{Standard Quantity}$$

Based on Value

Sales Mix Variance = Revised Standard Sales × Standard Sales

Revised Standard Sales = Budgeted Ratio of Sales × Standard Sales

$$\text{Budgeted Ratio of Sales} = \frac{\text{Budgeted Sales of a Product}}{\text{Total Budgeted Sales}}$$

Illustration 28

Calculate Sales-mix variance:

Budgeted Sales

Product	Units Sold (Units)	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,500	15	8
B	1,500	10	5
C	1,500	8	2

Actual Sales

A	1,100 units for ₹ 14,300
B	1,900 units for ₹ 17,100
C	3,000 units for ₹ 27,000

Calculate Sales-mix Variance.

Solution:

Sales Mix Variance = Standard Price × (Revised Standard Quantity - Actual Quantity)

(i) Std value of actual mix is to be calculated as follows:

Product A: 1,100 units × ₹15 = ₹16,500

Product B: 1,900 units × ₹10 = ₹19,000

Product C: 3,000 units × ₹ 8 = ₹24,000

₹59,500

(ii) Revised std mix is to be calculated as follows:

Product A: $\frac{6,000 \text{ units} \times 1,500 \text{ units}}{4,500 \text{ units}}$ = 2,000 units

Product B: $\frac{6,000 \text{ units} \times 1,500 \text{ units}}{4,500 \text{ units}}$ = 2,000 units

Product C: $\frac{6,000 \text{ units} \times 1,500 \text{ units}}{4,500 \text{ units}}$ = 2,000 units

(iii) Std. value of revised std mix is calculated as:

Product A: 2,000 units × ₹15 = ₹30,000

Product B: 2,000 units × ₹10 = ₹20,000

Product C: 2,000 units × ₹ 8 = ₹16,000

₹66,000

(iv) Now, substituting the values in the formula, we get sales-mix variance = (₹59,500 – ₹66,000) = ₹6,500 (A)

5. Sales Quantity Variance

This is the difference between the Revised Standard quantity of sales and Budgeted sales quantity.

Sales Quantity Variance = Budgeted Sales – Revised Standard Sales

Illustration 29

XYZ & Co. manufactures and sells three products. It provides the following data for the month of September:

Budgeted Sales

Product	Units Sold (Units)	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,500	15	8
B	1,500	10	5
C	1,500	8	2

Actual Sales

A	1,100 units for ₹ 14,300
B	1,900 units for ₹ 17,100
C	3,000 units for ₹ 27,000

Calculate Sales Quantity Variance.

Solution:

Calculation of Sales Quantity variance:

i. Formula:

Sales Quantity variance = Std selling price per unit (Std proportion for actual sales - Budgeted qty of Sales)

ii. Substituting the values, we get:

Product A = ₹15 (2,000 units – 1,500 units) = ₹15 × 500 = ₹ 7,500 (F)

Product B = ₹10 (2,000 units – 1,500 units) = ₹10 × 500 = ₹ 5,000 (F)

Product C = ₹ 8 (2,000 units – 1,500 units) = ₹8 × 500 = ₹ 4,000 (F)

Sales quantity variance (Total) = ₹ 16,500 (F)

Sales Variances Based on Profit Margin:

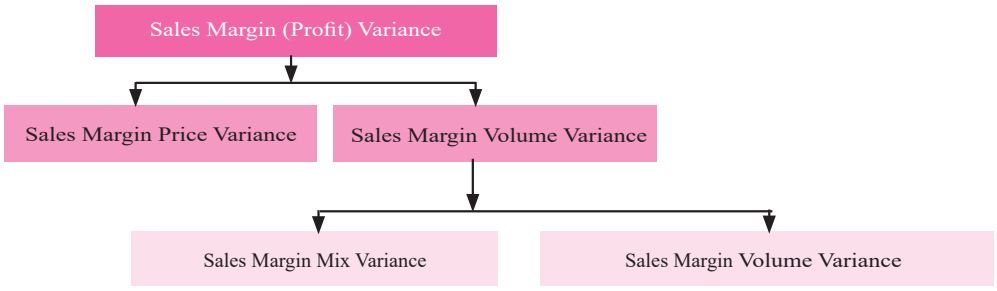


Figure 6.7 : Classifications of Sales Variances Based on Profit Margin

Based on Profit Margin:

1. Sales Margin Value Variance

This is the difference between the actual value of sales margin and budgeted value of sales margin.

Sales Margin Value Variance = Budgeted Profit - Actual Profit

2. Sales Margin Volume Variance

It is that portion of Total Sales Margin Variance which is due to the difference between budgeted and actual quantity sold.

Sales Margin Volume Variance = Budgeted Profit - Standard Profit.

or, = Standard Profit per unit × (Budgeted Quantity of Sales - Actual Quantity of Sales)

Illustration 30

Budgeted Sales

Product	Units Sold	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,000	15	8
B	1,000	10	5
C	1,000	8	2

	Actual Sales
A	800 units for ₹ 9,600
B	1,200 units for ₹ 10,800
C	1,500 units for ₹ 13,500

Calculate: (i) Actual Profit per unit, (ii) Sales Margin Volume Variance.

Solution:

Basic Calculations:

(i) Actual profit per unit is calculated as follows:

For Product A : Actual selling price per unit – (Budgeted selling price per unit – Standard profit per unit)

$$= \frac{₹\ 9,600}{800 \text{ units}} = ₹\ 12 – (₹\ 15 – ₹\ 8)$$

$$= ₹\ 12 – (7) = ₹\ 5$$

For Product B $$= \frac{₹\ 10,800}{1,200 \text{ units}} – (₹\ 10 – ₹\ 5)$$

$$= ₹\ 9 – (₹\ 5) = ₹\ 4$$

For Product C $$= \frac{₹\ 13,500}{1,500 \text{ units}} – (₹\ 8 – ₹\ 2)$$

$$= ₹\ 9 – (₹\ 6) = ₹\ 3.$$

Sales Margin Volume Variance= Standard Profit per unit ×(Budgeted Quantity of Sales - Actual Quantity of Sales).

(ii) Substituting the values, we get:

For Product A = ₹ 8 (1,000 units – 800 units) = ₹ 1,600 (A)

Product B = ₹ 5 (1,000 units – 1,200 units) = ₹ 1,000 (F)

Product C = ₹ 2 (1,000 units – 1,500 units) = ₹ 1,000 (F)

Total = ₹ 400 (F)

3. Sales Margin Price Variance

This variance is the difference between the standard price of the quantity of the sales effected and the actual price of those sales.

Sales Margin Price Variance = Standard Profit – Actual Profit

or, = Actual Quantity of Sales × (Standard Profit per unit – Actual Profit per unit)

Illustration 31

The sales manager of a company that produces and sells three products A, B and C, provides you the following information for the month of August:

Budgeted Sales

Product	Units Sold	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,000	15	8
B	1,000	10	5
C	1,000	8	2

	Actual Sales
A	800 units for ₹ 9,600
B	1,200 units for ₹ 10,800
C	1,500 units for ₹ 13,500

Calculate: (i) Actual Profit per unit, (ii) Sales Margin Price Variance.

Solution:

Basic Calculations:

(i) Actual profit per unit is calculated as follows:

For Product A : Actual selling price per unit – (Budgeted selling price per unit – Standard profit per unit)

$$= \frac{₹\ 9,600}{800 \text{ units}} = ₹\ 12 – (₹\ 15 – ₹\ 8)$$

$$= ₹\ 12 – (7)$$

$$= ₹\ 5$$

For Product B $$= \frac{₹\ 10,800}{1,200 \text{ units}} – (₹\ 10 – ₹\ 5)$$

$$= ₹\ 9 – (₹\ 5)$$

$$= ₹\ 4$$

For Product C $$= \frac{₹\ 13,500}{1,500 \text{ units}} – (₹\ 8 – ₹\ 2)$$

$$= ₹\ 9 – (₹\ 6)$$

$$= ₹\ 3$$

Calculation of Sales-Price Variance:

(ii) Sales Margin Price Variance = Actual Quantity of Sales ×(Standard Profit per unit – Actual Profit per unit).

Substituting the values for each product, we get

Product A = 800 units (₹ 8 – ₹ 5) = ₹ 2,400 (A)

Product B = 1,200 units (₹ 5 – ₹ 4) = ₹ 1,200 (A)

Product C = 1,500 units (₹ 2 – ₹ 3) = ₹ 1,500 (F)

Total = ₹ 2,100 (A)

4. Sales Margin Mix Variance

This is that portion of the Sales Margin Volume or Quantity Variance which is due to the difference between the actual and budgeted quantities of each product of which the sales mixture is composed valuing the difference of quantities at standard margin.

Sales Margin Mix Variance = Revised Standard Profit - Standard Profit

or = (Revised Standard Quantity - Actual Quantity) × Standard Profit per unit or Budgeted Profit per unit

5. Sales Margin Quantity Variance

This variance arises due to the difference between, Budgeted Sales Quantity and Revised Standard Sales Quantity.

Sales Margin Quantity Variance = Budgeted Profit - Revised Standard Profit

Illustration 32

Budgeted Sales

Product	Units Sold	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,000	15	8
B	1,000	10	5
C	1,000	8	2

Actual Sales

A	800 units for ₹ 9,600
B	1,200 units for ₹ 10,800
C	1,500 units for ₹ 13,500

Calculate Sales Margin Quantity Variance.

Solution:

Calculation of Sales Margin Quantity Variance:

i. Sales Margin Quantity Variance = Budgeted Profit - Revised Standard Profit

ii. Substituting the values, we get

For Product A	= ₹8 (1,166 – 1,000) = 8 × 166	= ₹ 1,328 (F)
Product B	= ₹5 (1,167 – 1,000) = 5 × 167	= ₹ 835 (F)
Product C	= ₹2 (1,167 – 1,000) = 2 × 167	= ₹ 334 (F)
	Total	= ₹ 2,497 (F)

Illustration 33

Budgeted and actual sales for the month of December, 2022 of two products A and B of M/s. XY Ltd. were as follows:

	Budgeted		Actual	
Product	**Budgeted Units**	**Sales Price/Unit (₹)**	**Actual Units**	**Sales Price / Unit (₹)**
A	6,000	₹5	5,000	5.00
			1,500	4.75
B	10,000	₹2	7,500	2.00
			1,750	8.50

Budgeted costs for Products A and B were ₹4.00 and ₹1.50 unit respectively. Work out from the above data the following variances.

Sales Volume Variance, Sales Value Variance, Sales Price Variance, Sales Sub Volume Variance, Sales Mix Variance.

Solution:

Product	(1)	(2)	(3)	(4)
	AQAP (₹)	AQSP (₹)	RSQSP (₹)	SQSP (₹)
A	5,000 × 5.00	6,500 × 5	5,906.25 × 5	6,000 × 5
	1,500 × 4.75			
B	7,500 × 2.00			
	1,750 × 1.90	9,250 × 2	9,843.75 × 2	10,000 × 2
A	25,000	32,500	29,531.25	30,000
	7,125			
B	15,000			
	3,325	18,500	19,687.5	20,000
Total	**₹50,450**	**₹51,000**	**₹49,219**	**₹50,000**

Revised Standard Quantity for

A = 6,000/16,000 × 15,750 = 5,906.25 units

B = 10,000/16,000 × 15,750 = 9,843.75 units

1. AQAP = Actual Sales = ₹50,450
2. AQSP= Actual Quantity of Sales at Standard Price = ₹51,000
3. RSQSP = Revised Budgeted or Standard Sales = ₹49,219
4. SQSP = Standard or Budgeted Sales = ₹50,000

   a. Sales Sub Volume or Quantity Variance = 3 – 4 = ₹781 (A)

   b. Sales Mix Variance = 2 – 3 = ₹1,781 (F)

   c. Sales Volume Variance = 2 – 4 = ₹1,000 (F)

   d. Sales Price Variance = 1 – 2 = ₹550 (A)

   e. Sales Value Variance = 1 – 4 = ₹450 (F)

Important Notes

(a) Budgeted Sales =Budgeted Quantity of Sales×Standard Selling Price per unit/ Budgeted Selling Price per unit.

(b) Actual Sales = Actual Quantity of Sales × Actual Selling Price per unit

(e) Standard Sales = Actual Quantity of Sales × Standard Selling Price per unit

(d) Revised Standard Sales:

(i) Based on Quantity

Total Quantity of Actual Mix ÷ Total Quantity of Standard Mix × Standard Quantity × Standard Price per unit.

(ii) Based on value:

Budgeted Ratio on Sales × Standard Sales

Budgeted Ratio on Sales = Budgeted Sales of a Product ÷ Total Budgeted Sales

Interpretation of Variances and Inferences Drawn

6.5

The purpose of standard cost accounting is to control costs and promote efficiency. This system is not another accounting method for accumulating manufacturing costs, but it is used in conjunction with such methods as job order, process costing. Standard costing is based on a predetermination of what it should cost to manufacture a product, and the inventory accounts are debited for these standard costs. A comparison is then made between these standard costs and the actual costs that were incurred. Any deviation from the standards can be quickly detected and responsibility pinpointed so that the company can take appropriate action to eliminate inefficiencies or take advantage of efficiencies.

This is known as management by exception, where both significant unfavourable and favourable differences from standard are the focal point of management attention.

A standard is a norm against which the actual performance can be measured. The objective of setting standards is to measure efficiency and to monitor costs by assigning responsibility for deviations from the standards.

Also, a standard can motivate employees by providing a goal for achievement, but a question that often arises is, ''what is the proper standard to use?'' A company can estimate materials, labour, and factory overhead usage and costs, but what about the unforeseen costs, such as spoilage, lost time, and equipment breakdowns? Should these items be considered in determining the standard cost to manufacture a product?

Some companies set their standards at the maximum degree of efficiency. Using such an ideal standard, they determine costs by considering estimated materials, labour, and overhead costs; the condition of the factory and machinery; and time for rest periods, holidays, and vacations—but make no allowances for inefficient conditions such as lost time, waste, or spoilage. This ideal standard can be achieved only under the most efficient operating conditions; therefore, it is practically unattainable, generally giving rise to unfavourable variances. Companies using this type of standard feel that it provides a maximum objective for which to strive in the attempt to improve efficiency. There is, however, a psychological disadvantage—factory personnel may become discouraged and lose their incentive to meet standards that are usually impossible to attain except under perfect operating conditions.

Recognizing this potential problem, most companies set attainable standards that include such factors as lost time and normal waste and spoilage. These companies realize that some inefficiency cannot be completely eliminated, so they design standards that can be met or even bettered in efficient production situations. The primary concern of the manufacturer should be to set standards that are high enough to provide motivation and promote efficiency, yet not so high that they are unattainable and, thus, bad for worker morale.

Standard Costing guides as a measuring rod to the management for determination of "Variances" in order to evaluate the production performance. The term "Variances" may be defined as the difference between Standard Cost and Actual Cost for each element of cost incurred during a particular period. The term "Variance Analysis" also may be defined as the process of analyzing variance by subdividing the total variance in such a way that management can assign responsibility for Off-Standard Performance.

The variance may be favourable variance or unfavourable variance. When the actual performance is better than the Standard, it resents "Favourable Variance." Similarly, where actual performance is below the standard it is called as "Unfavourable Variance."

Once the variances have been calculated, those who manage the business have to decide which variances should be investigated. Should every adverse variance be investigated? Such an investigation takes time and so itself involves a further cost in searching for a cause. Is it worth incurring this further cost to find out what happened to the costs under investigation? Such an investigation might unearth some unwelcome facts about the world beyond accounting. It has been suggested that the accountant feels 'safe' in a separate accountant's world. Perhaps no one, other than the management accountant. One extreme conclusion which might be drawn is that it is safer to avoid any type of investigation.

It is fairly obvious that a reasonable answer lies between the two extremes of investigating everything and investigating nothing. Nevertheless, it may be useful to think about the extreme cases in order to justify the middle ground. Many who take a traditional approach prefer to use judgement in deciding which variance to investigate.

Such persons would run their eye down the variance report, item by item, using their knowledge and experience to identify variances for further investigation. That approach is called 'intuition' and is fine for the experienced manager, but risky when applied by a trainee or someone not familiar with the operational factors behind the variances.

If the accounting information is being processed by computer, it is often convenient to let the computer do the work of highlighting the variances for investigation. So some systematic approach is needed.

This may be achieved by setting a filter rule which filters out the unimportant but draws attention to the matters regarded as significant. This might be, 'Investigate all variances which are more than 10 per cent of the total standard cost of this cost centre'. It might be, 'Investigate all variances which are more than ₹10,000 in amount each month'. Establishing filters is a matter of experience and judgement in order to ensure that no significant difference by amount is overlooked.

Using filters may not always be the perfect approach. The choice of what is important may vary depending on the nature of the variance or the nature of the cost item. Using the filter does not take into account the costs and benefits of variance investigation.

It does not incorporate the past history of performance in that item, where inefficiencies are persisting through lack of remedial action. The item may be one where the variance has suddenly worsened dramatically, but still falls within the filter limits. For example, where a cost item has habitually shown a variance within three per cent of standard cost but then suddenly increases to 12 per cent that could be highly significant.

The selection of variances for investigation is therefore very much dependent on circumstances and on the person making the selection.

Illustration 34

Computation of All Variances

The following information related to a manufacturing concern:

Standard	₹
Material A: 24,000 kgs @ ₹ 3 per kg	72,000
Material B: 12,000 kgs @ ₹4 per kg	48,000
Wages: 60,000 hours @ ₹ 4 per hour	2,40,000

Variable Overheads: 60,000 hours @ ₹ per hour	60,000
Fixed Overheads: 60,000 hours @ ₹2 per hour	1,20,000
Total Cost	5,40,000
Budgeted Profit	60,000
Budgeted Sales	6,00,000
Budgeted Production (units)	12,000

Actual	₹
Sales (9,000 units)	4,57,500
Material A Consumed: 22,275 kgs.	62,370
Material B Consumed: 10,890 kgs.	44,649
Wages Paid (48,000 hours)	1,91,250
Fixed Overhead	1,20,900
Variable Overhead	45,000
Labour Hours worked	47,700
Closing (Work in Progress)	900 units
Degree of Completion	
Material A and B	100%
Wages and Overheads	50%

You are required to calculate all the variances.

Solution:

Workings:

In order to calculate Cost Variances, a Statement of Equivalent Production is prepared first and to prepare the statements showing Standard and Actual Cost of Materials, which are shown as under:

Equivalent Production in Units

Particulars	Direct Materials		Labour & Overhead	
Units Completed	100%	9,000	100%	9,000
Work-in-Progress	100%	900	50%	450
Total Equivalent Units		9,900		9,450

Standard and Actual Cost of Material

Material	Standard Cost of 9,900 units			Actual Cost of 9,900 units			
	Qty. (Kg.) [SQ]	Rate (₹) [SP]	Amt (₹) [SQ × SP]	Qty. (Kg.) [AQ]	Rate (₹) [AP]	Amt (₹) [AQ × AP]	Amt (₹) [AQ × SP]
A	19,800	3	59,400	22,275	2.80*	62,370	66,825
B	9,900	4	39,600	10,890	4.10*	44,649	43,560
Total	29,700		99,000	33,165		1,07,019	1,10,385

Calculation of Cost Variances:

Computation of Material Cost Variances:

Material Cost Variance = Standard Cost – Actual Cost = SQ × SP – AQ × AP

SQ = Standard Qty for Actual Production

AQ = Actual Qty for actual Production

SP = Standard Price per kg

AP = Actual Price per kg

Material A = ₹39,600 – ₹43,065

= ₹3,465 (A)

Material B = ₹26,400 – ₹29,750

= ₹3,350 (A)

Total = ₹6,851 (A)

Material Price Variance = Standard Cost of Actual Quantity – Actual Cost

= AQ × SP – AQ × AP = AQ × (SP – AP)

Material A = 14,850 kg. × (₹3.00 – ₹2.90) = ₹1,485 (F)

Material B = 7,260 kg. × (₹4.00 – ₹4.09) = ₹710 (A)

Total = ₹775 (F)

Material Usage Variance = Standard Cost of Standard Quantity for Actual Output – Standard Cost of Actual Quantity

= SQ × SP – AQ × SP = SP × (SQ – AQ)

Material A = ₹3 × (13,200 kg. – 14, 850 kg.)

= ₹4,950 (A)

Material B = ₹4 × (6,600 kg. – 7,260 kg.)

= ₹2,640 (A)

Total = ₹7,590 (A)

Material Mix Variance = Total Actual Quantity (units) × (Average Standard Price per unit of Standard Mix – Average standard Price per unit of Actual Mix)

$$= 22{,}110 \text{ kg.} \times \left(\frac{₹\ 66{,}000}{19{,}800 \text{ Kg.}} - \frac{₹\ 73{,}590}{22{,}110 \text{ Kg.}} \right)$$

= ₹110 (F)

Material Yield Variance = Average Standard Price per unit of Standard Mix × [Total Standard Quantity (units) – Total Actual Quantity (units)]

$$= \left(\frac{₹\ 66{,}000}{19{,}800 \text{ Kg.}} \right) \times (19{,}800 \text{ kg.} - 22{,}110 \text{ kg.})$$

= ₹ 7,700 (A)

Computation of Direct Labour Variances:

Labour Cost Variance = Standard Cost – Actual Cost = SH × SR – AH × AR

= (₹6,300 units × 5 hours) × ₹4 – ₹1,27,500

= ₹1,500 (A)

SH = Standard Hours of Actual Production

AH = Actual Hours Paid

SR = Standard Rate per hour

AR = Actual Rate per hour

Labour Rate Variance = Standard Cost of Actual Time – Actual Cost

= SR × AH – AR × AH = (SR – AR) × AH

$= \left(₹\ 4 - \frac{₹\ 1,27,500}{32,000\ \text{hours}}\right) \times 32,000\ \text{hours}$

= ₹ 500 (F)

Labour Efficiency Variance = Standard Cost of Standard Time for Actual Production – Standard Cost of Actual Time

= (SH × SR) – (AH × SR) = (SH – AH) × SR

AH = Actual Hours Worked

= ₹400 × (6,300 units × 5 hours – 31,800 hours)

= ₹1,200 (A)

Idle Time Variance = Standard Rate Hour × Actual Idle Hours = (AH × SR) – (AH × SR)

= (AH – AH) × SR

= ₹4.00 × (32,000 hours – 31,800 hours)

= ₹800 (A)

Computation of Variable Overhead Variances:

Cost Variance = Standard Variable Overheads for Production – Actual Variable Overheads

= 6,300 units × ₹5 – ₹30,000

= ₹1,500 (F)

Expenditure Variance = Budgeted Variable Overheads for Actual Hours – Actual Variable Overheads

= 31,800 hours × ₹1 – ₹30,000

= ₹1,800 (F)

Efficiency Variances = Standard Variable Overheads for Production – Budgeted Variable Overheads for Actual Hours

= 6,300 units × ₹5 – 31,800 hours × ₹1

= ₹300 (A)

Computation of Fixed Overheads Variances:

Cost Variances = Absorbed Fixed Overheads – Actual Fixed Overheads
= 6,300 units × ₹10.00 – ₹80,600
= ₹63,000 – ₹80,600
= ₹17,600 (A)

Expenditure Variance = Budgeted Fixed Overheads - Actual Fixed Overheads
= 8,000 units × ₹10.00 – 80,600
= ₹80,000 – ₹80,600
= ₹600 (A)

Volume Variance = Absorbed Fixed Overheads – Budgeted Fixed Overheads
= ₹63,000 – ₹80,000
= ₹17,000 (A)

Efficiency Variance = Absorbed Fixed Overheads – Budgeted Fixed Overheads for Actual Hours
= ₹63,000 – ₹2.00 × 31,800 hours
= ₹600 (A)

Capacity Variance = Budgeted Fixed Overheads for Actual Hours - Budgeted Fixed Overheads
= ₹2.00 × 31,800 hours – ₹80,000
= ₹16,400 (A)

Computation of Sales Variances:

Value Variance = Actual Sales – Budgeted sales
= AP × AQ – BP × BQ
= ₹3,05,000 – ₹50 × 8,000 units
= ₹95,000 (A)

Price Variance = Actual Sales – Standard Sales
= AP × AQ – BP × AQ
Or
= AQ × (AP – BP)
= ₹3,05,000 – 6,000 units × ₹50
= 5,000 (F)

Volume Variance = Standard Sales – Budgeted Sales
= BP × AQ – BP × BQ
Or
= BP × (AQ – BQ)

= ₹50 × (6,000 units – 8,000 units)

= ₹1,00,000 (A)

Computation of Sales Margin Variances:

Sales Margin Price Variance = Sales Price Variance

= 5,000 (F)

Sales Volume Variance = Sales Volume Variance x Budgeted Net Profit Ratio

= 1,00,000 (A) × ((₹5)/(₹50) × 100)

= ₹10,000 (A)

Margin Variance = Sales Margin Price Variance + Sales Margin Volume Variance

= ₹5,000 (F) + ₹10,000 (A)

= ₹5,000 (A)

Control Ratios in the context of Variance Analysis:

In addition to variances, certain control ratios are commonly used by the management for the use in controlling operations. These ratios are generally expressed in terms of percentage. If the ratio is 100% or above, it indicates Favorable position and vice versa. Three important ratios are given below:

Efficiency Ratio:

It is defined as the standard hour equivalent to the work produced expressed as a percentage of actual hours spent in production. Thus, this ratio shows whether actual time taken in production is more or lesser than the time allowed by the standard. It's formula are as follows:

Efficiency Ratio = (Standard hours for actual output ÷ Actual hours worked) × 100

Activity Ratio:

It is defined as the standard hour equivalent to the work produced expressed as a percentage of budgeted standard hours. This ratio shows the extent to which the production facilities have been utilized as compared with that contemplated in budgets. Its formula is:

Activity Ratio = (Standard hours for actual output ÷ Budgetary hours) × 100

Capacity Ratio:

It shows the relation, between actual hours worked and the budgeted hours. Its formula is:

Capacity Ratio = (Actual hours worked ÷ Budgetary hours) × 100

Illustration 35 (Problem on Control Ratios)

Calculate Efficiency and Capacity ratio from the following figures:

Budgeted production	80 units
Actual production	60 units
Standard time per unit	8 hours
Actual hours worked	500 hours.

Solution:

Efficiency Ratio = (Standard hours for actual output ÷ Actual hours worked) × 100
= [(60 units × 8 hours) ÷ 500 hours] × 100 = 96%

Capacity Ratio = (Actual hours worked ÷ Budgetary hours) × 100
= (500 hours ÷ 80 units × 8 hours) × 100 = 78.12%

Solved Illustrations & Cases

Illustration 36

The Management of your company have provided you the following data. The Company manufactures a single product for which the standard variable cost is:

	₹ per unit
Direct material 81 kg @ ₹7 per kg	567
Direct labour 97 hours @ ₹ 4 per hour	388
Variable overhead 97 hours @ ₹ 3 per hour 291	1,246

During February, 530 units were produced and the costs incurred were as follows:

Direct material: 42,845 kg purchased and used; cost ₹ 3,08,484

Direct labour: 51,380 hours worked; cost ₹ 2,00,382

Variable overhead: cost ₹ 1,56,709

You are a newly appointed Cost Accountant and the management is asking you to make necessary calculations, showing the variances, if any with respect to Material, Labour and Variable overhead.

The Standard Costing is in operation.

Solution:

(a) Direct Material Total/Cost Variance:

	Amount (₹)
530 units should cost @ ₹ 567 per kg	3,00,510
But did cost	3,08,484
Total direct material cost variance	7,974 (A)

Note:

This is an adverse variance because actual cost exceeds standard, hence causing actual profit to be less than budget.

This variance can now be analysed into its 'price' and 'quantity' elements.

(b) Direct Material Price Variance:

The direct material price variance reveals how much of the direct material total variance was caused by paying a different price for the materials used.

	Amount (₹)
42,845 kg purchased should have cost @ ₹ 7 per kg	2,99,915
But did cost	3,08,484
Direct material price variance	8,569 (A)

The adverse price variance indicates that expenditure was ₹8,569 more than standard because a higher than standard price was paid for each kg of material

Material Usage Variance:

(Actual production × standard material cost per unit)- (actual material used × standard cost per unit of materials).

or, (Standard Quantity for Actual Output – Actual Quantity) × Standard Price per kg.

= (42,930 – 42,845) × ₹7 per kg = ₹ 595 (F).

This is because actual quantities consumed are less than the standard quantities for actual output.

(a) Direct Labour Total /Cost Variance:

	Amount (₹)
530 units should cost @ ₹388 per unit	2,05,640
But did cost	2,00,382
Total direct labour cost variance	5,258 (F)

Note:

This is a favourable variance because actual cost is less than standard This variance can now be analysed into its 'price' and 'quantity' elements. The 'price' part is called the labour rate variance and the 'quantity' part is called the labour efficiency variance.

(b) Direct Labour Rate Variance:

Labour rate variance:

(Actual hours paid × standard labour rate per hour) - (Actual hours paid × actual direct labour rate per hour).

The direct labour rate variance reveals how much of the direct labour total variance was caused by paying a different rate for the labour hours worked.

	Amount (₹)
51,380 hours should have cost@ ₹4	2,05,520
But did cost	2,00,382
Direct labour rate variance	5,138(F)

The favourable rate variance indicates that expenditure was ₹5,138 less than standard because a lower than standard rate was paid for each hour of labour.

(c) Direct Labour Efficiency Variance:

The direct labour efficiency variance reveals how much of the direct labour total variance was caused by using a different number of hours of labour, compared with the standard allowance for the production achieved.

	Hours
530 units produced should take @ 97 hours	51,410
But did take	51,380
Variance	30 (F)
X standard labour rate per hour ₹4	
Direct labour efficiency variance	₹120 (F)

The favourable efficiency variance of ₹ 120 is the saving in labour cost (at standard rates) resulting from using fewer labour hours than the standard expected for this level of output.

Labour efficiency variance:

= (Standard hours for actual production – Actual Hours) × Standard labour rate per hour

= (51,410 - 51,380) × ₹4 = ₹ 120 (F)

(a) Variable overhead total/ cost variance:

	Amount (₹)
530 units should cost @ ₹ 291	1,54,230
But did cost	1,56,709
Total variable overhead cost variance	2,479 (A)

This variance can now be analysed into its 'price' and 'quantity' elements. The 'price' part is called the variable overhead expenditure variance and the 'quantity' part is called the variable overhead efficiency variance.

(b) Variable overhead expenditure variance:

Actual overhead cost incurred × (Actual hours worked × standard variable production overhead absorption rate per hour).

The variable overhead expenditure variance reveals how much of the variable overhead total variance was caused by paying a different hourly rate of overhead for the hours worked.

	Amount (₹)
51,380 hours of variable overhead should cost ₹3	1,54,140
But did cost	1,56,709
Variable overhead expenditure variance	2,569(A)

The adverse expenditure variance indicates that expenditure was ₹2,569 more than standard because a higher than standard hourly rate was paid for variable overhead.

(c) Variable overhead efficiency variance:

The variable overhead efficiency variance reveals how much of the variable overhead total variance was caused by using a different number of hours of labour, compared with the standard allowance for the production achieved. Its calculation is very similar to the calculation of the labour efficiency variance

Variable overhead efficiency variance

= (Standard hours for actual production – Actual hours) × Standard variable overhead rate per hour.

= (51,410 - 51,380) × ₹ 3 per hour = ₹90 (F).

Illustration 37

The standard cost card shows the following details relating to the materials needed to produce 1 kg of a product:

Quantity of materials required: 3 kg

Price of material: ₹ 2.5/kg

Actual production data are given as follows:

Production during the month: 1,000 kg

Quantity of material used: 3,500 kg

Price of material: ₹ 3/kg

Required:

Calculate the material cost variance

Calculate the material price variance

Material usage variance

Solution:

Standard Quantity (SQ) = 1,000 kg of production × 3kg = 3,000 kg

Standard Price (SP) = ₹ 2.5/kg

Actual Quantity (AQ) = 3,500 kg

Actual Price (AP) = ₹ 3/kg

Now, the variances can be calculated as follows:

(1) Material Cost Variance = Standard Cost – Actual Cost

= (SQ × SP) – (AQ × AP)

= (3,000 × 2.50) – (3,500 × 3)

= ₹ 3,000 (A)

(2) Material Price Variance = (SP-AP) × AQ

= (₹ 2.50 – ₹ 3) × 3,500

= ₹ 1,750 (A)

(3) Material Usage Variance = (SQ – AQ) × SP

= (3,000 – 3,500) × ₹ 2.50 = ₹ 1,250 (A)

Illustration 38

A manufacturing concern which has adopted standard costing furnishes the following information:

Standard: Materials for 70 kgs of finished product 100 kgs., Price of materials ₹ 1 per kg.

Actual: Output 2,10,000 kgs.

Material used 2,80,000 kgs.

Cost of materials ₹ 2,52,000

Calculate: (a) Material Usage Variance; (b) Material Price Variance; (c) Material Cost Variance.

Solution:

(a) Material Usage Variance

(SQ – AQ) × SP

For 70 kgs of finished output, material allowed = 100 kgs.

For 2,10,000 kgs. of actual output, material allowed =100/70× 2,10,000 kgs. = 3,00,000 kgs.

(3,00,000 – 2,80,000) × ₹ 1 = ₹ 20,000 (F).

(b) Material Price Variance

(SP – AP) × AQ

Actual Price per kg. =Cost of material/Qty. of materials used = ₹ 2,52,000/2,80,000 = ₹ 0.90

2,80,000 (1 – 0.90) = ₹ 28,000 (F).

(c) Material Cost Variance

(SQ × S P) – (AQ × AP)

(3,00,000 × ₹ 1) – (2,80,000 ×₹ 0.90)

₹ 3,00,000 – ₹ 2,52,000 = ₹48,000 (F)

Illustration 39

From the following you are required to calculate

(a) Material Usage Variance

(b) Material Price Variance

(c) Material Cost Variance

Quantity of material purchased 3,000 units

Value of material purchased ₹ 9,000

Standard quantity of material required for one tonne of finished product 25 units

Standard rate of material ₹ 2 per unit

Opening stock of material NIL

Closing stock of material 500 units

Finished production during the period 80 units

Solution:

SQ = Standard Quantity for Actual Production = 25 × 80 = 2,000 units.

AQ = Actual Quantity = 2,500 units (3,000 units – 500 units)

SP = Standard Price =₹ 2

AP = Actual Price = ₹3

SQ × SP = Standard Cost of Standard Material = 2,000 × 2 = ₹ 4,000

AQ × SP = Standard Cost of Actual Material = 2,500 × 2 = ₹ 5,000

AQ × AP = Actual Cost of Material = ₹ 7,500 (2,500 units × ₹ 3 per unit)

Computation of Material Variances:

a. Material usage variance = SQ × SP - AQ × SP = ₹ (4,000 – 5,000) = ₹ 1,000 (A)

b. Material price variance = AQ × SP – AQ × AP = ₹ (5,000 – 7,500) = ₹ 2,500 (A)

c. Material cost variance = SQ × SP – AQ × AP = (4,000 – 7,500) = ₹ 3,500 (A)

Illustration 40

Z Limited maufactures a standard product. The standard mix of it is:

Material X: 60% at ₹15 per kg.

Material Y: 40% at ₹10 per kg.

Normal loss in output is 20 percent of input due to shortage of material Y. The actual results for May, 2022 were:

Material X: 210 kg at ₹16 per kg.

Material Y: 190 kg at ₹10.50 per kg.

Actual output: 330 kg.

You are required to calculate:

(i) Material Cost Variance

(ii) Material Price Variance

(iii) Material Usage Variance

(iv) Material Mix Variance

(v) Material Yield Variance

Solution:

Working notes:

1. Total SQ for Actual output= 330 × 100÷80 = 412.50 kg.

   Standard Quantity for X = 412.50 × 60% = 247.50 kg.

   Standard Quantity for Y = 412.50 × 40 % = 165.00 kg.

2. RSQ = Total Actual quantity × Standard proportion

Revised Standard Quantity for X = (210 + 190) = 400 × 60% = 240 kg.

Revised Standard Quantity for Y = = (210 + 190) = 400 × 40% = 160 kg.

3. Standard Yield (SY) by using actual quantity: 400kg × 80% = 320 kg.

Computation of Material Variances:

(i) Material Cost Variance = (SQ × SP) – (AQ × AP)

For material X: (247.5 × ₹15) – (210 × ₹16)

= ₹ 3712.50 – ₹ 3,360 = ₹ 352.50 (F)

For material Y: (165 × ₹ 10) – (190 × ₹ 10.50) = ₹ 1,650 – ₹ 1,995 = ₹ 345 (A)

Total Material Cost Variance = ₹ 7.50 (F)

(ii) Material Price Variance = AQ (SP – AP)

For X : 210 (₹ 15 – ₹ 16) = ₹ 210 (A)

For Y : 190 (₹ 10 – ₹ 10.50) = ₹ 95 (A)

Total Material Price Variance = ₹ 305 (A)

(iii) Material Usage Variance = SP (SQ – AQ)

For X: ₹15 (247.50 – 210) = ₹562.50 (F)

For Y : 10 (165 – 190) = ₹ 250.00 (A)

Total Material Usage Variance = ₹ 312.50 (F)

(iv) Material Mix Variance = SP (RSQ – AQ)

For X: ₹ 15 (240 – 210) = ₹ 450 (F)

For Y: ₹ 10 (160 – 190) = ₹ 300 (A)

Total Material Mix Variance = ₹ 150 (F)

(v) Material Yield Variance = Standard Cost per unit (SC) (AY – SY)

= ₹ 16.25 (330 – 320)

= ₹ 162.50(F)

Standard Cost (SC) per unit = ₹ 16.25, calculated as under:

X : 247.50 × ₹15 = ₹3712.50

Y : 165 × ₹ 10 = ₹1650.00

₹5,362.50

Total Standard Cost for 330 units of output = ₹ 5362.50

Hence, SC per unit = ₹ 5362.50 ÷ 330= ₹ 16.25

Illustration 41

The following data is obtained from the cost record of ABC Limited:

Standard Mix		Actual Mix	
Material X	120 kg. @ ₹25	Materials X	110 kg. @ ₹ 30
Material Y	80 kg. @ ₹50	Material Y	90 kg. @ ₹ 45
	200 kg.		200 kg.
Less: Loss 30%	60 kg.	Less: Loss 25%	50 kg.
Output	**140 kg.**	Output	**150 kg.**

You are required to find out the following material variances:

(i) Cost Variance;
(ii) Price Variance;
(iii) Usage Variance;
(iv) Mix Variance;
(v) Yield Variance.

Solution:

Working Notes:

1. Calculation of Total Standard Material Cost or (SQ × SP):

   Material X: 120 × ₹ 25 = 3,000

   Material Y: 80 × ₹ 50 = 4,000

   Total Standard cost of output of 140kgs = 7,000

   Hence, Total Standard Cost for Actual Output 150 kg = ₹ 7000÷140 × 150 = ₹ 7500

   Hence, per unit standard cost of output = ₹ 7,500/150 = ₹ 50

2. Total Actual Cost or (AQ x AP):

Material X	110 × ₹30 =	₹ 3,300
Material Y	90 × ₹ 45 =	₹ 4,050
Total Actual Cost =		₹ 7,350

3. (AQ x SP) =

Material X	110 × ₹ 25 =	₹ 2,750
Material Y	90 × ₹ 50 =	₹ 4,500
		₹ 7,250

4. Revised Standard Quantity (RSQ) For Material X :

   (Total AQ 200 ÷ Total Standard Quantity 200) × Standard Quantity for Mateial X i.e., 120 = 120 kg.

   Similarly, RSQ for Material Y = 80 kg.

5. (RSQ × SP) =

Material X	120 × ₹ 25 =	₹ 3,000
Material Y	80 × ₹ 50 =	₹ 4,000
		₹ 7,000

Computation of Variances:

(i) Material Cost Variance = Total Standard Cost – Total Actual Cost = ₹7,500 – ₹ 7,350 = ₹ 150 (F)

(ii) Material Price Variance= AQ (SP-AP) or (AQ × SP) - (AQ × AP) = ₹ 7,250 – ₹7,350 = ₹100 (A)

(iii) Material Usage Variance = SP (SQ-AQ) or (SP × SQ) - (SP × AQ) = ₹ 7,500 – ₹ 7,250 = ₹ 250 (F)

(iv) Material Mix Variance = SP (RSQ-AQ) or (SP × RSQ) - (SP × AQ) = ₹7,000 – ₹7,250 = ₹ 250(A)

(v) Material Yield Variance = Standard Cost per unit (AY – SY) = ₹ 50 (150-140) = ₹500 (F)

Illustration 42

The standard and actual figures of M Limited are as under:

Standard time for the job: 800 hours

Standard rate per hour: ₹ 60

Actual wages paid: ₹50,688

Actual rate per hour: ₹64

You are required to:

Compute Labour Cost Variance; Labour Rate Variance; and Labour Efficiency Variance.

Solution:

Computation of Labour Variances:

Labour Cost Variance = Total Standard Cost of labour –Total Actual Cost of labour or (SH × SR) – (AH × AR) = (800 × ₹60) – (792 × ₹ 64) = ₹48,000 – ₹50,688 = ₹ 2,688 (A)

Labour Rate Variance = AH (SR – AR) = 792 (₹ 60 – ₹ 64) = ₹3,168(A)

Labour Efficiency Variance = SR (SH – AH) = ₹ 60 (800 – 792) = ₹ 480 (F)

Note: Actual Hours Worked (AH) = ₹50,688/₹64=792 hours

Illustration 43

Calculate Labour Variances from the following data:

Standard:

Number in the gang 80 Men and 40 Women

Wage Rate per hour: ₹ 45 for man and ₹ 40 for woman

Output per gang hour: 50 Units

Gang-hours in a five-day week: 40

Actual:

Number in the gang: 64 Men and 56 Women

Wage Rate per hour: ₹ 50 for a Man and ₹ 25 for a Woman

Actual gang hours paid for: 40

Actual gang hours worked: 39

Actual output: 2400 Units

Solution:

Labour Cost Variance: Total Standard Labour Cost – Total Actual Labour Cost

Standard Labour Cost of 50 Units:

Men: 80 × 45 = ₹3,600

Women: 40 × 40 = ₹1,600

Total = ₹5,200

Standard Labour Cost of 2400 Units = 2400 × 5200 ÷50 = ₹ 2,49,600

Actual Labour Cost of 2400 Units:

Men: 64 × 40 × 50 = ₹ 1,28,000

Women: 56 × 40 × 25 = ₹ 56,000

Total = ₹ 1,84,000

Labour Cost Variance = ₹ (249600 – 184000) = ₹ 65,600 (F)

Labour Rate Variance = (SR – AR) x AH

Men: (45 –50) × (64 × 40) = ₹ 12,800 (A)

Women: (40 – 25) × (56 × 40) = ₹ 33,600 (F)

Total = ₹ 20,800 (F)

Labour Efficiency Variance = (SH – AHW) × SR; AHW = Actual Hours Worked – Idle Hours

Standard hours (SH i.e., Actual Output in terms of standard hours):

Men Hours:

2400÷50 = 48 × 80 = 3,840

Woman Hours:

48 × 40 = 1920

Actual Hours paid (AH):

Men 40 × 64 = 2560 Hours

Women: 40 × 56 = 2240 Hours

Labour Efficiency Variance:

Men: (3840 – 2496) × ₹ 45 = ₹ 60,480 (F)

Women: (1920 – 2184) × ₹ 40 = ₹ 10,560 (A)

Total = ₹49,920 (F)

Labour Idle Time Variance = Idle Hours × SR

Men: 1 × 64 × 45 = ₹ 2880 (A)

Women: 1 × 56 × 40 = ₹2240 (A)

Total = ₹ 5120 (A)

Labour Mix Variance (LMV) = (RSH – AH) × SR

Actual Hours (AH) worked:

Men: 39 × 64 = 2,496 Hours

Women: 39 × 56 =2,184 Hours

Total = 4680 Hours

Revised Standard Hours (RSH) i.e., Standard Proportion (2:1) of 4,680 Hours

Men: (4680 × 2) ÷3 = 3,120 Hours

Women: (4680 × 1) ÷3 = 1,560 Hours

Labour Mix Variance:

For Men: (3,120 – 2,496) × ₹45 = ₹ 28,080 (F)

For Women: (1,560 – 2,184) × ₹ 40 = ₹ 24,960 (A)

Total = ₹ 3,120 (F)

Labour Yield Variance = Standard Labour Cost per unit (Actual Yield – Standard Yield)

= ₹ 104 (2,400 – 1,950) = ₹ 46,800 (F)

Standard Yield = (Total Actual Time excluding Idle Time ÷Total Standard Time) × Standard Output in units = (4,680 ÷ 4,800) × 2,000

= 1,950 units

Standard Labour Cost per unit = ₹ 2,49,600÷2400 units = ₹ 104.

Illustration 44

AB Ltd. has furnished the following information:

	Budgeted	Actual (July 2022)
Number of Working Days	25	27
Production (in units)	20,000	22,000
Fixed Overheads	₹30,000	₹ 31,000

Budgeted fixed overhead rate is ₹ 1.00 per hour. In July 2022, the actual hours worked were 31,500. In relation to fixed overheads, calculate:

(i) Efficiency Variance

(ii) Capacity Variance

(iii) Calendar Variance

(iv) Volume Variance

(v) Expenditure Variance

Solution:

Standard rate per unit (Budgeted overheads/Budgeted output) i.e., = (₹30,000/20,000 units) = ₹ 1.50

Standard time per unit (30,000/20,000) = 1.50 hours

(i) Efficiency Variance = Standard overhead rate (Standard hours for actual output – Actual hours worked)

₹1.00 (33,000 – 31,500) = ₹ 1,500 (F)

Standard hour for actual output = 22,000 units @ 1.5 hours = 33,000 hours.

(ii) Capacity Variance = Standard rate per hour (Actual hours worked – Budgeted hours for 27 days)

₹1 (31,500 – 32,400) = ₹ 900 (A)

Budgeted hrs for 25 days = 30,000 therefore, budgeted hours for 27 days = 32,400 i.e., (30,000÷25 ×27)

(iii) Calendar Variance

Standard Overheads rate per day (Actual working days – Budgeted working days)

₹1,200× (27 – 25) = ₹ 2,400 (F), where, Standard Overheads rate per day = ₹30,000÷25 days = ₹1,200

(iv) Volume Variance

Standard rate per unit (Actual Output – Budgeted output)

₹ 1.50 × (22,000 – 20,000) = ₹ 3,000 (F).

(v) Expenditure Variance

Budgeted overheads – Actual overheads

₹ 30,000 – ₹ 31,000 = ₹1,000 (A).

Illustration 45

The budget and actual sales for a period in respect of two products are as follows:

Product	Budgeted			Actual		
	Quantity (Units)	Price (₹)	Value (₹)	Quantity (Units)	Price (₹)	Value (₹)
X	600	3	1,800	800	4	3,200
Y	800	4	3,200	600	3	1,800

Calculate Sales Variances.

Solution:

(i) Sales Value Variance= Actual Value of Sales – Standard Value of Sales

Total Actual Value of Sales = ₹ 3,200 + ₹ 1,800 = ₹ 5,000

Total Standard Value of Sales = ₹1,800 + ₹3,200 = ₹ 5,000

Sales Value Variance = ₹5,000 – ₹ 5,000 = Nil

(ii) Sales Price Variance= Actual Quantity Sold (Actual Price – Standard Price)

Product A 800 (₹4– ₹ 3) = ₹ 800 Favourable

Product B 600 (₹3–₹4) = ₹ 600 Unfavourable

Total Sales Price Variance = ₹ 200 Favourable

(iii) Sales Volume Variance= Standard Price (Actual Units – Standard Units)

Product A = ₹ 3 (800 – 600) = ₹ 600 Favourable

Product B= ₹4 (600–800) = ₹ 800 Unfavourable

Total Sales Volume Variance = ₹200 Unfavourable.

Illustration 46

S. M. Ltd. has given the following budgeted and actual sales figures:

Product	Budget			Actual		
	Quantity	Sale Price	Value	Quantity	Sale Price	Value
	units	₹	₹	units	₹	₹
A	500	60	30,000	600	65	39,000
B	700	40	28,000	650	38	24,700

The cost per unit of product A and B was ₹55 and ₹32 respectively. Compute variances to explain difference between budgeted and actual profit. Assume the Standard cost per unit and Actual Cost per unit are same.

Solution:

(i) Total Sales Margin Variance= Actual Profit– Budgeted Profit

or, (Actual Quantity × Actual Profit per Unit) – (Budgeted Quantity × Budgeted Profit per Unit)

Actual Profit per Unit= Actual Sales Price – Standard Cost per unit.

Note: While calculating Actual profit per unit, in the context of sales variances in terms of Profit Margin, Standard Cost per unit, must be taken as same with the Actual Cost per unit, otherwise sales variances cannot be computed. This is done in order to nullify the effect of Cost Variances.

Product A = ₹65 – ₹ 55 = ₹10

Product B = ₹ 38 – ₹ 32 = ₹ 6

Budgeted Profit per Unit = Budgeted Sale Price – Actual Cost

Product A = ₹ 60 – ₹ 55 = ₹5

Product B = ₹40– ₹ 32 = ₹8

Calculation for Actual Profit

Product A = 600 × ₹ 10 = ₹6,000

Product B = 650 × ₹ 6 = ₹3,900

= ₹9,900

Calculation for Budgeted Profit:

Product A: 500 × 5 = ₹2,500

Product B: 700 × 8 = ₹ 5,600

= ₹8,100

Sales Margin Variance = ₹ 9,900– ₹ 8,100 = ₹ 1,800 Favourable

(ii) Sales Margin Variance due to Selling Price:

Actual Quantity (Actual Price– Standard Price)

Product A = 600 (₹65 - ₹60) = ₹ 3,000 Favourable

Product B = 650 (₹ 38–₹ 40) = ₹ 1,300 Unfavourable

Sales Margin Variance due to Selling Price = ₹1,700 Favourable

(iii) Sales Margin Variance due to Volume:

Standard Profit per unit (Actual Quantity– Standard Quantity)

Product A: 5(600–500) = ₹ 500 Favourable

Product B: 8(650–700) = ₹ 400 Unfavourable

Sales Margin Variance due to Volume = ₹ 100 Favourable

(iv) Sale Value Variance= Budgeted sales Value-Actual sales value.

= (500 × ₹ 60+700 × ₹ 40) - (600 × ₹ 65+650 × ₹ 38) = ₹ 5700 (F)

(v) Sales Volume Variance= Standard selling price per Unit (Actual Quantity of Sales – Standard Quantity of Sales).

Product	Budgeted Qty.	Actual Qty.	Difference Qty.	Budgeted Price (₹)	Variance ₹
A	500	600	100 (F)	60	6,000 (F)
B	700	650	50 (A)	40	2,000 (A)
					Total 4,000 (F)

(vi) Sales Price Variance = Actual Quantity (Budgeted selling Price – Actual Selling Price).

	BP (₹)	AP(₹)	Diff.	AQ	Variance (₹)
Product A	60	65	₹ 5 (F)	600	3000 (F)
Product B	40	38	₹2 (A)	650	1300 (A)
					Total 1700 (F)

(vii) Sales Quantity Variance = Budgeted sale value - Revised standard sales value.

	BSV (₹)	AQ	BP (₹)	SSV of AQ	Revised SSV of AQ	Variance (₹)
Product A	30,000	600	60	36,000	62,000 × 30,000/58000 =32,069	2,069(F)
Product B	28,000	650	40	26,000	62,000 × 28,000/58,000 = 29,931	1,931(F)
						4,000(F)

(viii) Sales Mix Variance = Revised Standard sales value -Standard sales value

	AQ	BP (₹)	SSV of AQ (₹)	Revised SSV of AQ (₹)	Variance (₹)
Product A	600	60	36,000	62,000 × (30,000 ÷ 58,000) = 32,069	3,991 (F)
Product B	650	40	26,000	62,000 × (28,000 ÷ 58,000) = 29,931	3,991 (A)
				Total	**Nil**

Where:

BP – Budgeted Margin per unit

AP – Actual Margin per unit

AQ - Actual Quantity

SSV of AQ – Standard Sales Value of Actual Quantity

Revised SSV of AQ – Revised Standard Sales Value of Actual Quantity.

Illustration 47

You are appointed as a Manager (Costing) of Camelia Chemical Company manufactures one product and use a standard cost system. The established standards for materials and labour follow:

Material A: 3 Kg @₹ 6 . . . . . ₹ 18

Labour: 4 hr@ ₹7.50 per hr . . . . . ₹ 30

The operating data for the month of May 2022 are as under:

Work in process, May 1: 200 units, all materials, 20% complete as to labour.

Work in process, May 31: 600 units, all materials, 80% complete as to labour.

Completed during the month: 6,400 units.

All materials are added at the beginning of processing in the department.

20,900 Kgs of materials were used in production during the month, at a total cost of ₹ 1,23,310. Direct labour amounted to ₹ 2,08,670, which was at a rate of ₹ 7.70 per hour.

MD of the concerned company has asked you to calculate necessary variances, but he is not sure about that.

You are just required to help him in this regard.

Solution:

The following points are considered:

In addition to the usual procedures used to solve standard cost problems, equivalent production (FIFO) must be calculated. The equivalent production determined by the FIFO method will be used to calculate the standard materials and standard labour allowed. Two variances (price and quantity) must be determined for materials, and two variances (rate and efficiency) must be determined for labour.

Calculation of Equivalent Production for Materials and Labor by the FIFO Method:

Materials:

Work in process, May 1: 200 units (all materials added last period) 0

Units started and finished during May (6,400 – 200) 6,200

Work in process, May 31: 600 units (all materials added) 600

Total equivalent production—materials 6,800

Labour:

Work in process, May 1: 200 units (80% of labour required) 160

Units started and finished during May 6,200

Work in process, May 31: 600 units (80% labour added) 480

Total equivalent production—labour 6,840

Determining the Materials and Labour Variances:

Materials Variances

Materials price variance = (Actual Price – Standard Price) × Actual quantity

= (₹ 5.90- ₹6.00) × 20,900

= ₹ 2,090 (F)

Materials Quantity variance = (Actual Quantity – Standard Quantity) × Standard Price

= [20,900 – (6,800 × 3)] × ₹6

= ₹ 3,000 (A)

Note: ₹1,23,310 ÷ 20,900 = ₹5.90 per kg.

Labour Variances

Labour Rate Variance = (Actual Rate - Standard Rate) × Actual hours

= (₹7.70 – ₹ 7.50) × 27,100

= ₹ 5,420 (A)

Labour Efficiency Variance = (Actual Hours – Standard Hours) × Standard Rate

= [27,100 – (6,840 × 4)] × ₹ 7.50

= ₹ 1,950 (F)

Note: ₹ 2,08,670 ÷ ₹ 7.70 = 27,100 hours

The Manager (Cost) should write a 'Report' to the MD showing the above variance calculations.

Illustration 48

HLL Company uses a standard cost system and budgets the following sales and costs for 2022:

Unit sales	20,000
Sales	₹ 2,00,000
Total production cost at standard	₹ 1,30,000
Gross profit	₹ 70,000
Beginning inventories	None
Ending inventories	None

The 2022 budgeted sales level was the normal capacity level used in calculating the factory overhead predetermined standard cost rate per direct labour hour.

At the end of 2022, the Company reported production and sales of 19,200 units. Total factory overhead incurred was exactly equal to budgeted factory overhead for the year and there was under-applied total factory overhead of ₹ 2,000 at December 31. Factory overhead is applied to the work in process inventory on the basis of standard direct labour hours allowed for units produced. Although there was a favorable labour efficiency variance, there was neither a labour rate variance nor materials variances for the year.

Require: An explanation of the under-applied factory overhead of ₹ 2,000, being as specific as the data permit and indicating the overhead variances affected.

Solution:

Under-applied factory overhead will arise when actual factory overhead incurred is larger than the standard amount of factory overhead applied to work in process. The standard amount of factory overhead applied to work in process is based on actual rather than on budgeted units of output.

Based on the information given, the sum of the factory overhead spending, efficiency, and idle capacity variances resulted in an unfavorable total factory overhead variance of ₹ 2,000. The factory overhead efficiency variance must be favourable because it is computed on the same basis as the direct labour efficiency variance which was given as favourable.

The Company would have an unfavourable idle capacity variance because the actual activity level for the year was less than the capacity level used in calculating the standard cost rate for factory overhead.

As to the factory overhead spending variance, the balance would be unfavourable because actual costs would have had to exceed the budgeted cost of the actual units produced since the budget allowance for production of 19,200 units must be less than for 20,000 units and the actual costs were exactly equal to the budget allowance for 20,000 units. The magnitude of the spending variance is indeterminate from the information given.

Illustration 49

A team of management consultants and company executives concluded that a standard cost installation was desirable vehicle for accomplishing the objectives of a progressive management. State some uses of standard costs that can be associated with the above decision.

Solution:

(a) Standard Costs are the scientifically predetermined cost of manufacturing a single unit, or a number of units of product, during a specified period in the immediate future. A standard cost, as the word implies, consists of two parts: a standard and a cost. The standard is the carefully determined method or measurement of executing a task and desirable vehicle for accomplishing the objectives of a progressive management.

(b) The advantages of a standard cost system include the following:

(1) It guides the management to evaluate the production performance.

(2) It helps the management in fixing standards.

(3) Standard costing is useful in formulating production planning and price policies.

(4) It guides as a measuring rod for determination of variances.

(5) It facilitates eliminating inefficiencies by taking corrective measures.

(6) It acts as an effective tool of cost control.

(7) It helps the management in taking important decisions.

(8) It facilitates the principle of "Management by Exception."

(9) Effective cost reporting system is possible.

Illustration 50

In a Cost Conference, the speaker discussing budgets and standard costs made the following statement:

"Budgets and standards are not the same thing. They have different purposes and are set up and used in different ways; yet a specific relationship exists between them."

(a) Identify distinctions or differences between budgets and standards.

(b) Identify similarities between budgets and standards.

Solution:

(a) In budgetary control, budgets are used as a means of planning and control. The targets of various segments are set in advance and actual performance is compared with predetermined objects. In this way management can assess the performance of different departments. On the other hand, standard costing also set standards and enables to determine efficiency on the basis of standards and actual performance. Budgetary control is essential to determine standard costs, whereas, the standard costing system is necessary for planning budgets. In budgetary control the budgets are prepared for the concern as a whole whereas in standard costing the standards are set for producing a product or for providing a service. In standard costing, unit concept is used while in budgetary control total concept is used. The budgets are fixed on the basis of past records and future expectations. Standard costs are fixed on the basis of technical information. Standard costs are planned costs and these are expected in future. As far as scope is concerned, in case of budgetary control it is much wider than standard costing. Budgets are prepared for incomes, expenditures and other functions of the departments such as purchase, sale, production, finance and personnel department. In contrary, standards are set up for expenditures only and, therefore, for manufacturing departments standards are set for different elements of cost i.e., material, labour and overheads.

Further, in budgetary control, the targets of expenditure are set and these targets cannot be exceeded. In this system the emphasis is on keeping the expenditures within the budgeted figures. In standard costing the standards are set and an attempt is made to achieve these standards. The emphasis is on achieving the standards. Actual costs may be more than the standard costs and there can be no such thing in budgetary control. The budgetary control system can be applied partly or wholly. Budgets may be prepared for some departments and may not be prepared for all the departments. If a concern is interested in preparing production budget only, it is free to do so.

Standard costing cannot be used partially; it will have to be used wholly. The standards will have to be set for all elements of cost. In fact, the systems operate in two different fields and both are complimentary in nature.

(b) Although standards and budgets have certain differences, they possess similarities which are of such a nature that the existence of standard costs greatly facilitates budget preparation. The first similarity is that both budgets

and standards attempt to predetermine expenses. The budget and the standards have been set by records of current operational methods or procedures and have not just been set by hopes for so-called "good production."

Second, both consider departmental expenses according to accounts, generally speaking, all departments have their sub-accounts. They have been budgeted for a certain amount to be spent for specific uses. If there are cost differences, they should be investigated at the time they are happening.

Third similarity is that both assume costs are controllable along direct lines of supervision and responsibility. Supervisors are responsible to manage not only for production but also for cost of production. Supervisors should be aware of the budget as well as the standards for their departments.

Finally, both require the issuance of periodic comparative cost reports. When the costs are much higher or lower than the budgeted amount and are controlled by standards, these differences should be broken down to show management specific reasons for these differences at each interim reporting period.

Budgets are similar to standard costs in their methods of approach and measurement. If standard costs are known, budgeted costs can be derived from them by the application of ratios.

Illustration 51

The use of standard costs in pricing and budgeting is quite valuable since decisions in the fields of pricing and budgetary planning are made before the costs under consideration are incurred. Discuss.

Solution:

To set sales prices, executives need cost information furnished by the accounting department. Since standard costs represent the cost that should be attained in a well-managed plant operated at normal capacity, they are ideally suited for furnishing information which will enable the sales departments to price products.

Budgets are used for planning and coordinating future activities and for controlling current activities. When budget figures are based on standard costs, the accuracy of the resulting budget is strongly influenced by the reliability of the standard costs. With standards available, production figures can be translated into the manufacturing costs.

Illustration 52

In a Somani Paper Mill, materials specification standards are set up for various grades of pulps and secondary furnish (waste papers) for each grade and kind of paper produced. Yet at regular intervals the cost accountant is able to determine a materials mix variance. Why a mix variance does occur?

Solution:

Although specifications are established primarily by the laboratory, mix changes are made when production people feel the less costly grades of furnish or even pulp can be used satisfactorily. Production people hope, of course, that the final result will still be the same high quality product. The difference between the engineered laboratory standard and the actual usage at different standard costs results in a mix variance.

Solved Case

(Variance Analysis – Comprehensive with Reconciliation)

Mr M. S. Pandurangan is the owner of Ranga Pens Inc. which specialises in production of handmade fountain pens. Ranga Pens are produced in batches that are designed on the basis of 'group buy' schemes. During the last quarter of 2021, Mr M.S. Pandurangan designed the 'Abhimanyu' (an acrylic oversized fountain pen with #8 Ambitious Nib) and circulated a google form amongst fountain pen connoisseurs and lunched a 'group buy' scheme. Mr M.S. Pandurangan buys the #8 Ambitious Nibs from Mr Subramanium of Chennai who produces the nibs in his factory in Chennai. On receiving the order, Mr Subramanium revises his manufacturing facilities. During the year ended

30th June 2022, Mr Subramanium finds that there is significant difference between the budgeted profit of ₹2,00,000 (standard profit – ₹10 and standard output for the year ended 30th June 2022 – 20000 units) and the actual profit of ₹55,000 (as shown in the profit and loss account). Mr Subramanium requests his friend Mr Nikhil who is a Cost Accountant by profession to look into the issue. Mr Nikhil extracts the following information from the accounts of Mr Subramanium.

Profit and Loss Account for the year ended 30th June 2022

Dr. Cr.

Particulars	₹	Particulars	₹
To Direct Material	2,18,000	By Sales (13000 units)	5,20,000
To Direct Labour	1,10,000		
To Direct Charges	26,000		
To Factory Overhead Charges	37,000		
To Variable Overhead Charges	36,000		
To Office Expenses	38,000		
To Net Profit	55,000		
	5,20,000		5,20,000

The standard output for the year ended was 20000 units. The standard cost and the standard profit per unit are given as below:

Particulars	₹
Direct Material (4 grams @ ₹ 3.75 per gram)	15.00
Direct Labour (4 hours @ ₹ 2 per hour)	8.00
Direct Charges	2.00
Works Charges	
Fixed	2.00
Variable	3.00
Office Expenses (Fixed)	2.00
Total Standard Cost (per unit)	32.00
Standard Profit (per unit)	10.00
Standard Selling Price	42.00

During the period actual material price was ₹ 4.00 per unit and Labour was actually paid @ ₹ 2.20 per hour and it is also stated that 4 units are produced in an hour.

Solution

After extracting the information Mr Nikhil calculated the variances and categorised the variances. His calculation and categorisations are presented below.

A. Sales Variances

a. Sales Price Variance = Actual Quantity (Budgeted Price – Actual Price)

= 13,000 (42-40) = 26,000 (A)

b. Sales Volume Variance = Budgeted Profit (Budgeted Quantity – Actual Quantity)

=10 (20,000-13,000) = 70,000 (A)

c. Contribution difference due to sales volume[3]

= Budgeted contribution per unit (Budgeted Sales – Actual Sales)

= 14 (20,000-13,000) = 98,000 (A)

Working note:

Budgeted contribution per unit = Sales per unit – Variable Cost per unit

= 42 – (15 + 8 + 2+ 3) = 14

B. Material Variances

a. Material Price Variance = (Standard cost of actual mix) – (Actual cost of actual mix)

= Actual quantity (Standard Price-Actual Price)

= 54,500 (3.75 - 4.00) = 13,625 (A)

Working note

Actual quantity = (Actual Material Cost)/(Actual Material price unit)

= 218000/(₹ 4 per grams)

= 54500 grams

b. Material Usage Variance

= (Actual Yield × Standard Cost per unit of output)

– Standard cost of actual mix

= Standard Cost (Standard Quantity for actual yield – Actual Quantity used)

= 3.75 (13000 × 4 – 54500)

= 9375 (A)

C. Labour Variance

a. Labour rate variance = Actual Hours (Standard rate per hour – Actual rate per hour)

$= \frac{110000}{2.20} \times (2.00 - 2.20) = 10000$ (A)

b. Labour efficiency variance = Standard Rate × (Standard hours for Actual Yield – Actual hours)

= 2 (4 ×13000-50000) = 4000 (F)

D. Direct Charges Variance = Nil

For 13000 units, direct charges should be ₹ 26,000 [13000 × 2(Standard rate)], and it is ₹ 26,000 as shown in profit and loss account. Thus, direct charges variance is NIL.

E. Variable Overhead Variances

a. Variable overhead expenditure variance

= (Actual hours taken × Standard Rate per hour) – Actual Overhead cost

$= (50000 \times \frac{₹3}{4 \text{ units}}) - 36000$

= 1500 (F)

[3] This is not to be considered for reconciliation purpose. This is calculated for illustrative purpose only.

b. Variable Overhead Efficiency Variance

= Standard rate per hour (Standard hours worked for actual production – Actual Hours worked)

$= \frac{₹3}{4 \text{ units}} (13000 \times 4 - 50000)$

= 1500 (F)

F. Fixed Overhead Variances (FOH)

a. FOH Expenditure Variance = Budgeted OH Cost – Actual OH Cost

= (20000 × 4[4]) – (37000 + 38000)

= 5000 (F)

b. FOH Volume Variance = Standard Rate per unit (Budgeted Yield – Actual Yield)

= 4 (20000-13000)

= 28000 (A)

c. FOH Efficiency Variance = Standard Rate per hour (Standard hours for actual yield – Actual Hours taken)

$= \frac{4}{4} (52000-50000)$

= 2000 (F)

d. FOH Capacity Variance = Standard Rate per hour (Budgeted Hours – Actual Hours)

= 1 (80000-50000)

= 30000 (A)

After calculating the variances and categorising them Mr Nikhil proceeds with the preparation of a statement of reconciliation which clearly shows the reasons of difference between the budgeted profit and the actual profit (as shown in profit and loss account). The statement of reconciliation prepared by Mr Nikhil is illustrated below:

Statement of Reconciliation

Amount in ₹

	Variances		
	Favourable	Adverse	
Budgeted Profit (20000 units × ₹ 10 per unit)			2,00,000
Sales Price Variance		26,000	
Sales Volume Variance		70,000	
Material Price Variance		13,625	
Material Usage Variance		9,375	
Labour Rate Variance		10,000	
Labour Efficiency Variance	4,000		
Variable Overhead Expenditure Variance	1,500		
Variable Overhead Efficiency Variance	1,500		
FOH Expenditure Variance	5,000		
FOH Volume Variance[5]		28,000	
	12,000	1,57,000	
Net Adjustment for variance			1,45,000
Actual Profit			55,000

[4] Fixed element of Works Charges (₹ 2) + Fixed element of Office Expenses (₹ 2) = ₹ 4.

[5] The FOH volume variance (28000 (F)) is constituted of the FOH efficiency variance (2000 (F)) and FOH capacity variance (30000 (F)).

Illustration 53

From the following particulars for a period reconcile the actual profit with the budgeted profit:

Particulars	Budgeted	Actual
	(₹ lac)	(₹ lac)
Direct Material	50.00	66.00
Direct Wages	30.00	33.00
Variable overheads	6.00	7.00
Fixed overheads	10.00	12.00
Net Profit	4.00	8.50
	100.00	126.50

Actual material price and wage rates were higher by 10%. Actual sales prices are also higher by 10%.

Solution:

(Amount in ₹ lakh)

Sales Price Variance =	$126.5 - [126.5 \times {}^{100}/_{110}] =$	11.5 (F)
Sales Volume Variance =	$[126.5 \times {}^{100}/_{110}] - 100 =$	15.0 (F)
Sales Value Variance =	$126.5 - 100 =$	26.5 (F)
% of Volume Increase =	$15\% [{}^{15}/_{100} \times 100]$	
Material Price Variance =	$[66 \times {}^{100}/_{110}] - 66 =$	6 (A)
Material Volume Variance =	$[50 \times {}^{15}/_{100}] =$	7.5 (A)
Material usage Variance =	$[50 \times {}^{115}/_{100}] - [66 \times {}^{100}/_{110}] =$	2.5 (A)
Material Cost Variance =	$50 - 66 =$	16 (A)
Wage Rate Variance =	$[33 \times {}^{100}/_{110}] - 33 =$	3 (A)
Wage Volume Variance =	$[30 \times {}^{15}/_{100}] =$	4.5 (A)
Wage efficiency Variance =	$[30 \times {}^{115}/_{100}] - [33 \times {}^{100}/_{110}] =$	4.5 (F)
Wage Cost Variance =	$30 - 33 =$	3.0 (A)
Variable overhead Volume Variance =	$[6 \times {}^{15}/_{100}] =$	0.9 (A)
Variable overheads efficiency Variance =	$[6 \times {}^{115}/_{100}] - 7$	0.1 (A)
Variable overhead Cost Variance =	$6 - 7 =$	1.0 (A)
Fixed overhead Cost Variance =	$10 - 12 =$	2.0 (A)

Statement showing the reconciliation of budgeted profit with actual profit

OR

Profit Variance Statement

(₹ in lakhs)

Budgeted Profit		4.00
Add: Sales Price Variance	11.50	
Sales Volume Variance	15.00	
Wage efficiency Variance	4.50	31.00
		35.00
Less: Material Price Variance	6.00	
Material Volume Variance	7.50	
Material usage Variance	2.50	
Wage Rate Variance	3.00	
Wage Volume variance	4.50	
Variable overhead Volume Variance	0.90	
Variable overheads efficiency Variance	0.10	
Fixed overhead Cost Variance	2.00	26.50
Actual Profit		8.50

Illustration 54

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:

Particulars	(₹)
Direct Material (3 units @ ₹1.50)	4.50
Direct Labour (3 hrs. @ ₹ 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:

Particulars		Favourable (₹)	Adverse (₹)
Direct Material			
	Price		4,250
	Usage	1,050	
Direct labour			
	Rate		4,000
	Efficiency	3,200	
Factory overheads			
	Variable – expenditure	400	
	Fixed – expenditure	400	
	Fixed – Volume		1,680
Administration overheads			
	Expenditure		400
	Volume		1,680

You are required to:

Ascertain the details of actual costs and prepare a Profit and Loss Statement for the period showing the actual Profit/Loss. Show working clearly.

Reconcile the Actual Profit with Standard Profit.

Solution:

Statement showing the Actual Profit and Loss Statement

Particulars	Amount (₹)	Amount (₹)
Standard Material Cost (14,400 × 4.50)	64,800	
Add: Price Variance	4,250	
Less: Usage Variance	(1,050)	68,000
Standard Labour Cost (14,400 × 3)	43,200	
Add: Rate Variance	4,000	
Less: efficiency Variance	(3,200)	44,000
Direct expenses (14,400 × 0.50)		7,200
Prime Cost		1,19,200
Factory overhead:		
Variable (14,400 × 0.25)	3,600	
Less: expenditure Variance	(400)	3,200

Fixed (14,400 × 0.30)	4,320	
Add: Volume Variance	1,680	
Less: expenditure Variance	(400)	5,600
Administration overhead (14,400 × 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

Statement showing Reconciliation of Standard Profit with Actual Profit

Particulars	₹	₹
Standard Profit (14,400 × 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

EXERCISE

Theoretical Questions

Multiple Choice Questions

1. Which of the following is true of standards?

   A. Standards represent a benchmark or a norm

   B. Standards relate to input quantity

   C. Standards relate to input cost

   D. All of the above

2. Standards that can be attained only under the best circumstances are referred to as:

   A. Attainable standards

   B. Budget standards

   C. Ideal standards

   D. Practical standards

3. Who is most likely to be held responsible for a material price variance?

   A. Line workers

   B. Production supervisors

   C. Purchasing managers

   D. Production schedulers

4. Cost variance is the difference between

   A. The standard cost and marginal cost

   B. The standards cost and budgeted cost

   C. The standards cost and the actual cost

   D. None of these

5. Standard costing is a tool, which replaces the bottleneck of the ___ costing.

   A. Present

   B. Future

   C. Historical

   D. None of the above

6. If standard cost > actual, then it is

   A. Not favourable

   B. Favourable

   C. Neither favourable nor not favourable

   D. None of the above

7. From cost control point of view the standard most commonly used is:

   A. Expected standard

   B. Theoretical standard

   C. Normal standard

   D. Basic standard

8. When more than one material is used in the manufacture of a product, which of the following variances arises:

   A. Material yield variance

   B. Material mix variance

   C. Material price variance

   D. Material usage variance

9. Which of the following equations can be used to calculate a material quantity variance?

   A. (AQ × AP) - (AQ × SP)

   B. (AP × SP) - (AQ × SP)

   C. (AQ × SP) - (SQ × SP)

   D. (AQ × SP) - (AQ × AP)

10. Which of the following equations can be used to calculate a material price variance?

    A. (AQ × AP) - (AQ × SP)

    B. (AP × SP) - (AQ × SP)

    C. (AQ × SP) - (SQ × SP)

    D. (AQ × SP) - (AQ × AP)

11. Which of the following is not likely to be a reason of unfavourable direct labour efficiency variance?

    A. Increase in direct materials prices

    B. Frequent break downs during production process

    C. Lack of proper supervision

    D. Use of old, outdated or faulty equipment

12. Which of the following is a purpose of standard costing?

    A. To determine profit at different levels

    B. To determine break-even point

    C. To control costs

    D. To allocate cost with more accuracy

13. Which of the following activities is the Standard Costing System used for?

    A. It is a basis for implementing cost control and fixing the price of products through variance analysis

    B. It helps to ascertain the cost-volume relationship between products manufactured by the business

    C. It helps to establish the breakeven point for the products manufactured by the company

    D. None of the above

14. Which of the following activities is true under the Standard Costing System?

    A. The overhead volume variance is always beneficial

    B. The idle time variance is never favourable

    C. To calculate the overall costs, a company can either use budgetary control or standard costing but not both of those techniques

    D. The overhead efficiency variance plus overhead expense variance is equal to the overhead budget variance for variable overheads

15. A standard cost is a carefully _____ unit cost which is prepared for each cost unit.

    A. Pre-determined

    B. Absorbed

    C. Apportioned

    D. None

16. Setting of standard involves effective utilization of ___.

    A. Men

    B. Material

    C. Machines

    D. All of the above

17. The standard cost card contains quantities and costs for

    A. Direct material only.

    B. Direct labour only.

    C. Direct material and direct labour only.

    D. Direct material, direct labour, and overhead.

18. Standards differ from budgets in that:

    A. Budgets but not standards may be used in valuing inventories.

    B. Budgets but not standards may be journalized and posted.

    C. Budgets are a total amount and standards are a unit amount.

    D. Only budgets contribute to management planning and control.

19. Standard Costs:

    A. Are imposed by governmental agencies.

    B. Are predetermined unit costs which companies use as measures of performance.

    C. Can be used by manufacturing companies but not by service or not-for-profit companies.

    D. All of the above.

20. The advantages of standard costs include all of the following except:

    A. Management by exception may be used.

    B. Management planning is facilitated.

    C. They may simplify the costing of inventories.

    D. Management must use a static budget.

21. Normal standards:

    A. Allow for rest periods, machine breakdowns, and setup time.

    B. Represent levels of performance under perfect operating conditions.

    C. Are rarely used because managers believe they lower workforce morale.

    D. Are more likely than ideal standards to result in unethical practices.

22. The setting of standards is:

    A. A managerial accounting decision.

B. A management decision.

C. A worker decision.

D. Preferably set at the ideal level of performance.

23. Which of the following is correct about the total overhead variance?

A. Budgeted overhead and budgeted overhead applied are the same.

B. Total actual overhead is composed of variable overhead, fixed overhead, and period costs.

C. Standard hours actually worked are used in computing the variance.

D. Standard hours allowed for the work done is the measure used in computing the variance.

24. Which of the following is incorrect about variance reports?

A. They facilitate "management by exception."

B. They should only be sent to the top level of management.

C. They should be prepared as soon as possible.

D. They may vary in form, content, and frequency among companies.

25. Which of the following is incorrect about a standard cost accounting system?

A. It is applicable to job order costing.

B. It is applicable to process costing.

C. It reports only favourable variances.

D. It keeps separate accounts for each variance.

26. Generally accepted accounting principles allow a company to:

A. Report inventory at standard cost but cost of goods sold must be reported at actual cost.

B. Report cost of goods sold at standard cost but inventory must be reported at actual cost.

C. Report inventory and cost of goods sold at standard cost as long as there are no significant differences between actual and standard cost.

D. Report inventory and cost of goods sold only at actual costs; standard costing is never permitted.

Answer:

1-D, 2-C, 3-C, 4-C, 5-C, 6-B, 7- A, 8-B , 9-C, 10-A, 11-A, 12-C, 13-A, 14-B, 15-A, 16-D, 17-D, 18-C, 19-B, 20-D, 21-A, 22-B, 23-D, 24-B, 25-C, 26-C.

State True or False

1. One of the most important phases of responsibility accounting is establishing standard costs and evaluating performance by comparing actual costs with the standard costs.
2. The standards are predetermined and a comparison of standards with actual costs enables to determine the efficiency of the concern.
3. The basic purpose of standard costing is to determine efficiency or inefficiency in manufacturing a particular product.
4. In budgetary control, the targets of expenditure are set and these targets cannot be exceeded.
5. A current standard is a standard which is established for use over a short period of time and is related to current condition.
6. The deviations of the actual from the standard is known as 'variances'.
7. Material Price Variance (MPV) = (SP - AP) × SQ
8. Material Yield Variance (MYV) = (AY - SY) × AC
9. Labour Cost Variance is the difference between the Standard Cost of labour allowed for the actual output achieved and the actual wages paid.
10. Fixed Overhead Cost Variance = Recovered Fixed Overheads – Actual Fixed Overheads

Answer:

1-True, 2-True, 3-True, 4-True, 5-True, 6-True, 7-False, 8-False, 9-True, 10-True.

Fill in the Blanks

1. The purpose of ……. accounting is to control costs and promote efficiency.
2. A …….is a norm against which the actual performance can be measured.
3. Recognizing the potential problem, most companies set ……that include such factors as lost time and normal waste and spoilage.
4. Once the ……have been calculated, those who manage the business have to decide which variances should be investigated.
5. The selection of variances for ……is therefore very much dependent on circumstances and on the person making the selection.
6. ..... = Standard hours for actual output ÷ Actual hours worked × 100
7. ..... is the difference between the standards cost and the actual cost.

8. ..... allow for rest periods, machine breakdowns, and setup time.
9. ..... is the variance which arises due to change in the composition of a standard group, or, combination of labour force.
10. The ..... is how overhead is applied to a product and is typically based on direct labor hours, direct labor rupees or machine hours.

Answer:

1- Standard cost, 2- Standard, 3- Attainable standards, 4- Variances, 5- Investigation, 6- Efficiency Ratio, 7- Cost variance, 8- Normal standards, 9- Labour mix variance, 10- Overhead base

⊙ Short Essay Type Questions

1. What is meant by Standard Costing?
2. Distinguish between Standard Cost and Estimated Cost?
3. Explain in brief the various types of variances used in standard costing.
4. How do price and quantity variances relate to materials costs?
5. How do rate and efficiency variances relate to labour costs?
6. What two factors must be considered when breaking down a variance into its components? Explain.
7. What is the difference between ideal and practical standards? Which standard generally is used in planning?
8. Describe the managerial uses of variance analysis.

⊙ Essay Type Questions

1. What are the specific procedures on which a standard cost accounting system is based?
2. What are the advantages of Standard Costing? Also discuss the limitations of Standard Costing.
3. Distinguish between Standard Costing and Budgetary Control.
4. Discuss the preliminary steps for establishing a system of Standard Costing.
5. How does a standard cost accounting system work, and why is it valuable to management?
6. What is the difference between the standard cost and the actual cost of production?
7. Is a favourable variance ‘‘good’’ and an unfavorable variance ‘‘bad’’? Explain.
8. How does a materials purchase price variance differ from a materials price variance.
9. Are actual costs or standard costs charged to Work in Process?
10. When a company uses a standard cost system, are the inventory accounts—Finished Goods, Work in Process, and Materials— valued at actual cost or standard cost?

Practical Questions

⊙ Multiple Choice Questions

1. What is the labour rate variance if standard hours for 100 units of output are 400 @ ₹ 2 per hour and actual hours taken are 380 @ ₹ 2.25 per hour?

   A. ₹120 (A)

   B. ₹100 (A)

   C. ₹95 (A)

   D. ₹ 25 (F)

2. Standard quantity of material for one unit of output is 10 kgs @ ₹ 8 per kg . Actual output during a given period is 800 units. The standards quantity of raw material

   A. 8,000 kgs

   B. 6,400 Kgs

   C. 64,000 Kgs

   D. None of these

3. Standard price of material per kg is ₹ 20, standard usage per unit of production is 5 kg. Actual usage of production 100 units is 520 kgs, all of which was purchase at the rate of ₹ 22 per kg. Material cost variance is

   A. ₹ 2,440 (A)

   B. ₹ 1,440 (A)

   C. ₹ 1,440 (F)

   D. ₹ 2,300 (F)

4. To produce a particular batch of product, F Corporation paid its workers ₹ 12.00 per hour for 4,000 hours of work. The standards for the quantity of work represented by the batch were ₹ 12.50 per hour and 4,400 hours. What was the labour efficiency variance?

   A. 2,000.00 (F)

   B. 5,000.00 (F)

   C. 5,000.00 (A)

   D. 2,000.00 (A)

5. The firm's direct-labour rate variance was ₹ 4,800 unfavourable. Actual labour was 24,000 direct labour hours, at a cost of ₹ 1,68,000 for 25,000 units of finished product requiring 1 hour of direct labour each, at standard. What is the standard rate per direct labour hour?

   A. ₹ 7.20

   B. ₹ 6.80

   C. ₹7.00

   D. Cannot be determined from the information given

6. During the month of December actual direct labour cost amounted to ₹ 39,550, the standard direct labour rate was ₹ 10 per hour and the direct labour rate variance amounted to ₹ 450 favourable. The actual direct labour hours worked was:

   A. 3,955 hours

   B. 4,000 hours

   C. 3,910 hours

   D. 4,500 hours

7. XYZ factory working for 50 hours per week employs hundred workers on a job work. The standard output is 200 units per gang hour and standard rate is ₹ 1 per hour. During a week in June, five employees were paid @ ₹ 1.20 per hour and ten employees were paid @ 80 paise per hour. Rest of the employees was paid @ standard hour rate. The actual number of units produced was 10,200. Determine labour cost variance

   A. ₹ 100 favourable

   B. ₹ 150 unfavourable

   C. ₹ 150 favourable

   D. ₹ 100 unfavourable

8. In producing product ZZ, 14,800 direct labor hours were used at a rate of ₹ 8.20 per hour. The standard was 15,000 hours at ₹ 8.00 per hour. Based on these data, the direct labour:

   A. Quantity variance is ₹ 1,600 favourable.

   B. Quantity variance is ₹ 1,600 unfavourable.

   C. Price variance is ₹ 2,960 favourable.

   D. Price variance is ₹ 3,000 unfavourable.

Answer:

1- C, 2-A, 3-B, 4-B, 5-B, 6- B, 7- C, 8- A.

⊙ Comprehensive Numerical Problems

1. Calculate Material Cost Variances from the following information:

   Standard Price of material per kg = ₹4

   Standard Usage of materials = 800 kgs

   Actual Usage of materials = 920 kgs

   Actual Price of materials per kg = ₹3

   Actual Cost of materials ₹ 2,760

   Standard cost of material for actual production ₹ 3,200

2. From the following particulars calculate:

   (a) Material Cost Variance

   (b) Material Price Variance

   (c) Material Usage Variance

   (d) Material Mix Variance

   The Standard Mix of Product is :

   X 300 Units at ₹ 7.50 per unit

   Y 400 Units at ₹ 10 per unit

   Z 500 Units at ₹ 12.50 per unit

   The Actual Consumption was:

   X 320 Units at ₹ 10 per unit

   Y 480 Units at ₹ 7.50 per unit

   Z 420 Units at ₹ 15 per unit

3. From the following particulars, calculate Labour Variances:

   Standard hours = 200

   Standard rate for actual production = ₹ 1 per hour

   Actual hours = 190

   Actual Rate = ₹1.25 per hour

4. 100 workers are working in a factory at a standard wage of ₹4.80 per hour. During a month there are four weeks of 40 hours each. The standard performance is set at 360 units per hour. The following is the summary of the wages paid during the month:

   91 workers were paid @ ₹4.80 per hour

   5 workers were paid @ ₹5.00 per hour

   The remaining were paid @ ₹4.60 per hour

   Power failure stopped production for 2 hours and actual production were 57,960 units. Calculate labour variances.

5. Standard hours for manufacturing two products m and n are 15 hours per unit and 20 hours per unit respectively. Both products require identical kind of labour and the standard wage rate per hour is ₹5. In the year 2022, 10,000 units of A and 15,000 units of B were manufactured. The total of labour hours actually worked were 4,50,500 and the actual wage bill came to ₹ 23,00,000. This included 12,000 hours paid for @ ₹7 per hour and 9,400 hours paid for @ ₹7.50 per hour, the balance having been paid at ₹5 per hour. You are required to compute the labour variances.

6. Calculate Labour Yield Variance from the following details:

Standard	Actual
Skilled 180 workers @ ₹ 80 per hour	160 workers
Unskilled 120 workers @ ₹ 40 per hour	140 workers

Budgeted hours for one month 200. Actual hours during the month 180; Budgeted production 6000 units less standard loss 20%, Actual production 4600 units.

7. From the following particulars, compute the Variable Overhead Variances:

	Standard	Actual
Output in units	2,500 units	2,000 units
Labour Hours	5,000	6,000
Variable Overheads	₹ 1,000	₹ 1,500

8. From the following particulars calculate Fixed Overhead Variances:

	Standard	Actual
Output in units	5,000	5,200
Labour Hours	20,000	20,100
Fixed Overhead	₹ 10,000	₹ 10,200

Standard time for one unit 4 hours.

9. Calculate Overhead Variances from the following information:

	Standard	Actual
Fixed Overheads	₹ 4,000	₹4,250
Variable Overheads	₹ 6,000	₹ 5,600
Output in Units	2,000	1,900

10. A Company has normal capacity of 100 machines working 8 hours per day of 25 days in a month. The budgeted fixed overheads of a month are ₹ 1,50,000. The Standard time required to manufacture one unit of product is 4 hours. In a particular month, the company worked for 24 days of 750 machine hours per day and produced 4,500 units of the product. The actual fixed overheads incurred were ₹1,45,000.

Compute:

(a) Efficiency Variance

(b) Capacity Variance

(c) Calendar Variance

(d) Expenditure Variance

(e) Volume Variance

(f) Total Fixed Overhead Variance

11. The standard cost card for a product shows:

Per unit	₹
Material cost – 2 kg. @ ₹ 2.50 each	5.00
Wages – 2 hours @ ₹ .50 each	1.00

The actual which have emerged from business operations are as follows:

Production	8,000 units
Material consumed:	
16,500 Kgs. @ ₹ 2.40 each	₹ 39,600
Wages paid:	
18,000 Hours @ ₹ 0.40 each	₹ 7,200

Calculate appropriate material and labour variances.

12. The following is the standard mix to produce 10 units of a product:

A: 12 Units @ ₹ 150; B: 16 Units @ ₹ 200; C: 20 Units @ ₹ 250;

During the month of April, 2022, 10 mixes were completed but the actual output obtained was only 90 units. Calculate Material Cost Variance, Material Price Variance, Material Mix Variance and Material Yield Variance, if the actual consumption of material was as follows:

A: 128 Units @ ₹ 200; B: 192 Units @ ₹ 150; C: 168 Units @ ₹ 300

13. The budgeted production of a company is 20,000 Units per month. The Standard Cost Sheet is as under:

Direct Materials	1.5 kg @ ₹ 6 per kg
Direct Labour6 hours	@ ₹ 5 per hour
Variable Overheads	6 hours @ ₹ 4 per hour
Fixed Overheads	₹ 3 per unit
Selling Price	₹ 72 per unit

The following are the actual details for the month:

(1) Actual production and sales 18,750 units

(2) Direct materials consumed 29,860 kgs at ₹ 5.25 per kg.

(3) Direct labour hours worked 1,18,125 hours at ₹ 6 per hour

(4) Actual overheads were ₹ 5,25,000 out of which a sum of ₹ 40,000 was fixed

(5) There is no change in the selling price.

Calculate:

(i) Direct Materials Usage and Price Variances

(ii) Direct Labour Efficiency and Rate Variances

(iii) Variance Overheads Efficiency and Expense Variances

(iv) Fixed Overhead Volume and Expense Variances

(v) Sales Volume Variance.

14. The budgeted and actual sales of a concern manufacturing a single product are given below:

Sales as budgeted: 10,000 units at ₹3 per unit ₹30,000;

Actual Sales: 5,000 units at ₹ 3 per unit ₹ 15,000

8,000 units at ₹2.50 per unit ₹ 20,000

Ascertain Sales Price Variance and Sales Volume Variance

15. From the following information is given about standard and actual sales. You are required to calculate Sales Variances:

Standard Qty.	Units	Sales Price ₹	Actual Qty.	Units Sales Price ₹
X	250	2.50	250	2.50
Y	200	3.00	300	3.25
Z	150	3.50	200	3.75

16. From the following details, calculate Sales Margin Variances:

Product	Budgeted		Actual	
	Qty. Sales	Price ₹	Qty. Sales	Price ₹
X	300	46	400	50
Y	500	28	450	26

The cost per unit of product X and Y was ₹45 and ₹ 20 respectively.

17. The following details relating to a month are given:

Standard:

Grade A: 120 workers @ ₹ 90 per hour

Grade B : 160 workers @ ₹ 40 per hour

Budgeted hours for a month = 200.

Budgeted production 5000 units less standard loss of 20 %

Actual:

Grade A: 110 workers @ ₹ 80 per hour

Grade B : 184 workers @ ₹ 45 per hour

Actual hours during the month = 200.

Actual production = 4250 units

You are required to calculate:

(i) Labour Cost Variance

(ii) Labour Rate Variance

(iii) Labour Efficiency Variance

(iv) Labour Mix Variance

(v) Labour Yield Variance

⊙ Unsolved Case

Good Company, a newly created company produces chairs and tables. The budgeted sales data for the first month of operation follows (CM stands for contribution margin per unit):

The Sales Manager of the company has arrived at the following figures:

	Budgeted	CM Actual	CM Budgeted Units	Actual Units
Chairs	₹ 60	₹ 50	150	100
Tables	₹ 250	₹300	60	50

Market size information for New Company's first month of operation was:

Units Market Size Sold In units		
Actual	150	2,000
Expected	210	2,500

The Sales Manager has asked for your help in finding out the differences between Budgeted and Actual figures. You as a Management Accountant have been advised to help the Sales Manager, in finding out the differences, in the form of different variances.

Key Terms

Basic Standard: Basic standard is the standard established for use over a long period from which a current standard can be developed.

Budgets: Formal written plans that represent management's planned actions in the future and the impacts of these actions on the business.

Current Standard: Current standard is a standard which is established for use over a short period of time and is related to current conditions.

Flexible budget: A budget that shows the budgeted amount of manufacturing overhead for various levels of output; used in isolating overhead variances and setting standard overhead rates.

Ideal Standards: that can be attained under the best circumstances—that is, with no machinery problems or worker problems. These unrealistic standards can only be met when the company has highly efficient, skilled workers who are working at their best effort throughout the entire period needed to complete the job.

Idle Time Variance: Idle time variance is the standard cost of actual time paid to workers for which they have not worked due to abnormal reasons.

Labour efficiency variance (LEV): A variance from standard caused by using more or less than the standard amount of direct labor-hours to produce a product or complete a process; computed as (Actual hours worked - Standard hours allowed) x Standard rate per hour.

Labour rate variance (LRV) : A variance from standard caused by paying a higher or lower average rate of pay than the standard cost to produce a product or complete a process; computed as (Actual rate -Standard rate) x Actual hours worked.

Labour Cost Variance: Labour cost variance is the difference between the actual labour costs and the standard labour costs

Labour Mix Variance: Labour mix variance is the variance which arises due to change in the composition of a standard group, or, combination of labour force.

Labour Yield Variance: Labour yield variance is the variation in labour cost on account of increase or decrease in yield or output as compared to the relative standard.

Management by exception: The process where management only investigates those variances that are unusually favorable or unfavorable or that have a material effect on the company.

Material Cost Variance: Material cost variance is the difference between standard material costs and actual material costs.

Materials price variance (MPV): A variance from standard caused by paying a higher or lower price than the standard for materials purchased; computed as (Actual price – Standard price) x Actual quantity purchased.

Materials usage variance (MUV): A variance from standard caused by using more or less than the standard amount of materials to produce a product or complete a process; computed as (Actual quantity used - Standard quantity allowed) x Standard price.

Material Mix Variance: Material mix variance is that part of material usage variance which arises from the difference between the standard mix and actual mix of different types of materials used in production.

Material Yield Variance: Material yield variance is the difference between the standard cost of production achieved and the actual total quantity of materials used, multiplied by the standard weighted average price per unit.

Overhead budget variance (OBV): A variance from standard caused by incurring more or less than the standard manufacturing overhead for the actual production volume achieved, as shown by a flexible budget; computed as Actual overhead - Budgeted overhead at the actual production volume level.

Overhead volume variance (OVV): A variance from standard caused by producing at a level other than that used in setting the standard overhead application rates; computed as Budgeted overhead - Applied overhead.

Overhead Base : The overhead base is how overhead is applied to a product and is typically based on direct labor hours, direct labor dollars or machine hours

Practical standards: Standards those are strict but attainable. Allowances are made for machinery problems and rest periods for workers. These standards are generally used in planning.

Standard cost: A carefully predetermined measure of what a cost should be under stated conditions.

Standard Price: Standard price is a pre-determined price fixed on the basis of a specification of a product or service and of all factors affecting the price.

Standard level of output: A carefully predetermined measure of what the expected level of output should be for a specified period of time, usually one year.

Standard Costing: Standard costing is a technique which uses standards for costs and revenue for the purpose of control through variance analysis.

Standard Time: Standard time is the total time in which a task should be completed at standard performance, i.e. basic time plus contingence time allowance plus allowance for relaxation.

Standard fixed overhead rate: "Total budgeted fixed overhead costs divided by an expression of capacity, usually normal capacity in terms of standard hours or units."

Standard variable overhead rate: "Total budgeted variable overhead costs divided by an expression of capacity, such as the expected number of standard machine hours or standard direct labor hours."

Sales Value Variance: This Variance refers to the difference between budgeted sales and actual sales.

Sales Price Variance: This is the portion of Sales Value Variance which is due to the difference between standard price of actual quantity and actual price of the actual quantity of sales.

Sales Volume Variance: It is that part of Sales Value Variance which is due to the difference between the actual quantity or volume of sales and budgeted quantity or volume of sales.

Sales Mix Variance: It is that portion of Sales Volume Variance which is due to the difference between the standard proportion of sales and the actual composition or mix of quantities sold.

Sales Quantity Variance: It is a sub variance of Sales Volume Variance. This is the difference between the revised standard quantity of sales and budgeted sales quantity.

Sales Margin Value Variance: This is the difference between the actual value of sales margin and budgeted value of sales margin.

Sales Margin Volume Variance: It is that portion of Total Sales Margin Variance which is due to the difference between budgeted and actual quantity sold.

Sales Margin Price Variance: This variance is the difference between the standard price of the quantity of the sales effected and the actual price of those sales.

Sales Margin Mix Variance: This is that portion of the Sales Margin Volume or Quantity Variance which is due to the difference between the actual and budgeted quantities of each product of which the sales mixture is composed valuing the difference of quantities at standard margin.

Total variable overhead cost variance: The difference between actual variable overhead costs and the standard variable overhead costs that are applied to good units produced using the standard variable overhead rate.

Total fixed overhead cost variance: The difference between actual fixed overhead costs and the standard fixed overhead costs that are applied to good units produced using the standard fixed overhead rate.

Variance: A deviation of actual costs from standard costs; may be favorable or unfavorable. That is, actual costs may be less than or more than standard costs. Variances may relate to materials, labour, or manufacturing overhead.

Variance Analysis: Variance analysis is the analysis of variances arising in standard costing system into their constituent parts.

Variable Overhead Efficiency variance (VOHEV) A variance from standard caused by using more or less than the standard amount of overhead application base to produce a product or complete a process; computed as (Actual OH base – Standard OH base) x Standard variable OH rate per base.

Variable Overhead Spending variance (VOHSV) A variance from standard caused by incurring more actual variable overhead than the standard variable overhead cost to produce a product or complete a process; computed as (Actual variable OH rate -Standard variable OH rate) x Actual amount of base.

SECTION - E

FORECASTING, BUDGETING AND BUDGETARY CONTROL

Forecasting, Budgeting and Budgetary Control

7

This Module includes:

Forecasting, Budgeting and Budgetary Control

SLOB Mapped against the Module

To gather in-depth knowledge of techniques and tools for profit planning, variance analyses, optimal utilization of resources and responsibility accounting. (CMLO 3b, 5a, 5b).

Module Learning Objectives:

After studying this module, the students will be able to

- Conceptualise the importance of the budgeting process and its linkage with profit planning.
- Acquire in-depth knowledge for the preparation and presentation of various budgets.
- Appreciate budgetary control mechanism and its impact on optimum utilisation of resource.

Introduction

7.1

Planning and control systems are linked inextricably to the ways in which people behave. Such systems consider and deals with what people are meant to do (missions, objectives, goals, etc.), how they should do it (plans), what they should allocate resources to (budgets) and how well they do it (budgetary control mechanisms).

A budget is often thought of as a financial plan. A budget may, however, be expressed not only in financial terms but also in quantitative terms (e.g. budgets for labour hours, material purchases, or units of sales). Budgets are, of course, internal to the organization and, like most management accounting information, do not form part of the organization's published financial statements.

Budgeting has come to be accepted as an efficient method of short-term planning and control. It is employed, no doubt, in large business houses, but even the small businesses are using it at least in some informal manner. Through the budgets, a business wants to know clearly as to what it proposes to do during an accounting period or a part thereof. The technique of budgeting is an important application of Management Accounting. Probably, the greatest aid to good management that has ever been devised is the use of budgets and budgetary control. It is a versatile tool and has helped managers cope with many problems including inflation.

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.

The CIMA Official Terminology defines a budget as "a plan quantified in monetary terms, prepared and approved prior to a defined period of time, usually showing planned income to be generated and/or expenditure to be incurred during that period and the capital to be employed to attain a given objective".

According to Brown and Howard "a budget is a predetermined statement of managerial policy during the given period which provides a standard for comparison with the results actually achieved."

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 basis for its revision."

Uses of budgets

Primary uses:

- Quantifying planned resource usage (materials, labour, etc.)
- Quantifying income generation
- Quantifying resource procurement (materials, outsourced components, subcontractors)

Secondary uses:

- Quantifying payment for resources (cash budgeting)
- Quantifying collections of cash (from debtors, etc.)

Tertiary uses:

- Telling people what they are meant to achieve
- Basis of negotiation
- Means of communication
- Component of reward/payment systems

Some questions to be asked when preparing a manufacturing firm's annual budget:

- What products are we going to sell?
- How much of each product are we going to sell?
- When will we sell the products?
- Where will the products be sold?

If we buy in the products for selling on:

- When will we buy them?
- Who will we buy them from?
- How much will we pay for them?

Questions raised when the product is being manufactured:

- **Materials:**
  - How much of each material will we need?
  - Where will we get the materials and when?
  - How much will we pay for the materials and when?
  - How much will we buy and how much will we keep in stock?
- **Labour:**
  - How much labour will we use?
  - How many people of each type will we need?
  - When will we employ them?
  - When will we pay them?
- For each type of cost (salaries, insurance, rents/rates, administrative expenses, stationery, phone, heating, lighting, etc.)
  - How much will we need?
  - When will we need it?
  - Who will supply it?

- When will we pay for it?

Forecast Vs Budget

Forecast is mainly concerned with an assessment of probable future events. Budget is a planned result that an enterprise aims to attain. Forecasting precedes preparation of a budget as it is an important part of the budgeting process. It is said that the budgetary process is more a test of forecasting skill than anything else. A forecast provides a detailed look at what a business is doing to further its growth and development. Businesses use forecasts as a means of predicting what their operations, customer reach, revenue potential and profitability will look like at a specific time in the future. Generally, forecasts create projections on an annual basis, but businesses can create forecasts that estimate several years ahead. A budget outlines future financial operations to meet revenue goals and reduce costs. Both financial documents rely on accurate reporting and analysis, but there are several differences between a company's forecast and budget. A budget is both a mechanism for profit planning and technique of operating cost control.

The main differences between budget and forecast can be listed as under:

A Budget is a financial plan expressed in quantitative terms, prepared by the management in advance for forthcoming period whereas, forecast means estimation of future trends and outcomes, based on the past and present data. Budget is the financial expression of a business plan or target but Forecast is the prediction of upcoming events or trends in business, on the basis of present business conditions. Again, Budget sets target but in Forecast, no target is set. Budget is an annual concept but on the other hand Forecast is done on regular intervals. Variance analysis is done between Budgets and Actuals but in Forecast, there is no such provision. Budget primarily means, what business want to achieve but in Forecast, the idea is, what business will achieve.

In order to establish a budget, it is essential to forecast various important variables like sales, selling prices, availability of materials, prices of materials, wage rates etc.

Features of Budget:

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

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 a coordinated team operating in unison towards clearly defined objectives.
3. To force a definition and crystallization of company policies and aims.
4. To increase the effectiveness with which people and capital are employed.
5. To disclose areas of potential improvement in the company's operations.
6. To stimulate study of relationship of the company to its external economic environment for improving the effectiveness of its direction.

Rationale for Budgets

7.2

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 of the executives and other personnel 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. **Coordination:**

   Coordinating the various activities of the business and centralizing control, but also facility for management to decentralize responsibility arid 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. Providing a yardstick against which actual results can be compared.

General Principles in the Budgetary Process 7.3

Definition of Objectives:

Objectives should be defined precisely. They should be written out; areas of control de-marketed and items of revenue and expenditure to be covered by the budget stated. This will give a clear understanding of the plan and its scope to all those who must cooperate to make it a success.

Identification of key (or budget) factor:

Key Factor is also called as "Limiting Factor" or Governing Factor. While preparing the budget, it is necessary to consider key factor for successful budgetary control. The influence of the Key Factor which dominates the business operations in order to ensure that the functional budgets are reasonably capable of fulfillment. The Key Factors include:

(1) Raw materials may be in short supply.

(2) Non-availability of skilled labours.

(3) Government restrictions.

(4) Limited sales due to insufficient sales promotion.

(5) Shortage of power.

(6) Underutilization of plant capacity.

(7) Shortage of efficient executives.

(8) Management policies regarding lack of capital.

(9) Insufficient research into new product development.

(10) Insufficiency due to shortage of space.

Budget Center:

A Budget Center is defined by the terminology as "a section of the organization of an undertaking defined for the purpose of budgetary control." For effective budgetary control budget centre or departments should be established for each of which budget will be set with the help of the head of the department concerned.

Budget Committee and Controller:

Formulation of a budget usually requires whole time services of a senior executive; he must be assisted in this work by a Budget Committee, consisting of all the heads of department along with the Managing Director as the Chairman. The Controller is responsible for coordination and development of budget programmes and preparing the Budget Manual.

Budget Officer:

Budget Officer is usually some senior member of the accounting staff who controls the budgetary process. He does not prepare the budget himself, but facilitates and co-ordinates the budgeting activity. He assists the individual departmental heads and the budget committee, and ensures that their decisions are communicated to the appropriate people.

Budget Manual:

The Budget manual is a schedule, document or booklet, which shows in a written form, the budgeting organization and procedure. The manual should be well written and indexed so that a copy thereof may be given to each department head for guidance.

Budget period:

The period covered by a budget is known as budget period. Normally a calendar year or a period coterminous with the financial year is adopted as the Budget Period. It is then sub-divided into shorter periods – it may be months or quarters or such period as coincide with period of trading activity.

The budget period is the length of time for which a budget is prepared and employed. The period may depend upon the type of budget. There is no specific period as such. However, for the sake of convenience, the budget period may be fixed depending upon the following factors:

(a) Types of Business

(b) Types of Budget

(c) Nature of the demand of the product

(d) Length of trade cycle

(e) Economic factors

(f) Availability of accounting period

(g) Availability of finance

(h) Control operation

Standard of activity or output:

The standards of activity levels for future period should be laid down. These are generally based on past statistics, known market changes and current conditions and forecast of future situations. In a progressive business, the achievement of a year must exceed those of earlier years. In budgeting, fixing the budget of sales and capital expenditure are most important since these budgets determine the extent of development activity.

Essentials of Effective Budgeting:

1. **Organization Chart:**

   For the purpose of effective budgetary control, it is imperative on the part of each entity to have definite "plan of organization." This plan of organization is embodied in the organization chart. The organization chart explaining clearly the position of each executive's authority and responsibility of the firm. All the functional heads are entrusted with the responsibility of ensuring proper implementation of their respective departmental budgets. An organization chart for budgetary control is given showing clearly the type of budgets to be prepared by the functional heads.

2. **Support of top management:**

   If the budget structure is to be made successful, the consideration by every member of the management not only is fully supported but also the impulsion and direction should also come from the top management. No control system can be effective unless the organization is convinced that the management considers the system to be important.

3. **Team Work:**

   This is an essential requirement, if the budgets are ready from "the bottom up" in a grass root manner. The top management must understand and give enthusiastic support to the system. In fact, it requires education and participation at all levels. The benefits of budgeting need to be sold to all.

4. **Realistic Objectives:**

   The budget figures should be realistic and represent logically attainable goals. The responsible executives should agree that the budget goals are reasonable and attainable.

5. **Excellent Reporting System:**

   Reports comparing budget and actual results should be promptly prepared and special attention focused on significant exceptions i.e. figures that are significantly different from expected. An effective budgeting system also requires the presence of a proper feed-back system.

6. **Structure of Budget team:**

   This team receives the forecasts and targets of each department as well as periodic reports and confirms the final acceptable targets in form of Master Budget. The team also approves the departmental budgets.

7. **Well defined Business Policies:**

   All budgets reveal that the business policies formulated by the higher level management. In other words, budgets should always be after taking into account the policies set for particular department or function. But for this purpose, policies should be precise and clearly defined as well as free from any ambiguity.

8. **Integration with Standard Costing System:**

   Where standard costing system is also used, it should be completely integrated with the budget programme, in respect of both budget preparation and variance analysis.

9. **Goal Congruence:**

   All the employees or staff other than executives should be strongly and properly inspired towards budgeting system. Human beings by nature do not like any pressure and they dislike or even rebel against anything forced upon them.

Relationship between Budgets and Budgetary Control

Budgets form the basis for the exercise of budgetary control. A budget is a means, and Budgetary control is the end result. A budget is an integral part of the Budgetary control system. The Budget is a financial plan. Budgetary control results from the administration of the financial plan.

The terms budgetary control and budgeting are often used interchangeably to refer to a system of managerial control. Budgetary control implies the use of a comprehensive system of budgeting to aid management in carrying out its functions like planning, coordination and control. It is a system which uses budgets for planning and controlling different activities of business.

Requirements of a Good Budgeting System

(i) The organizational goal should be quantified and clearly stated. These goals should be within the framework of organizations' strategic and long-range plans.

(ii) Budgeting process should be backed and supported by the chief executive of an organization.

(iii) The organizational goals must be divided in functional goals.

(iv) The budget should cover all phases of the organization.

(v) All persons in the organization should mentally accept the exercise of budget preparation.

(vi) The persons responsible for execution of budget should participate in budget preparation.

(vii) The budget should be realistic. It should represent goals that are reasonably attainable.

(viii) The budgeting system should be based on information, communication and participate.

(ix) The budgeting should be a continuous exercise.

(x) Periodic reports should be prepared promptly, comparing budget and actual result, i.e., there should be effective follow–up.

(xi) Clear cut organisational lines should be established with appropriate delegation of responsibilities for effective budget implementation.

Types of Budgets

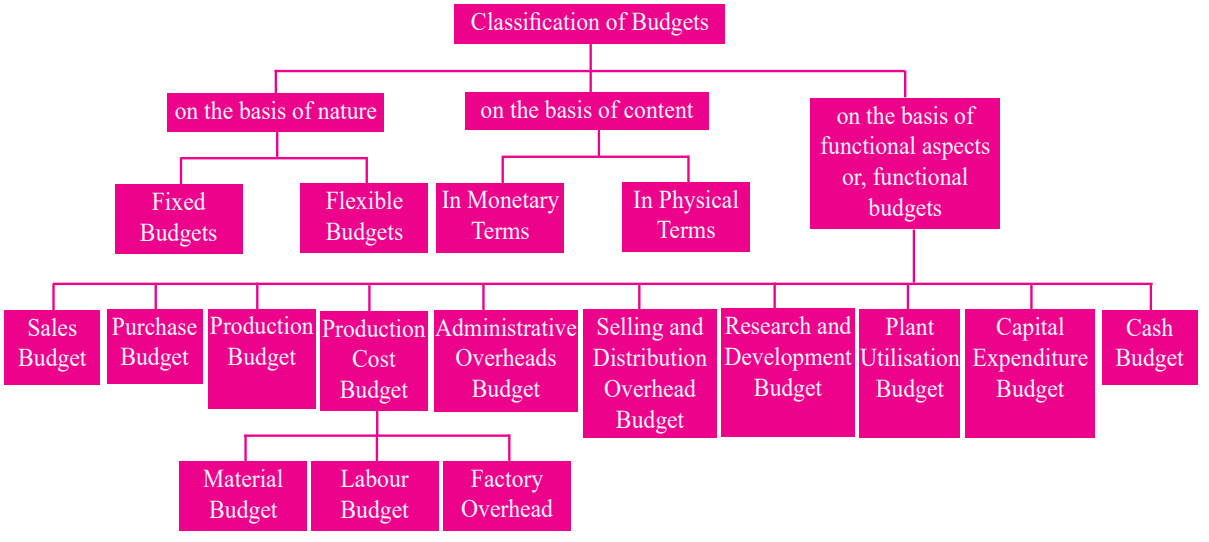


Figure 7.1 : Classification of Budgets

Fixed or Static Budget

Fixed Budget is used as an effective tool of cost control. In case the level of activity usually attained is different from the level of activity for activity for budgeting purpose, the fixed budget becomes ineffective. A budget may be prepared for, say 1,00,000 units. Actual activity level may be say, 1,20,000 units. If it is a fixed budget, then absolute differences of budgeted figures and actual figures will be found out without any type of adjustment for change in level of activity. Such a budget is quite suitable for fixed expenses.

Fixed budget are established only for short – term periods when the actual results are not anticipated to differ from the budget estimates. This is not a rigid budget, it can be modified, but the level of activity remains one or the same.

Essential Conditions:

(i) When the nature of Business is not seasonal.

(ii) There is no impact of external factors on the business activities.

(iii) The demand of the product is certain and stable.

(iv) Supply orders are issued regularly.

(v) The market of the product should be domestic rather than foreign.

(vi) There is no need of special labour or material in the production of the products.

(vii)Supply of production inputs is regular.

(viii)There is a trend of price stability.

Generally, all above conditions are not found in practice. Hence, Fixed Budget is not important in business concern.

Merit/Advantages:

(i) Very Simple to prepare

(ii) Less time consuming.

Demerit/Disadvantages

(i) It is misleading. A poor performance may remain undetected and a good performance may go unrealized.

(ii) It is not suitable for long period.

(iii) It is also found unsuitable particularly when the conditions of the business are changing constantly.

(iv) It takes away the initiative from members of the administrative staff since they do not find any interest in their job.

(v) It is inadequate for control purposes.

(vi) It violates logic. Based on logic, comparison should be made between two things with a like base.

(vii)Accurate estimates not possible.

Formulation of Various Types of Budgets 7.4

7.4.1 Fixed and Flexible Budgets

1. Fixed Budget:

A fixed budget is designed to remain unchanged irrespective of the level of activity actually attained. A budget is drawn for a particular level of activity is called fixed budget. According to ICWA London "Fixed budget is a budget which is designed to remain unchanged irrespective of the level of activity actually attained." Fixed budget is usually prepared before the beginning of the financial year.

This type of budget is not going to highlight the cost variances due to the difference in the levels of activity. Fixed Budgets are suitable under static conditions.

2. Flexible Budget:

A flexible budget is a budget which is designed to change in accordance with the various level of activity actually attained. The flexible budget also called as Variable Budget or Sliding Scale Budget, takes both fixed, variable and semi fixed manufacturing costs into account. Flexible Budget is also called Variable or Sliding Scale budget, "takes both the fixed and manufacturing costs into account. Flexible budget is the opposite of static budget showing the expected cost at a single level of activity. According to CIMA, England defined "Flexible Budget is a budget which is designed to change in accordance with the level of activity actually attained."

According to the principles that guide the preparation of the flexible budget a series of fixed budgets are drawn for different levels of activity. A flexible budget often shows the budgeted expenses against each item of cost corresponding to the different levels of activity. This budget has come into use for solving the problems caused by the application of the fixed budget.

Methods of Preparing Flexible Budget

The following methods are used in preparing a flexible budget:

(1) Multi-Activity Method.

(2) Ratio Method.

(3) Charting Method.

(1) **Multi-Activity Method:** This method involves preparing a budget in response to different level of activity. The different level of activity or capacity levels are shown in Horizontal Columns, and the budgeted figures against such levels are placed in the Vertical Columns. The expenses involved in production as per budget are grouped as fixed, variable and semi variable.

(2) **Ratio Method:** According to this method, the budget is prepared first showing the expected normal level of activity and the estimated variable cost per unit at the side expected level of activity in addition to the fixed

cost as estimated. Therefore, the expenses as per budget, allowed for a particular level of activity attained, will be calculated on the basis of the following formula:

Budgeted fixed cost + (Variable cost per unit of activity × Actual unit of activity)

(3) **Charting Method:** Under this method total expenses required for any level of activity, are estimated having classified into three categories, viz., Variable, Semi Variable and Fixed. These figures are plotted on a graph. The expenses are plotted on the Y-axis and the level of activity is plotted on X-axis.

The graphs will thus, help in ascertaining the quantum of budgeted expenses corresponding to the level of activity attained with the help of this chart.

Need for Flexible Budget

The need for preparation of flexible budget arises in the following circumstances:

(i) Seasonal fluctuations in sales and/or production-for example, in soft drinks industry;

(ii) A company which keeps on introducing new products or make changes in the design of its products frequently;

(iii) An industry engaged in make-to-order business like ship building;

(iv) An industry which is influenced by changes in fashion; and

(v) General changes in sales.

Characteristics of Flexible Budget:

(i) Adjustable according to Business Conditions.

(ii) Prepared in advance for various levels of activity.

(iii) It is a dynamic budget.

(iv) Control possible over unfavourable impact of change in future.

(v) Classification of cost in the form of Fixed, Semi-variable and Variable cost.

(vi) Related to a particular period.

(vii) Production possible at any level of activity.

Advantages/Merits/Importance of Flexible Budget:

1. **Easy Calculation:** With the help of Flexible Budget, the sales, costs and profit may be calculated easily by the business at various levels of production capacity.
2. **Easy Adjustment of Change:** In Flexible Budget, adjustment is very simple according to change in business conditions.
3. **Knowledge about the impact of cost:** In Flexible Budget, the cost is classified into three categories, namely, fixed cost, semi-variable cost and variable cost and because of this it is very easy to know the real impact of cost factors on business profits.
4. **Comparable:** With the help of Flexible Budget, the actual cost of production may be easily compared with budgeted cost in business and industry and right decisions may be taken by the management well in time.
5. **Cost Control:** After the completion of the year, the actual cost may be compared with budgeted cost and steps may be taken to minimise the variance. Hence, it helps the management in controlling cost.
6. **Determination of Production Level:** Flexible Budget shows budgeted cost with classification at various

levels of activity along with sales and profits. Hence, the management can easily select the level of production which shows the profit predetermined by the owners of the business. It also shows the quantity of product to be produced to earn determined profit.

7. **Other Advantages**

   (i) Free from the impact of future business uncertainties.

   (ii) Knowledge about the impact of external factors on economic activities of the business.

   (iii) Marginal analysis is possible.

   (iv) Free from the disadvantages of Flexible Budget.

   (v) More useful for business and industry whose nature is dynamic and seasonal and affected from the change in the income, habit, interest of the consumers and the business which is also affected from the changing government policy, demonstration effect, business cycles and works under the conditions of perfect and monopolistic competition.

Limitations or Demerits of Flexible Budget:

1. The formulation of Flexible Budget is possible only when there is a proper accounting system maintained.
2. Flexible Budget also requires the system of standard costing in business.
3. The formulation of Flexible Budget depends upon availability of cost experts in the business.
4. The formulation of Flexible Budget is possible only when the perfect knowledge about the factors of production and variable business circumstances is available.
5. It is very expensive and labour oriented.

Distinction between fixed and flexible budget

Basic of Difference	Fixed budget	Flexible Budget
1. Assumption	It is based on the assumption that business conditions will remain constant.	It is based on the assumption that business conditions are changing.
2. Nature	It has a fixed nature. Change is not possible once prepared	It has a dynamic/variable nature. Adjustment is possible
3. Classification of Cost	Cost is not classified according to their nature in Fixed Budget.	Cost is classified into fixed, variable and semi-variable costs according to their nature.
4. Comparison	It is very difficult to compare between two activity levels on the basis of Fixed Budget	It is very easy to compare between two activity levels on the basis of Flexible Budget due to classification of costs.
5. Forecast	Pure forecast is not possible on the basis of Fixed Budget	Pure forecast about various costs of production is possible on the basis of Flexible Budget
6. Business decisions	Fixed Budget is not more appropriate and suitable for business decisions.	Flexible Budget is more appropriate and suitable for business decisions.
7. Effectiveness	Fixed Budget is not more effective because it is not dynamic	Flexible Budget is more effective because it is dynamic
8. Economy	Fixed Budget is less expensive and less time consuming.	Flexible Budget is more expensive and time consuming.

Classification of Budgets on the Basis of Business Activity

On the basis of business activities, the budgets may be classified into two categories, namely,

i) Secondary/Functional budgets

ii) Master Budget (Co-ordinating Budget)

Illustration 1

Draw up a flexible budget for overhead expenses on the basis of the following data and determine the overhead rates at 70%, 80% and 90%:

Plant Capacity	At 80% capacity (₹)
Variable Overheads:	
Indirect labour	12,000
Stores including spares	4,000
Semi Variable:	
Power (30% - Fixed; 70% -Variable)	20,000
Repairs (60%- Fixed; 40% -Variable)	2,000
Fixed Overheads:	
Depreciation	11,000
Insurance	3,000
Salaries	10,000
Total overheads	62,000
Estimated Direct Labour Hours	1,24,000

Solution:

Flexible Budget at Different Capacities and Determination of Overhead Rates

Particulars	70% (₹)	80% (₹)	90% (₹)
(A) Variable overheads:			
Indirect labour	10,500	12,000	13,500
Stores including spares	3,500	4,000	4,500
Total (A)	14,000	16,000	18,000
(B) Semi Variable overheads:			
Power (Working Note)	18,250	20,000	21,750
Repairs (Working Note)	1,900	2,000	2,100
Total (B)	20,150	22,000	23,850
(C) Fixed overheads:			
Depreciation	11,000	11,000	11,000
Insurance	3,000	3,000	3,000
Salaries	10,000	10,000	10,000
Total (C)	24,000	24,000	24,000

Grand Total (A+B+C)	58,150	62,000	65,850
Labour Hours	$1,24,000 \times \frac{70\%}{80\%} = 1,08,500$	1,24,000	$1,24,000 \times \frac{90\%}{80\%} = 1,39,500$
Overhead rate per hour (₹)	$\frac{58,150}{1,08,500} = 0.536$	$\frac{62,000}{1,24,000} = 0.50$	$\frac{65,850}{1,39,500} = 0.472$

Working notes: Semi Variable overheads

	70%	90%
Power:		
Variable (70%)	$14,000 \times \frac{70\%}{80\%} = 12,250$	$14,000 \times \frac{90\%}{80\%} = 15,750$
Fixed (30%)	6,000	6,000
Total	18,250	21,750
Repairs:		
Variable (40%)	$800 \times \frac{70\%}{80\%} = 700$	$800 \times \frac{90\%}{80\%} = 900$
Fixed (60%)	1,200	1,200
Total	1,900	2,100

7.4.2 Functional Budgets

Functional budgets are budgets prepared for each department or process within an organization. A financial or quantitative statement prepared for a function of an organisation; it summarizes the policies and the level of performance expected to be achieved by that function for a budget period. These functional budgets are then summarized to produce the overall summary or master budget for the whole organization. Functional budgets are associated with the functions of an organization. A functional budget can be temporary or permanent, depending on its use. The functional budget is one which relates to any of the functions of an organization. The numbers of functional budgets depend upon the size and nature of business.

The following are the commonly used functional budgets:

- Sales Budget
- Production Budget
- Direct Material Budget
- Direct Labour Budget
- Production Overheads Budget
- Office & Administration Overheads Budget
- Selling & Distribution Overheads Budget
- Advertising Cost Budget
- Research & Development Expenditure Budget
- Capital Expenditure Budget
- Cash Budget

Functional Budgets

Budgets, which relate to individual functions in an organisation, are known as Functional Budgets. Following are some of the commonly used Functional Budgets:

1. Sales Budget

A Sales Budget provides an estimate of quantity and Selling Price for each product for each zone or region. The sales budget, a type of operating budget, is a forecast of the expected units a company intends to sell over a period of time and the revenue it should generate from it. It is the basis for preparing the income statement for the business. The Sales Budget may be classified in the following manner:

(i) Products; (ii) Areas or Territories; (iii) Types of customers; (iv) Salesmen or Agents; and (v) Periods (i.e., weekly, fortnightly, monthly, quarterly, half-yearly or yearly)

Factors to be considered in preparing Sales Budget

As business existence depends upon the sales it is going to make and therefore it is an important one to be prepared meticulously. It is the forecast of what it can reasonably sell to its customers during the period for which budget is prepared. The company's profit mostly depends upon the ability to sell its products to customers.

The following factors must be considered in preparing the sales budget:

(a) The locality of the market i.e., domestic or export

(b) The target customers i.e., industry or trade or a section or group of general public etc.,

(c) The product portfolio i.e., the number of products offered and their popularity among the target customers.

(d) The market share of each product and its influence on the product portfolio and the total market

(e) The effectiveness of existing marketing policy on the current sales volume and value.

(f) The market share of competitor's products and their effect on the company's sales.

(g) Seasonal fluctuation in sales.

(h) Expenditure on advertisement and its impact on sales.

Illustration 2

XYZ Ltd. produces two products, X and Y and operates three sales divisions for sale of their products. Prepare a sales budget for six months ended 30/06/2022 from the following information.

Budgeted sales for six months ended 31/12/2021:

Particulars	Divn. I	Divn. II	Divn. III
Product X	1,600 @ ₹10	2,400 @ ₹10	2,400 @ ₹10
Product Y	800 @ ₹9	4,800 @ ₹9	2,000 @ ₹9

Actual sales during the same period:

Particulars	Divn. I	Divn. II	Divn. III
Product X	2,000 @ ₹10	3,200 @ ₹10	2,800 @ ₹10
Product Y	400 @ ₹9	4,000 @ ₹9	1,600 @ ₹9

In the management meeting, following decisions have been taken:

(i) The price of product X should be increased by ₹ 1 as there is a high demand for product X.

(ii) Product Y is not selling at the expected rate as this product has been over-priced. However, if the selling price is reduced by ₹1, it is expected that the market would pick up. Therefore, the divisional sales managers have made the following estimates:

Percentage increase over previous budget (%)

Product	Divn. I	Divn. II	Divn. III
Product X	20%	30%	10%
Product Y	5%	10%	8%

Solution:

Sales Budget

Period: 6 months ended 30/06/2022

Divn.	Product	Budget 30/06/22			Budget 31/12/21			Actual 31/12/21		
		Qty.	Price (₹)	Value (₹)	Qty.	Price (₹)	Value (₹)	Qty.	Price (₹)	Value (₹)
I	X	1,920	11	21,120	1,600	10	16,000	2,000	10	20,000
	Y	840	8	6,720	800	9	7,200	400	9	3,600
	Total	2,760		27,840	2,400		23,200	2,400		23,600
II	X	3,120	11	34,320	2,400	10	24,000	3,200	10	32,000
	Y	5,280	8	42,240	4,800	9	43,200	4,000	9	36,000
	Total	8,400		76,560	7,200		67,200	7,200		68,000
III	X	2,640	11	29,040	2,400	10	24,000	2,800	10	28,000
	Y	2,160	8	17,280	2,000	9	18,000	1,600	9	14,400
	Total	4,800		46,320	4,400		42,000	4,400		42,400
Grand Total		15,960		1,50,720	14,000		1,32,400	14,000		1,34,000

2. Production Budget

The production budget is the basis for developing cost budgets about the raw materials and other consumables to be purchased. It is a type of operating budget.

A Production Budget is prepared for estimating the required production for a given period. This budget is prepared on the basis of estimated sales (obtained from Sales Budget), inventory policy of the firm (with regard to finished goods), production capacity, procurement policy and other relevant factors.

Factors to be considered in Production Budget

Next to the sales budget, the main function of a business concern is the production and for this, a budget is prepared simultaneously with the sales budget. It is the forecast of production during the period for which the budget is prepared. It can also be prepared in two parts viz., production volume budget for the physical units i.e., the number of units, the tonnes of production etc., and the cost of production or manufacture showing details of all elements of the manufacture. While preparing the production budget, the following factors must be taken into consideration:-

(a) Production plan

Production planning is an important part of the preparation of the production budget. Optimum utilisation of plant capacity is taken by eliminating or reducing the limiting factors and thereby effective production planning is made.

(b) The capacity of the business concern

It is to be ensured that the capacity of the organisation will coincide the budgeted production or not. For this purpose, plant utilisation budget will also be necessary. The production budget must be based on normal capacity likely to be achieved and it should not be too high or too low.

(c) Inventory Policy

While preparing the production budget it is also necessary to see to what extent materials are available for producing the budgeted production. For that purpose, a purchase budget or a purchase plan must also be studied. Similarly, on the other hand, it is also necessary to verify the extent to which the inventory of finished goods is to be carried.

(d) Sales Policy

Sales budgets must also be considered before preparing production budget because it may so happen that the entire production of the concern may not be sold. In such a case the production budget must be in line with the sales budget.

(e) Sequence of Operations Policy

A plan of the sequence of operations of production for effective preparation of a production budget should always be there.

(f) Management Policy

Last, but not the least, the policy of the management should also be considered before preparing the production budget.

Objectives and Advantages of Production budget

- Optimum utilisation of the productive resources of the organisation;
- Maintaining low inventory which results in risk of deterioration and fall in prices;
- Focus on the factors that are necessary to frame policies and plan sequence of operations;
- Projection of policies framed, on the basis of past performance, into the future to get the desired results;
- To see that right materials are provided at right place and at right time;
- Helps in scheduling of production so that delivery dates are met and customer satisfaction is gained;
- Helpful in preparation of projected profit and loss statement, which is useful in evaluation of performance and profitability.

Illustration 3

Production Budget

From the following information, prepare a production budget for ABC Co. Ltd assuming that

(a) There is no loss in production

(b) Normal loss in production – 5% and 10% for products X and Y, respectively.

Information:

	Sales Budget (units)	Product X	Product Y
1.	Division I	2,000	1,000
	Division II	3,000	6,000
	Division III	2,500	2,250
	Total units	7,500	9,250
2.	Stock as on 1 January:		
	X – 1,500		
	Y – 2,000		
3.	Stock on 31 December: Estimated to be 10% more in quantity		

Solution:

Total number of units to be produced is to be found out in the same manner as discussed in the previous illustration

Production Budget Period:

Product (1)	Sales Budget (2)	Desired Closing Stock 31 December (3)	Opening Stock 1 January (4)	Units to be Produced (2) + (3) – (4) = (5)
X	7,500	1,500 + 10% = 1,650	1,500	7,650
Y	9,250	2,000 + 10% = 2,200	2,000	9,450

(a) When there is no loss in production

Units to be produced: X = 7,650 units & Y = 9,450 units.

(b) When there is loss in production:

X = 5% loss : units to be produced: $7,650 \times \frac{100}{95} = 8052.6$ units

Y = 10% loss : units to be produced: $9,450 \times \frac{100}{90} = 10,500$ units.

3. Direct Material Budget

Direct Materials Budget is prepared for estimating the quantity of raw material required for budgeted production. This budget is prepared on the basis of Production Budget, inventory policy of the firm (with regard to raw materials), material purchase policy, stock levels to be maintained at the stores, delivery period by supplier etc.

Illustration 4

From the following figures prepare the raw material purchase budget for January, 2021:

Particulars	Materials					
	A	B	C	D	E	F
Estimated Stock on Jan 1	16,000	6,000	24,000	2,000	14,000	28,000
Estimated Stock on Jan 31	20,000	8,000	28,000	4,000	16,000	32,000
Estimated Consumption	1,20,000	44,000	1,32,000	36,000	88,000	1,72,000
Standard Price per unit	25 paise	5 paise	15 paise	10 paise	20 paise	30 paise

Solution:

Raw Materials Purchase Budget for January 2021

Type	A	B	C	D	E	F	Total
Estimated Consumption (units)	1,20,000	44,000	1,32,000	36,000	88,000	1,72,000	
Add: Estimated stock on Jan 31, 2021 (units)	20,000	8,000	28,000	4,000	16,000	32,000	
	1,40,000	52,000	1,60,000	40,000	1,04,000	2,04,000	
Less: Estimated stock on Jan 1, 2021 (units)	16,000	6,000	24,000	2,000	14,000	28,000	
Estimated purchase (units) (1)	1,24,000	46,000	1,36,000	38,000	90,000	1,76,000	6,10,000
Rate per unit (₹) (2)	0.25	0.05	0.15	0.10	0.20	0.30	
Estimated purchases (₹) (1×2)	31,000	2,300	20,400	3,800	18,000	52,800	1,28,300

4. Direct Labour Budget

Direct Labour Budget is prepared to estimate the labour time required for meeting the budgeting production target, the number of workers required, the labour rate, the labour cost and labour recruitment plan.

Illustration 5

A factory works 8 hours per day, 6 days in a week and budget period is one year and during each quarter, lost hours due to leave, holidays and other causes are estimated to be 124 hours.

Particulars	Product A	Product B
Direct Labour per unit		
In P Dept.	2 hrs @ ₹ 1 Per Hrs	1 hr @ ₹ 2 Hrs
In Q Dept.	1 hr @ ₹ 3 Per Hrs	1 hr @ ₹ 3 Per Hrs
Units to be produced as per production budget	10,000	4,000

Required: Prepare (a) Manpower Budget, showing Direct Labour hours and number of workers; and (b) Manpower Budget showing labour cost.

Solution:

Manpower Budget showing Labour Hours and Number of Workers

Particulars	Dept. P	Dept. Q
A. Hours Required		
For Product 'A'	20,000	10,000
For Product 'B'	4,000	4,000
Total Hrs. Required	24,000	14,000
B. Hours during Budget Period (Note)	2,000	2,000
C. No. of Workers (A/B)	12	7

Manpower Budget showing Labour Cost

Particulars	Dept. P			Dept. Q		
	Hrs Required	Rate ₹	Amt ₹	Hrs Required	Rate ₹	Amt ₹
For Product 'A'	20,000	1	20,000	10,000	3	30,000
For Product 'B'	4,000	2	8,000	4,000	3	12,000
			28,000			42,000

Note: Budgeted Working Hours (8 × 6 × 52) - (124 × 4) = 2000 Hours

5. Production Overheads Budget

Production Overheads Budget is prepared for estimating the indirect material, indirect Labour and other Indirect Expenses for production. It is also used for estimating Factory Overhead Absorption or Recovery rates.

Illustration 6

The budget manager of Y Ltd is preparing a budget for the accounting year starting from 1 April 2022.

As a part of the budget operations, some items of factory overhead costs have been estimated by him under specified conditions of volume as follows:

Volume of production in (units)	60,000	75,000
Expenses:	(₹)	(₹)
Indirect materials	1,32,000	1,65,000
Indirect labour	75,000	93,750
Maintenance	42,000	51,000
Supervision	99,000	1,17,000
Engineering services	47,000	47,000

You are required to calculate the cost of factory overhead items given above at 80,000 units of production.

Solution:

The fixed and variable element included in each item of the fixed overhead is to be computed as follows:

(a) Indirect material:

Formula to compute the variable cost per unit:

$$\text{Variable cost per unit} = \frac{\text{Change in expense}}{\text{Change in output}}$$

$$= \frac{₹\ 1,65,000 - ₹\ 1,32,000}{75000 - 60,000} = \frac{₹\ 33,000}{15,000} = ₹\ 2.20$$

Variable indirect material = Production × variable cost per unit

= ₹ 60,000 units × ₹ 2.20 = ₹ 1,32,000 (given)

= ₹ 1,32,000 for 60,000 units

The same figure which is given in the question, i.e., ₹ 1,32,000.

Therefore, no fixed element is involved in the indirect material.

(b) Indirect Labour:

$$\text{Variable cost per unit} = \frac{\text{Change in expense}}{\text{Change in output}}$$

$$= \frac{₹\ 93,750 - ₹\ 75,000}{75,000 - 60,000} = \frac{₹\ 18,750}{15,000} = ₹\ 1.25$$

Indirect labour for 60,000 units = 60,000 × ₹ 1.25 = ₹ 75,000

In indirect labour also, there is no fixed element involved.

(c) Maintenance:

$$\text{Variable cost per unit} = \frac{\text{Change in expense}}{\text{Change in output}}$$

$$= \frac{₹\ 51,000 - ₹\ 42,000}{75,000 - 60,000} = \frac{₹\ 9,000}{15,000} = ₹\ 0.60$$

Maintenance for 60,000 units = 60,000 × 0.60 = ₹36,000.

Fixed element involved = ₹ 42,000 - ₹36,000 = ₹6,000.

(d) Supervision:

$$\text{Variable cost per unit} = \frac{₹\ 1,17,000 - ₹\ 99,000}{75,000 - 60,000} = \frac{₹18,000}{15,000} = 1.20$$

Fixed cost in supervision expenses = ₹99,000 – (60,000 × 1.20)

= ₹99,000 – ₹72,000 = ₹27,000.

Factory-overhead budget **Production: 80,000**

Particulars	Amount (₹)
Step (i) Indirect material (80,000 units × ₹2.20/unit variable cost)	1,76,000
Step (ii) Indirect labour (80,000 × variable @ ₹ 1.25/unit)	1,00,000
Step (iii) Maintenance:	
Fixed cost	6,000
Variable @ ₹ 0.60 for 80,000 units	48,000
Step (iv) Supervision:	
Fixed cost	27,000
Variable @ ₹1.20 for 80,000 units	96,000
Step (v) Engineering service: (Fixed cost)	47,000
Total factory Overheads (i+ii+iii+iv+v)	5,00,000

6. Office & Administration Overheads Budget

The Administrative Cost Budget signifies the expenses which are to be incurred on the operating activities of office during the plan period. It includes all the expenses that are incurred to run the administration whether expenses are of fixed or variable nature. Generally, administrative expenses are of a fixed nature and they do not change with a change in the level of activity.

Administrative expenses in an institution will be incurred for the activities like:

(i) Formulation of business policies;

(ii) Directing the organisation; and

(iii) Controlling the operations of an organization, etc.

Preparation of administration budget involves budgeting for top management functions like legal, finance, accounting, management information services, internal audit and taxation.

7. Selling & Distribution Overheads Budget

The Selling & Distribution overheads are based on sales forecasts because these are directly related with sales. The Selling & Distribution Expenses Budget is prepared by Sales Manager/Officer with the help of Branch Managers, Regional Manager, Sales Agents, Office Superintendents and Ministerial Staff, Distributors, officer-in-charge for advertisement etc. The expenses including the Selling & Distribution Expenses Budget may be further classified into four categories:

(i) Direct Selling Expenses, e.g., Salaries, Commission, Expenses of Salesmen etc.

(ii) Distribution Expenses, e.g., Rent, Rates, Wages Insurance etc. of the warehouse.

(iii) Cost of Sales Office Expense, e.g., Salaries, Rent, Rates, Light, Heat etc. of the Sales Office;

(iv) Publicity Expenditure, e.g., Press, Window Display, Posters, Radios, Televisions etc.

Illustration 7.

You are required to prepare a selling overhead Budget from the estimates given below:

Particulars	(₹)
Advertisement	1,000
Salaries of the Sales dept.	1,000
Expenses of the Sales dept.(Fixed)	750
Salesmen's remuneration	3,000

Salesmen's and dearness Allowance - Commission @ 1% on sales excluding Agent's sales.

Carriage outwards: estimated @ 5% on sales.

Agents Commission: 7½ % on Agent's sales.

The sales during the period were estimated as follows:

(a) ₹80,000 including Agent's Sales ₹8,000

(b) ₹90,000 including Agent's Sales ₹10,000

(c) ₹1,00,000 including Agent's Sales ₹10,500

Solution:

Selling Overhead Budget

Sales	₹ 80,000	₹ 90,000	₹ 1,00,000
(A) Fixed overhead:			
Advertisement	1,000	1,000	1,000
Salaries of the sales dept.	1,000	1,000	1,000
Expenses of the sales dept.	750	750	750
Salesmen remuneration	3,000	3,000	3,000
Total (A)	5,750	5,750	5,750

(B) Variable overhead:			
Salesmen's Commission & DA	(72,000 × 1%) = 720	(80,000 × 1%) = 800	(89,500 × 1 %) = 895
Carriage outwards	4,000	4,500	5,000
Agent's Commission	(8,000 × 7.5%) = 600	(10,000 × 7.5%) = 750	(10,500 × 7.5%) = 788
Total (B)	5,320	6,050	6,683
Grand Total (A + B)	11,070	11,800	12,433

8. Advertising Cost Budget

An advertising budget is a company's allocation of promotional expenditures over a specified time period. It is a measure of a company's planned expenditure on accomplishing marketing objectives.

Advertising Budget and Advertising Cost Budget is prepared for planning the advertisement and publicity, and the cost for advertisement. The budget includes deciding the medium of advertisement, the insertions or frequency, the reach, etc.

9. Research and Development Expenditure Budget

This budget is prepared for estimating the cost of research and development activities of the enterprise. This involves deciding upon the type of research, research plan and procedure, mode of carrying out research and development and the associated cost. The R&D budget covers all costs — including labour, materials, and overhead—associated with discovering new knowledge and translating research findings into plans or designs for new products.

10. Capital Expenditure Budget

The capital expenditure budget represents the expected expenditure on fixed assets during the budget period. It relates to projects involving huge capital outlay and long-term commitment. It may be long-term or short-term. But, it is usually prepared for a longer period, say, 5 to 10 years. If it is prepared for a longer period, it will have to be broken down into short periods. Since there is a high degree of inflexibility, recovery of cost will take a long period of time because of the investment in fixed assets. That is why this budget should be coordinated with other budgets, viz., Cash Budget, Factory Overhead Budget, Balance Sheet Budget etc. Proposal for capital expenditure may be initiated by any one from operating level to top level of management. The request is first appraised by the concerned departmental head, who, if project appears to be sound, makes formal request for "capital appropriation" to top management. Engineering department and finance and accounts department may render useful service to the departmental heads in making a convincing case for technical and financial strength of proposal. However, separate budgets may be prepared for each individual item of fixed assets. The capital investment proposal should be accompanied by comments from the following:

(i) Production Manager, (ii) Works Manager, (iii) Sales Manager, and (iv) Distribution Manager.

It is prepared for:

(i) the purchase of additional assets - either required for increased production or for starting a new type of product;

(ii) the replacement of existing assets;

(iii)the installation of improved types of assets due to technological development.

11. Cash Budget

A company needs to produce a cash budget in order to ensure that there is enough cash within the business to

achieve the operational levels set by the functional budgets. A Cash budget represents the expected future cash flow of an organization over a defined period of time. It is an estimate of the cash receipts expected in the future over the budget period, the expenditure to be incurred in cash, and finally, the cash balance with the company at the end of the period.

Cash Budgets are prepared with the help of Sales Budget and all Cost Budgets viz., Material Cost Budget, Labour Cost Budget, Production Overheads Budget, Administration Expenses Budget, Sales Cost Budget, Advertising Cost Budget, Research and Development Expenditure Budget, etc.

Activity-Based Budget

In contrast to the traditional ways of reporting budgets, activity-based cost management attempts to critically assess costs by activity and to provide managers with information on why costs are incurred in any process. It also aims to look at the output from that activity. The process concentrates on cost drivers and divides activities into value-added activities and non-value- added activities. By concentrating on non-value-added activities it is possible in the budget process to reduce these without impacting on the customer's use of the product or service. Managers are thus able to prioritize where they should be reducing waste and inefficiency.

Under the traditional approach to budgeting, costs are allocated against subjective (i.e. judgmental) headings – payroll, premises costs, and transport and so on. As has been stated above, there is no information linking costs with outcomes from the expenditure. Under activity-based budgets major activities are linked to the resource inputs. In summary, the process is as follows:

- Identify and define activities and activity pools.
- Directly trace costs to activities and cost objects where possible.
- Assign costs to activity cost pools.
- Calculate activity rates.
- Assign costs to cost objects using the activity rates and activity measures.
- Prepare necessary reports.

The organization is now in a position to focus on managing activities as a way of eliminating waste and reducing delays and defects. This information can be used to directly improve the budgeting and budgetary control processes.

7.4.3 Master Budget

When the functional budgets have been completed, the budget committee will prepare a Master Budget for the target of the concern. Accordingly, a budget which is prepared incorporating the summaries of all functional budgets. It comprises of budgeted profit and loss account, budgeted balance sheet, budgeted production, sales and costs. It is the summary budget incorporating its functional budgets, which is finally approved, adopted and employed. The Master Budget represents the activities of a business during a profit plan. This budget is also helpful in coordinating activities of various functional departments.

It is the summary Budget, incorporating its component functional budgets, which is finally approved, adopted and employed. Master budget gathers together all the budget gathers together all the budgets all the budgets of various departments and makes a Summary of them. Master budget is prepared in two parts; Forecast income statement and Forecast Balance Sheet. In the former part, the principal items of revenue, expenses, losses and profit are shown. In the Forecast Balance Sheet, the items of Balance sheet i.e., fixed assets, current assets, total capital employed and liabilities are shown. Master Budget is an outlay showing the proposed activity and the anticipated financial results during the coming year or budgeted year. It is presented before the Board of Directors for adoption and approval. After approval of the Master Budget, various functional budgets are sent to the concerned departments, so that, they can plan their working according to their budgets.

7.4.4 Cash Budget

This budget represents the anticipated receipts and payment of cash during the budget period. The cash budget also called as Functional Budget. Cash budget is the most important of the entire functional budget because; cash is required for the purpose to meeting its current cash obligations. If at any time, a concern fails to meet its obligations, it will be technically insolvent. Therefore, this budget is prepared on the basis of detailed cash receipts and cash payments. The estimated Cash Receipts include:

(1) Cash Sales
(2) Credit Sales
(3) Collection from Sundry Debtors
(4) Bills Receivable
(5) Interest Received
(6) Income from Sale of Investment
(7) Commission Received
(8) Dividend Received
(9) Income from Non-Trading Operations etc.

The estimated Cash Payments include the following:

(1) Cash Purchase
(2) Payment to Creditors
(3) Payment of Wages
(4) Payments relate to Production Expenses
(5) Payments relate to Office and Administrative Expenses
(6) Payments relate to Selling and Distribution Expenses
(7) Any other payments relate to Revenue and Capital Expenditure
(8) Income Tax Payable, Dividend Payable etc.

Illustration 8

Prepare a Cash Budget for the three months ending 30th June, 2022 from the information given below:

(a)

Month	Sales (₹)	Materials (₹)	Wages (₹)	Overheads (₹)
February	14,000	9,600	3,000	1,700
March	15,000	9,000	3,000	1,900
April	16,000	9,200	3,200	2,000
May	17,000	10,000	3,600	2,200
June	18,000	10,400	4,000	2,300

(b) Credit terms are:

Sales/debtors: 10% sales are on cash, 50% of the credit sales are collected next month and the balance in the following month.

Creditors: Materials 2 months

Wages 1/4 in the following month

Overheads 1/2 in the following month.

(c) Cash and bank balance on 1st April, 2022 is expected to be ₹ 6,000.

(d) other relevant information are:

(i) Plant and machinery will be installed in February 2022 at a cost of ₹96,000. The monthly instalment of ₹2,000 is payable from April onwards.

(ii) Dividend @ 5% on preference share capital of ₹2,00,000 will be paid on 1st June.

(iii) Advance to be received for sale of vehicles ₹9,000 in June.

(iv) Dividends from investments amounting to ₹1,000 are expected to be received in June.

Solution:

Cash Budget for the 3 Months Ending 30th June 2022 **(Amount in ₹)**

Particulars	April	May	June
Opening Balance (A)	6,000	3,950	3,000
Add: Receipts : (B)			
Cash Sales	1,600	1,700	1,800
Collection from debtors [see note(i)]	13,050	13,950	14,850
Advance for sale of vehicles	-	-	9,000
Dividends from Investments	-	-	1,000
Total (A+B)	20,650	19,600	29,650
Less: Payments :			
Materials	9,600	9,000	9,200
Wages [see note (ii)]	3,150	3,500	3,900
Overheads	1,950	2,100	2,250
Instalment of Plant & Machinery	2,000	2,000	2,000
Preference dividend	-	-	10,000
Total (C)	16,700	16,600	27,350
Closing Balance (A+B-C)	3,950	3,000	2,300

Working Notes:

(i) Computation of Collection from Debtors **(Amount in ₹)**

Month	Total Sales	Credit Sales	Feb	Mar	Apr	May	June
Feb	14,000	12,600	---	6,300	6,300	---	---
Mar	15,000	13,500	---	---	6,750	6,750	---
Apr	16,000	14,400	---	---	---	7,200	7,200
May	17,000	15,300	---	---	---	---	7,650
					13,050	13,950	14,850

(ii) Wages payment in each month is to be taken as three-fourths of the current month plus one-fourth of the previous month.

7.4.5 Zero Base Budgets

Traditional methods of budgeting have taken the current level of operating activity (the base) as the starting point and then adjusted this starting point for expected changes. As these changes are normally made at the margin of the existing budget and do not involve a fundamental review of the base budget, the term incremental budgeting is used to describe this process. In this context it can be seen that any inefficiencies in the base can be overlooked. Again we would, however, point out that many industries are under severe cost pressure so this may present a somewhat simplistic view of the world, and probably considerably more work goes on reviewing the base budget from the previous period than many textbooks appear to suggest.

The alternative solution presented to the problem of inefficiency in the base is termed zero-based budgeting (ZBB) or sometimes priority-based budgeting. As can be imagined, under this system each manager in charge of an authorized programme has to justify each item of expense as if the programme was totally new to the organization. This solution would thus reject the concept of an existing base and raise issues over whether the function should be performed at all, how it should be performed, how much should it cost to perform and so on. Managers are thus constantly questioning the way in which an activity is delivered and if it is to the benefit of their organization.

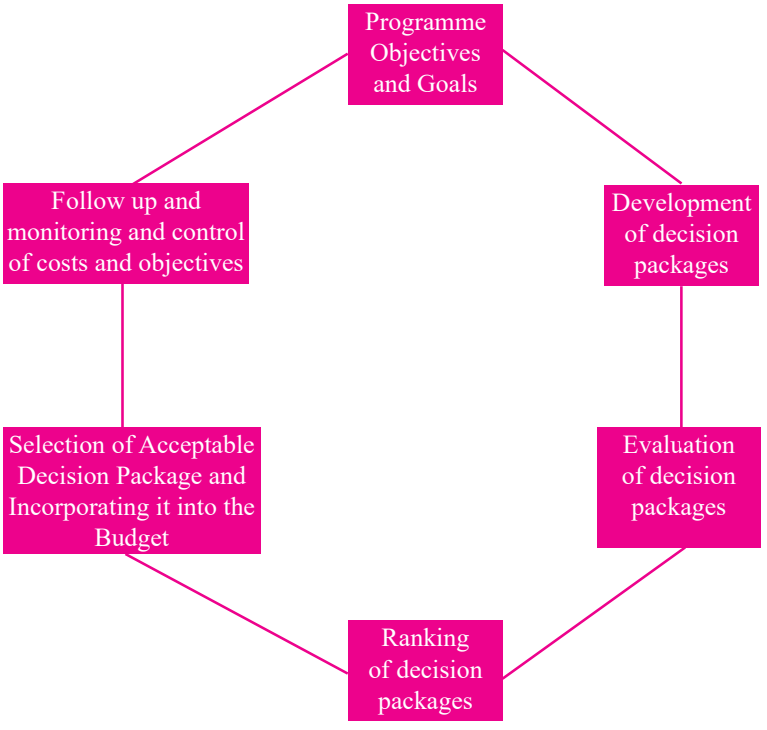


Figure 7.2 : ZBB Cycle

Option Budgets

A variation on ZBB that may add to the efficiency with which it can be made to operate is the use of option budgets. Under this system, managers are required to consider how their department/service would respond to a 5% or 10% cut in expenditure (increases are equally possible). These options are designed to force managers to think through their policies and operating procedures by again forcing them to question what they do and how they do it.

Important Aspects of ZBB

Zero Base Budgeting involves the following important aspects:

(1) It emphasizes on all requisites of budgets.

(2) Evaluation on the basis of decision packages and systematic analysis, i.e., in view of cost benefit analysis.

(3) Planning the activities promotes operational efficiency and monitors the performance to achieve the objectives.

Steps Involved in ZBB

The following are the steps involved in Zero Base Budgeting:

(1) No Previous year performance of inefficiencies are to be taken as adjustments in subsequent year.

(2) Identification of activities in decision packages.

(3) Determination of budgeting objectives to be attained.

(4) Extent to which Zero Base Budgeting is to be applied.

(5) Evaluation of current and proposed expenditure and placing them in order of priority.

(6) Assignment of task and allotment of sources on the basis of cost benefit comparison.

(7) Review process of each activity examined afresh.

(8) Weightage should be given for alternative course of actions.

Advantages of ZBB

Advantages of ZBB are as follows:

- ZBB allocates resources according to priorities which managers decide are essential or less essential.
- As budget allocations are related to business objectives, these results in resource allocation being improved.
- Managers, in having to defend their budgets, are forced to plan ahead and justify activities.
- Managers feel a greater sense of ownership as a result of the process.
- ZBB creates a questioning and critical attitude to processes and procedures amongst managers.
- Resources are allocated on the basis of need and benefits received in line with the objectives of the organization.

The disadvantages of ZBB are:

Disadvantages of ZBB are as follows:

- Other than in the smallest organizations, it is not possible from a time basis to constantly be reappraising activities.
- The organization could lose sight of its strategic goals if its gets obsessed with 'navel gazing'.
- The bureaucracy of meetings and reports can overwhelm managers.
- In government organizations managers are locked into delivery of certain programmes by law, although this should not stop them questioning the methods of delivery to seek efficiencies.
- In some organizations activities are highly interlinked and difficult to separate

7.4.6 Performance Budget

Performance Budget has been defined as a "budget based on functions, activities and projects." Performance of Budgeting may be described as "the budgeting system in which input costs are related to the performance, i.e., end results."

According to National Institute of Bank Management, Performance Budgeting is, "the Process of analyzing, identifying, simplifying and crystallizing specific performance objectives of a job to be achieved over a period, in the framework of the organizational objectives, the purpose and objectives of the job."

From the above definitions, it is clear that budgetary performance involves the following:

(1) Establishment of well-defined centers of responsibilities:

(2) Establishment for each responsibility centre - a programme of target performance is - physical units.

(3) Forecasting the amount of expenditure required to meet the physical plan laid down.

(4) Comparison of the actual performance with the budgets, i.e., evaluation of performance.

(5) Undertaking periodic review of the programme with a view to make modifications as required.

7.4.7 Programme Budget

A planning, programming budgeting system (PPBS) is an approach that seeks to separate the policy planning aspects of budgeting from the short-term financial planning process. From the overall objectives, the organization moves on to identify the programmes that will achieve those objectives. The costs and benefits of each programme are then identified so that they may be given relative priorities. Subjective judgement is required to select the most suitable programmes for implementation and the resources required are then allocated to those programmes.

7.4.8 Rolling Budget

A rolling budget is a budget which is continuously updated by adding a further accounting period (a month or quarter) when the earlier accounting period has expired.

An alternative approach is for the annual budget to be broken down by months for the first three months and by quarters for the remaining nine. The quarterly budgets are then developed on a monthly basis as the year proceeds. For example, during the first quarter, the monthly budgets for the second quarter will be prepared; and during the second quarter, the monthly budgets for the third quarter will be prepared. The quarterly budgets may also be reviewed as the year unfolds. For example, during the first quarter, the budget for the next three quarters may be changed as new information becomes available.

A new budget for a fifth quarter will also be prepared. This process is known as continuous or rolling budgeting, and ensures that a 12-month budget is always available by adding a quarter in the future as the quarter just ended is dropped. Contrast this with a budget prepared once per year. As the year goes by, the period for which a budget is available will shorten until the budget for next year is prepared.

Rolling budgets also ensure that planning is not something that takes place once a year when the budget is being formulated. Instead, budgeting is a continuous process, and managers are encouraged to constantly look ahead and review future plans. Another advantage is that it is likely that actual performance will be compared with a more realistic target, because budgets are being constantly reviewed and updated. The main disadvantage of a rolling budget is that it can create uncertainty for managers because the budget is constantly being changed.

Rolling budgets are an attempt to prepare targets and plans which are more realistic and certain, particularly with a regard to price levels, by shortening the period between preparing budgets.

Instead of preparing a periodic budget annually for the full budget period, there would be budgets every one, two, three or four months (three to six, or even twelve budgets each year). Each of these budgets would plan for the next twelve months so that the current budget is extended by an extra period as the current period ends: hence the name rolling budgets.

Suppose, for example, that a rolling budget is prepared every three months. The first three months of the budget period would be planned in great detail, and the remaining nine months in lesser detail, because of the greater uncertainty about the longer-term future. If a first continuous budget is prepared for January to March in detail and April to December in less detail, a new budget will be prepared towards the end of March, planning April to June in detail and July to March in less detail. Four rolling budgets would be prepared every 12 months on this 3 and 9-month basis, requiring, inevitably, greater administrative effort.

The advantages and disadvantages of rolling budgets

The advantages are as follows.

(a) They reduce the element of uncertainty in budgeting because they concentrate detailed planning and control on short-term prospects where the degree of uncertainty is much smaller.

(b) They force managers to reassess the budget regularly, and to produce budgets which are up to date in the light of current events and expectations.

(c) Planning and control will be based on a recent plan which is likely to be far more realistic than a fixed annual budget made many months ago.

(d) Realistic budgets are likely to have a better motivational influence on managers.

(e) There is always a budget which extends for several months ahead. For example, if rolling budgets are prepared quarterly there will always be a budget extending for the next 9 to 12 months. This is not the case when fixed annual budgets are used.

The disadvantages of rolling budgets can be a deterrent to using them.

(a) They involve more time, effort and money in budget preparation.

(b) Frequent budgeting might have an off-putting effect on managers who doubt the value of preparing one budget after another at regular intervals.

(c) Revisions to the budget might involve revisions to standard costs too, which in turn would involve revisions to stock valuations. This could replace a large administrative effort from the accounts department every time a rolling budget is prepared.

7.4.9 Outcome Budget

Budget management in a time of severe fiscal stress seems to have been construed as an exercise to control fiscal deficit and government borrowing. Outcome budgeting has been claimed as a major budgetary reform. It involves a movement beyond inputs and outputs towards outcomes, concerning a macro analysis of results, accomplishments and impact. It is a "pre-expenditure instrument" that seeks to educate and involve external stakeholders on government goals, accomplishments and the costs of achieving these results. But important lessons learnt from developed nations as well as the Indian story of performance budgeting need to be incorporated.

Outcome Budget analyses the progress of each ministry and department and what the respected ministry has done with its Budget outlay. It measures the development outcomes of all government programs. It was first introduced in the year 2005

One of the leading budgeting technique followed in India at present is the outcome budgeting or outcome based budgeting. It is practiced by most of the Ministries while preparing their budget details and submitting it to the Ministry of Finance for the preparation of the annual budget towards the end of February.

As per the ministry's directions, every ministry will have to prepare an outcome budget statement linking outlays against each scheme as well as project with the deliverables and medium term outcomes. Through "outcome-based budgeting", the ministry is trying to shift from traditional performance-based budgeting by planning expenditure, fixing appropriate targets and quantifying deliverables of each scheme.

It measures the development outcomes of all government programs and whether the money has been spent for the purpose it was sanctioned including the outcome of the fund usage. It is a means to develop a linkage between the money spent by a government and the results which follow. It measures the development outcomes of all government programmes and whether the money has been spent for the purpose it was sanctioned including the outcome of the fund usage.

Outcome budgeting makes government programmes more result oriented, instead of outlay oriented. Under outcome budgeting, the document shows physical dimensions of the financial budget indicating the actual physical performance in the previous year, current year and targeted performance during the projected (next) year.

It seeks to bring correlation between outlay, output and outcome:

Outlay- is the amount that is provided for a given scheme or project in the Budget.

Output- Refers to the direct and measurable product of program activities, often expressed in Physical terms or unit.

Outcome- It is the collective result or qualitative improvements brought about in the delivery of these services, often expressed in terms of improvements over earlier indicators and benchmarks.

Outcome's Go beyond mere 'outputs', they cover the quality and effectiveness of the goods or services.

An interesting feature of outcome based budgeting is that the outcomes of programmes are measured not just in terms of Rupees but also in terms of physical units like Kilowatt of energy produced or tonnes of steel produced. Also outcomes are expressed in terms of qualitative targets and achievements to make the technique more comprehensive. Then move on to discuss the procedure for outcome-based budgeting. Outcome budget is a performance measurement tool which having the following specific undermentioned objectives:

- Decision-making
- Evaluating programme performance and results
- Communicating programme goals
- Improving programme effectiveness
- Make budgets cost effective
- Fix accountability
- Aid better scheme management
- Better service delivery

7.4.10 Budgetary Control

(A) Rationale for Budgetary Control

Budgetary Control is defined as "the establishment of budgets, relating the responsibilities of executives to the requirement 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."

Budgetary control is intimately connected with budgets. The Chartered Institute of Management Accountants, London defines 'Budgetary control; as "the establishment of budgets, relating the responsibilities of executive to the requirements of a policy and the continuous comparison of actual with budgeted results either to secure by individual action the objectives of that policy or to provide a firm basis for its revision". The process of budgetary control is set up with the objective to closely monitor whether or not the actual sales and expenses are in line with the financial plan. The processes involve setting up goals at the organizational level and then percolate it to match the personal goals of each employee. The employees and departments are rewarded when the goals are achieved, but if the actual results seem to fall well below expectations then correction measures are undertaken.

A budgetary control system secures control over performance and costs in the different parts of a business:

(i) by establishing budgets

(ii) by comparing actual attainments against the budgets; and

(iii) by taking corrective action and remedial measures or revision of the budgets, if necessary.

The budget is a blue-print of the projected plan of action expressed in quantitative terms and for a specified period of time. The budgets put the plan in a concrete form and follow up action to see that plan is adhering to complete the system of control. In other words, while budgeting is the art of planning, budgetary control is the act of adhering to the plan. In fact, budgetary control involves continuous comparison of actual results with the budgets and taking appropriate remedial action promptly

Budgetary control is achieved by comparing the actual results with the budget. The differences are calculated as variances and management action may be taken to investigate and correct the variances if necessary or appropriate. If costs are higher or revenues are lower than the budget, then the difference is an adverse variance. If costs are lower or revenues are higher than the budget, then the difference is a favourable variance.

The main features of budgetary control are:

1. Establishment of budgets for each purpose of the business.
2. Revision of budget in view of changes in conditions.
3. Comparison of actual performances with the budget on a continuous basis.
4. Taking suitable remedial action, wherever necessary.
5. Analysis of variations of actual performance from that of the budgeted performance to know the reasons thereof.

Objectives of Budgetary Control:

Budgeting is a forward planning. It serves basically as a tool for management control; it is rather a pivot of any effective scheme of control.

The objectives of budgeting may be summarized as follows:

1. **Planning:** Planning has been defined as the design of a desired future position for an entity and it rests on the

belief that the future position can be attained by uninterrupted management action. Detailed plans relating to production, sales, raw-material requirements, labour needs, capital additions, etc. are drawn out. By planning many problems estimated long before they arise and solution can be thought of through careful study. In short, budgeting forces the management to think ahead, to foresee and prepare for the anticipated conditions. Planning is a constant process since it requires constant revision with changing conditions.

2. **Co-ordination:** Budgeting plays a significant role in establishing and maintaining coordination. Budgeting assists managers in coordinating their efforts so that problems of the business are solved in harmony with the objectives of its divisions. Efficient planning and business contribute a lot in achieving the targets. Lack of co-ordination in an organization is observed when a department head is permitted to enlarge the department on the specific needs of that department only, although such development may negatively affect other departments and alter their performances. Thus, co-ordination is required at all vertical as well as horizontal levels.
3. **Measurement of Success:** Budgets present a useful means of informing managers how well they are performing in meeting targets they have previously helped to set. In many companies, there is a practice of rewarding employees on the basis of their accomplished low budget targets or promotion of a manager is linked to his budget success record. Success is determined by comparing the past performance with previous period's performance.
4. **Motivation:** Budget is always considered a useful tool for encouraging managers to complete things in line with the business objectives. If individuals have intensely participated in the preparation of budgets, it acts as a strong motivating force to achieve the goals.
5. **Communication:** A budget serves as a means of communicating information within a firm. The standard budget copies are distributed to all management people provide not only sufficient understanding and knowledge of the programmes and guidelines to be followed but also give knowledge about the restrictions to be adhered to.
6. **Control:** Control is essential to make sure that plans and objectives laid down in the budget are being achieved. Control, when applied to budgeting, as a systematized effort is to keep the management informed of whether planned performance is being achieved or not.

Advantages of Budgetary control:

Budgetary control makes all the differences between drifting in an unchartered sea and following a well plotted course towards a predetermined distinction. It serves as a valuable aid to management through planning, co-ordination and control.

The principal advantages of a budgetary control system are enumerated below:

(1) Budgetary control aims at maximization of profits through effective planning and control of income and expenditure - directing capital and resources to the best and most profitable channel.

(2) There is a planned approach to expenditure and financing of the business so that economy is affected in the utilization of funds to the optimum benefit of the concern.

(3) It provides a clear definition of the objective and policies of the concern and a tool for objecting these policies to periodic examination.

(4) The task of managerial co-ordination is facilitated through budgetary control.

(5) Since each level of management is aware of the task and is fully conscious as to the best way by which it is to be performed, maximum effective utilization of men, materials and resources can be attained.

(6) Reports are furnished under the principles of management or control by exception. Only deviations from budgets which point out the weak spots and inefficiencies are properly looked into.

(7) It cultivates in the management the habit of thinking ahead - making careful study of the problems in advance before taking decisions.

(8) A budgetary control system assists delegation of authority and is a powerful tool of responsibility accounting.

(9) Budgets are the fore-runners of standard costs in the sense that they create necessary conditions to suit setting up of standard costs.

(10) The method of evaluating performance against budgets provides a suitable basis for establishing incentive system of remuneration by results as also spotting people with exceptional qualities of leadership and management.

(11) Since it involves foreseeing difficulties of various types, it will lead to their removal in time.

Limitations of Budgetary control:

1. It tends to bring about rigidity in operation, which is harmful. As budget estimates are quantitative expression of all relevant data, there is a tendency to attach some sort of rigidity or finality to them.
2. It being expensive is beyond the capacity of small undertakings. The mechanism of budgeting system is a detailed process involving too much time and costs.
3. Budgeting cannot take the position of management but it is only an instrument of management. 'The budget should be considered not as a master, but as a servant.' It is totally misconception to think that the introduction of budgeting alone is enough to ensure success and to security of future profits.
4. It sometimes leads to produce conflicts among the managers as each of them tries to take credit to achieve the budget targets.
5. Simple preparation of budget will not ensure its proper implementation. If it is not implemented properly, it may lower morale.
6. The installation and function of a budgetary control system is a costly affair as it requires employing the specialized staff and involves other expenditure which small companies may find difficult to incur. If managers are to use the budgets to control effectively, they must receive regular control information.

The budgetary control reports should be:

(a) **Timely:** The information should be made available as soon as possible after the end of the control period. Corrective action will be much more effective if it is taken soon after the event, and adverse trends could continue unchecked if budgetary reporting systems are slow.

(b) **Accurate:** Inaccurate control information could lead to inappropriate management action. There is often a conflict between the need for timeliness and the need for accuracy. The design of budgetary reporting systems should allow for sufficient accuracy for the purpose to be fulfilled.

(c) **Relevant to the recipient:** Busy managers should not be swamped with information that is not relevant to them. They should not need to search through a lot of irrelevant information to reach the part that relates to their area of responsibility. The natural reaction of an individual faced with this situation could be to ignore the information altogether.

The budgetary reporting system should ideally be based on the exception principle, which means that management attention is focused on those areas where performance is significantly different from budget. Subsidiary information could be provided on those items that are in line with the budget.

Many control reports also segregate controllable and non-controllable costs and revenues, that is, the costs and revenues over which managers can exercise control are highlighted separately in the reports.

(d) **Communicated to the correct manager:** Control information should be directed to the manager who has the responsibility and authority to act upon it. If the information is communicated to the wrong manager its value will be immediately lost and any adverse trends may continue uncorrected. Individual budget-holders' responsibilities must be clearly defined and kept up to date in respect of any changes.

(B) Importance and Significance of Budgetary Control

(1) Compels management to think about the future, which is probably the most important feature of a budgetary planning and control system. Forces management to look ahead, to set out detailed plans for achieving the targets for each department, operation and (ideally) each manager, to anticipate and give the organization purpose and direction.

(2) Promotes co-ordination and communication.

(3) Clearly defines areas of responsibility. Requires managers of budget centres to be made responsible for the achievement of budget targets for the operations under their personal control.

(4) Provides a basis for performance appraisal (variance analysis). A budget is basically a yardstick against which actual performance is measured and assessed. Control is provided by comparisons of actual results against budget plan. Departures from budget can then be investigated and the reasons for the differences can be divided into controllable and non-controllable factors.

(5) Enables remedial action to be taken as variances emerge.

(6) Motivates employees by participating in the setting of budgets.

(7) Improves the allocation of scarce resources.

(8) Economizes management time by using the management by exception principle.

(C) Linkage of Budgetary Control with Standard Costing and Profit Reconciliation

Like Budgetary Control, Standard Costing assume that costs are controllable along definite lines of supervision and responsibility and it aims at managerial control by comparison of actual performances with suitable predetermined yardsticks. The basic principles of cost control, viz., setting up of targets or standards, measurement of performance, comparison of actual with the targets and analysis and reporting of variances are common to both standard costing and budgetary control systems. Both techniques are of importance in their respective fields are complementary to each other. Thus, conceptually there is not much of a difference between standard costs and budgeted and the terms budgeted performance and standard performance mean, for many concerns one and the same thing.

Budgets are usually based on past costs adjusted for anticipated future changes but standard costs are of help in the preparation of production costs budgets. In fact, standards are often indispensable in the establishment of budgets. On the other hand, while setting standard overhead rates of standard costing purposes, the budgets framed for the overhead costs may be made use of with modifications, if necessary. Thus, standard costs and budgets are interrelated but not inter-dependent.

Table showing linkage of Budgetary Control with Standard Costing and Profit Reconciliation Operating Statement for the period ending…

Budgeted profit	x		
Sales volume variance		x	
Sales price variance		(x)	
Cost variances			

Materials price			x
Material usage			x
Labour rate Variance			x
Labour idle time Variance			x
Labour efficiency			x
Variable overheads expenditure	x		
Variable overheads efficiency	x		
Fixed overheads expenditure		x	
Fixed overheads efficiency		x	
Fixed overheads capacity	x		
Actual Profit	x		

Example

Reconciliation statement incorporating variances

(Note: In this statement, adverse variances are presented in brackets.)

Particulars	Amount (₹)	Amount (₹)
Budgeted net profit		6,000.00
Sales price variance	2,500.00	
Sales margin volume variance	–	
Direct materials price variance	(537.50)	
Direct materials usage variance	(675.00)	
Direct labour rate variance	1,964.00	
Direct labour efficiency variance	720.00	
Variable overhead rate variance	(1,473.00)	
Variable overhead efficiency variance	180.00	
Fixed overhead expenditure variance	(1,000.00)	
Fixed overhead volume variance	–	
Total variances		1,678.50
Actual profit		7,678.50

Cost control refers to management actions to keep the costs within standards and/or budget. Cost control can be defined as the comparative analysis of actual costs with appropriate standards or budgets to facility performance evaluation and formulation of corrective measures. It aims at accomplishing conformity between actual results and standards or budgets, keeping expenditures within prescribed limits. Cost control has the following features:

1. Creation of responsibility centres with defined authority and responsibility for cost incurrence.
2. Formulation of standards and budgets that incorporate objectives and goals to be achieved.
3. Timely cost control reports (responsibility reporting) describing the variances between budgets and standards and actual performance.

4. Formulation of corrective measures to eliminate and reduce unfavourable variances.
5. A systematic and fair plan of motivation to encourage workers to accomplish budgetary goals.
6. Follow-up to ensure that corrective measures are being effectively applied.

Like Budgetary Control, Standard Costing assumes that costs are controllable along definite lines of supervision and responsibility and it aims at managerial control by comparison of actual performances with suitable predetermined yardsticks. The basic principles of cost control, viz., setting up of targets or standards, measurement of performance comparison of actual with the targets and analysis and reporting of variances are common to both standard costing and budgetary control systems. Both techniques are of importance in their respective fields are complementary to each other. Thus, conceptually there is not much of a difference between standard costs and budgeted and the terms budgeted performance and standard performance mean, for many concerns one and the same thing.

Budgets are usually based on past costs adjusted for anticipated future changes but standard costs are of help in the preparation of production costs budgets. In fact, standards are often indispensable in the establishment of budgets. On the other hand, while setting standard overhead rates of standard costing purposes, the budgets framed for the overhead costs may be made use of with modifications, if necessary. Thus, standard costs and budgets are interrelated but not inter-dependent.

Despite the similarity in the basic principles of Standard Costing and Budgetary Control, the two systems vary in scope and in the matter of detailed techniques.

Budgets are prepared on the basis of standard costing. Standards which are set up in respect of materials, labour and overheads, are helpful in preparing various budgets. For example, flexible budget, sales budget, etc.

It is well recognized that a control system involves fixing of targets (in the form of specific tasks), collection of information regarding actuals and continuous comparison of actuals with the targets with a view to reporting for action. A budgetary control system, in this sense is also a control system. It is an excellent system for decentralization of authority without losing control over the operations of the firm.

One should not consider (budgets or) budgetary control as something rigid or strait-jacket. It is one of the system whereby dynamism is infused into an organization through the process of targets, the achievement of which will mean progress; of allowing a good deal of freedom of action within the delegated field of executives and of seeing to it that all concerned will work in a concerted manner for achieving the firm's objectives. There is always a good scope for initiative and drive but not for recklessness or too much caution.

In short, budgetary control means laying down in momentary and quantitative term what exactly has to be done and how exactly it has to be done over the coming period and then to ensure that actual results do not diverge from the planned course more than necessary. The word "necessary" is not to be loosely interpreted. Divergence due to inefficiency is not necessary.

Beyond Budgeting

A view is emerging that annual budgeting tends to fix a company's thinking and response to events when the world is changing. This limits flexibility in responding to these events.

There is an argument that the budget in effect reflects the previous year's reality, and this is what locks companies and managers into the past rather than thinking about what is happening to the business in the present. Rolling or perhaps monthly forecasting and budgets focus thinking on current and future realities and contexts. This is not seen as managing change as this is outside the control of the organization, but rather as an attempt to be ahead of change or more in control of the response to the challenges facing the organization. This importance may be emphasized in the knowledge-based economies that the western world has increasingly developed. Knowledge-based companies face competition which detracts from any innovation made particularly in respect of the time

horizon for the life of products, which is becoming shorter and shorter. Prices are also falling and quality rising. Firms need to be operating at the excellent end of the quality spectrum if they are to continue to flourish and be close to their customers. Managers are also talented people in short supply.

This type of individual seeks freedom, challenge and responsibility. Traditional time-consuming and 'legalistic' budget processes can be off-putting for such persons. The rapid production of new solutions to constantly changing issues in the competitive environment and strategies also depends on attracting and retaining such individuals.

In this view of the world the traditional budget is seen as the fixed point around which all management processes are based and aligned. This determines how managers behave and the activities and objectives on which they focus. Annual budgeting is seen as absorbing considerable management time, and the monthly budget actual comparisons as primarily about control. Managers will not exceed their budgets by perhaps spending necessary resources outside the planned budget cycle to react to events because their bonus or even their jobs will depend on it. This, in a globally competitive world where, when the budget was set, circumstances were entirely different from those pertaining when any comparisons are being made and decisions required. Inflexibility is thus seen as the key failing of traditional budgeting and companies are being urged to move towards continuous rolling forecasting to enable speedy and coordinated adaptations to actual and anticipated changes in the business environment.

Under rolling monthly forecasts of financial performance and for other non-financial value drivers, managers are forced to confront current and future opportunities and risks.

In essence, the beyond budgeting model calls for devolving managerial responsibility where power and responsibility go hand in hand.

(D) Benchmarking and Key Success Factor

Benchmarking is the process of identifying and learning from the best practices anywhere in the world. It is a powerful tool for continuous improvement in performance. It involves comparing firm's products, services or activities against other best performing organizations, either internal or external to the firm. The objective is to find out how the product, service or activity can be improved and ensure that the improvements are implemented.

It attempts to identify an activity that needs to be improved & finding a non-rival organization that is considered to represent world-class best practice and studying how it performs the activity.

Suggested Benchmarking Code of Conduct:

- Principle of Legality
- Principles of Exchange
- Principle of Confidentiality
- Principle of Use
- Principle of first part Contact
- Principle of Third Party Contact
- Principle of Preparation

It is a technique for continuous improvement in performance. It involves comparing a firm's product, services or activities against other best performing organizations, either internal or external to the firm. The objective is to determine how the products, services or activities can be improved and ensuring that such improvements are implemented as well. It is a performance measure that provides the driving force to establish high performance and means to accomplish these goals.

Pre-requisites of Benchmarking:

(i) The objectives of benchmarking should be clearly defined.

(ii) Senior Managers should support bench marking and commit themselves for continuous improvement.

(iii) The scope of the work should be appropriate in the light of the objectives, resources, time and experience of those involved.

(iv) Sufficient resources should be made available to complete projects within the required time.

(v) Benchmarking teams should have the right skill and competencies.

(vi) Stakeholders, staff and others should be kept informed of the reasons of benchmarking.

Stages in the Process of Benchmarking:

The process of benchmarking involves the following stages:

Stage 1:

- Planning
- Determination of benchmarking goal statement.
- Identification of best performance.
- Establishment of the benchmarking of process improvement team.
- Defining the relevant benchmarking measurement.

Stage 2:

Collection of Data and information

Stage 3:

Analysis of the findings based on the data collected in Stage 2

Stage 4:

Formulation and implementation of recommendations

Stage 5:

Constant monitoring and reviewing

Types of Benchmarking:

The benchmarking is a versatile tool that can be applied in variety of ways to meet a range of requirements. The distinct types of benchmarks have been over a period of time. Each has its own benefits and shortcomings, and therefore, each is appropriate in certain circumstances then others.

The Benchmarking is of the following:

- Competitive benchmarking
- Strategic benchmarking
- Global benchmarking
- Process Benchmarking
- Functional Benchmarking or Generic Benchmarking
- Internal Benchmarking

External Benchmarking

1. Competitive Benchmarking: It involves the comparison of competitor's products, process and business results with own. 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.
2. 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.
3. 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.
4. Process Benchmarking: It involves the comparison of an organization critical business processes and operations against best practice organization that performs similar work or delivers similar services. For example, how do best practice organization process customer's orders?
5. 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.
6. Internal Benchmarking: Internal benchmarking involves seeking partners from within the same organization. For example, form 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 may be fewer barriers to implementation as practices may be 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.
7. 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.

The benchmarking can also be categorized into:

1. Intra-group Benchmarking: In Intra group benchmarking the groups of companies in the same industry agree that similar units within the cooperating companies will pool data on their process. The processes are benchmarked against each other at or operational level. Improvement task forces are established to identify and transfer best practice to all members of the group.
2. Inter-Industry benchmarking: In inter-industry benchmarking a non-competing business with similar process is identified and asked to participate in a benchmarking exercise. For example, a publisher of schoolbook may approach a publisher of university level books to establish a benchmarking relationship. Although two publishers are not in direct competition but there are obviously many similarities in their business with respect to sources of supply, distribution channels. Each will be able to benefit from the experience of other and establish 'best practices' in their common business processes.

Critical success factors

Critical success factors (CSFs) are often quoted in management literature as those areas in which an organization needs to perform best if it is to achieve overall success. CSFs have frequently been used to help determine the requirements for executive information systems (EIS), supporting the 'key indicator' approach to management control. A number of methods have been developed to identify these key indicators, and the CSF approach is one of the most widely used, which should be measured and monitored using EIS to help manage the strategic direction of an organization.

It is difficult and expensive to gather, store, validate and make available the various types of management information required for decision making. As such, it is important for managers and providers of information support systems to determine, in advance, what is most relevant to them.

It is necessary to identify the 'key indicators' that will help a manager to plan, manage, and control an area of responsibility. This method is based on the need for managers to focus, at any point in time, on the most significant aspects of their responsibilities. The development of an EIS, designed to support management control, is based on two main concepts:

The selection of a set of key indicators of the health of the functional business area. Information will then be collected for each of these indicators.

Exception reporting – the ability to make available to a manager, as required, information on only those indicators where performance differs significantly from expectations.

The underlying belief is that an effective control system must be tailored to the specific industry in which the organization operates, and to the specific strategies that it has adopted. It must identify the CSFs that should receive careful and continuous management attention if the organization is to be successful, and it must highlight performance with respect to these key variables in reports available to all levels of management.

The first concept is frequently approached from the viewpoint of CSFs in that a limited number of areas are identified in which results, if they are satisfactory, will ensure successful performance. They are the few key areas, it is believed, where 'things must go right' if the organization is to flourish. In turn, each manager must identify the key areas that apply to them, in which results are identified as being absolutely necessary to achieve specific goals. The goals, in turn, support overall organizational goals. The genesis of this approach goes back to the history of warfare, where writers on battles have identified the successful leader as the one who concentrated his forces on the most significant areas.

The current state of performance in these areas should be continually measured. Because these areas are identified as being critical, each manager should have the appropriate information that indicates whether events are proceeding sufficiently well in each area. CSFs and associated performance indicators (PIs) can play a central role in this.

(E) Interpretation of Under and Over Performance and Inferences Drawn for Corrective Actions

Performance management can be defined as a systematic process for improving organizational performance by developing the performance of individuals and teams. It is a means of getting better results from the organization, teams and individuals by understanding and managing performance within an agreed framework of planned goals, standards and competence requirements. Processes exist for establishing shared understanding about what is to be achieved, and for managing and developing people in a way that increases the probability that it will be achieved in the short and longer term. It is owned and driven by line management.

The overall aim of performance management is to establish a high-performance culture in which individuals and teams take responsibility for the continuous improvement of business processes and for their own skills and contributions within a framework provided by effective leadership. Its key purpose is to focus people on doing the

right things by achieving goal clarity.

Specifically, performance management is about aligning individual objectives to organizational objectives and ensuring that individuals uphold corporate core values. It provides for expectations to be defined and agreed in terms of role responsibilities and accountabilities (expected to do), skills (expected to have) and behaviours (expected to be). The aim is to develop the capacity of people to meet and exceed expectations and to achieve their full potential to the benefit of themselves and the organization. Importantly, performance management is concerned with ensuring that the support and guidance people need to develop and improve are readily available.

Performance management is a planned process of which the primary elements are agreement, measurement, feedback, positive reinforcement and dialogue. It is concerned with measuring outputs in the shape of delivered performance compared with expectations expressed as objectives. In this respect, it focuses on targets, standards and performance measures or indicators. It is based on the agreement of role requirements, objectives and performance improvement and personal development plans. It provides the setting for on-going dialogues about performance, which involves the joint and continuing review of achievements against objectives, requirements and plans.

But it is also concerned with inputs and values. The inputs are the knowledge, skills and behaviours required to produce the expected results.

Developmental needs are identified by defining these requirements and assessing the extent to which the expected levels of performance have been achieved through the effective use of knowledge and skills and through appropriate behaviour that upholds core values.

Performance management is a continuous and flexible process that involves managers and those whom they manage acting as partners within a framework that sets out how they can best work together to achieve the required results. It is based on the principle of management by contract and agreement rather than management by command. It relies on consensus and cooperation rather than control or coercion.

Performance management focuses on future performance planning and improvement rather than on retrospective performance appraisal. It functions as a continuous and evolutionary process, in which performance improves over time; and provides the basis for regular and frequent dialogues between managers and individuals about performance and development needs. It is mainly concerned with individual performance but it can also be applied to teams. The focus is on development, although performance management is an important part of the reward system through the provision of feedback and recognition and the identification of opportunities for growth. It may be associated with performance- or contribution-related pay but its developmental aspects are much more important.

Performance management activities

The main activities are:

- Role definition, in which the key result areas and competence requirements are agreed.
- The performance agreement, which defines expectations – what individuals have to achieve in the form of objectives, how performance will be measured and the competences needed to deliver the required results.
- The performance improvement plan, which spells out what individuals, should do to improve their performance when this is necessary.
- The personal development plan, which sets out the actions people, should take to develop their knowledge and skills and increase their levels of competence.

Managing performance throughout the year, when action is taken to implement the performance agreement and performance improvement and personal development plans as individuals carry on with their day to- day work and

their planned learning activities. It includes a continuous process of providing feedback on performance, conducting informal progress reviews, updated objectives and, where necessary, dealing with performance problems.

Performance review, which is the formal evaluation stage when a review of performance over a period takes place covering achievements, progress and problems as the basis for the next part of the continuous cycle – a revised performance agreement and performance improvement and personal development plans. It can also lead to performance ratings.

Performance management should not be treated as a mechanistic system based on periodical formal appraisals and detailed documentation. The activities described above should be coherent in the sense of contributing to an overall systematic approach in which all aspects of the performance management process are aligned. Thus there needs to be a declaration of intent, which states why performance management is important, how it works and how people will be affected by it. The declaration should have the visible and continuous support of top management and should emphasize that the aim is to develop a high-performance culture and integrate organizational and individual goals. When developing and operating performance management it is necessary to ensure that it is regarded by all concerned as a joined-up process in which performance and development planning recorded in a performance agreement leads to continuous monitoring of performance against plans with built-in feedback. This in turn forms the basis of formal and informal reviews as and when appropriate (not just an annual event), which inform forward planning as part of a renewed performance agreement.

Good performance management

Good performance management is achieved through both parties ensuring that:

- New staff knows what is expected of them from the outset.
- Everyone is clear about corporate goals and works towards them.
- Objectives are SMART (Specific, Measurable, Achievable, Relevant, Time related).
- A system exists to accommodate day-to-day performance feedback.
- The personal development plan (PDP) is used formally to help self-developmental activities and/or improve performance.

Performance Standard means the acceptable range of performance for a Performance Indicator or a Service Volume that results when a Performance Corridor is applied to a Performance Target.

Under-performance:

Underperformance is when an employee is performing their duties below the required level that has been set and is expected of them. An employee who doesn't know exactly what's expected of them can often become unsure in their actions, leading to underperformance. Worse yet, if they're unaware that they are in fact underperforming. Underperformance jeopardizes the achievement of individual and organizational goals and objectives and is reflected in:

Work outputs which do not meet expectations;

Core competencies not being demonstrated at the expected level;

Complaints from peers, direct reports and/or managers, resulting in conflictual personal relations;

Complaints from those receiving the services of the staff member.

Sometimes, in the case of on-going underperformance, a performance improvement plan may be the best way to address the problems. Such a plan should be prepared, discussed and agreed with the staff member and documented in a format which best suits the particular situation.

Over-performance

Over performance means high performance. A "high-performance work team" refers to a group of goal-focused individuals with specialized expertise and complementary skills, which collaborate, innovate and produce consistently superior results. The group relentlessly pursues performance excellence through shared goals, shared leadership, collaboration, open communication, clear role expectations and group operating rules, early conflict resolution, and a strong sense of accountability and trust among its members. High performers stand out from average performers in any organization. They consistently exceed expectations and are management's go-to people for difficult projects because they have a track record of getting the job done. They're great at their job and take pride in their accomplishments, but may not have the potential (or the desire) to succeed in a higher-level role or to tackle more advanced work.

Corrective actions for removing under performance:

1. Developing clear job descriptions
2. Determining competency sets and selecting people through an appropriate selection process
3. Negotiating requirements and accomplishment-based performance standards, outcomes, and measures
4. Providing effective orientation, education, and training
5. Imparting on-going coaching and feedback
6. Conducting quarterly performance development discussions.

Solved Illustrations & Cases

Illustration 9

When the financial controller of Better Company set the budget for the year ahead, it was expected that monthly output of cake packages would be 12,000 units. In March the output was increased to 14,000 per month following negotiation with a chain of corner shops. The following table reports the original budget and the actual outcome for the month of March.

Particulars	Original Budget	Actual for March
	Amount (₹)	Amount (₹)
Cake packages output (units)	12,000	14,000
Direct materials	48,000	53,000
Direct labour	24,000	29,000
Variable overhead	6,000	7,200
Fixed overhead	4,000	4,500
Total production costs	82,000	93,700

Financial Controller wants to report about the impact of the above and requested you as a Management Accountant of the company to give a detailed report on these.

Solution:

The report should contain the following:

Particulars	Original budget	Flexible budget	Actual for March	Variance
	(1)	(2)	(3)	(2) – (3)
Units manufactured	12,000	14,000	14,000	
	₹	₹	₹	₹
Direct materials	48,000	56,000	53,000	3,000 (F)
Direct labour	24,000	28,000	29,000	1,000 (A)
Variable overhead	6,000	7,000	7,200	200 (A)
Fixed overhead	4,000	4,000	4,500	500 (A)
Total costs	82,000	95,000	93,700	1,300 (F)

The direct materials variance is 5.4% of the flexible budget amount and needs investigating even although it is favourable.

Two possible questions to investigate are:

(1) Did the budget estimates use outdated prices?

(2) Has the buying department chosen low price materials without perhaps considering the quality?

The labour variance is 3.6% of the flexible budget amount. Questions that could be asked here are:

(1) Has there been a rise in pay rates since the budget was set?

(2) Has the apparent purchase of lower cost materials had an impact on labour through using poorer quality materials?

The variable overhead and fixed overhead variances are lower percentages of the flexible budget, but the reasons should be noted to ensure that the variances do not increase in future periods.

Illustration 10

From the following information relating to 2021 and conditions expected to prevail in 2022, prepare a budget for 2022.

2021 Actual:	Amount (₹)
Sales (40,000 units)	1,00,000
Raw materials	53,000
Wages	11,000
Variable Overhead	16,000
Fixed Overheads	10,000

2022 Prospects:	
Sales (60,000 units)	1,50,000
Raw Materials	5% increase in prices
Wages	10% increase in wage rate
	5% increase in productivity

Additional plant: One Lathe	₹ 25,000
One Drill	₹12,000

10% Depreciation to be considered.

Solution:

Budget Showing Costs and Profits for the Year 2022:

Particulars	Amount (₹)
I. Sales	**1,50,000**
II. Costs:	
Raw Materials [(₹ 53,000 × 6 ÷ 4) × 105 ÷ 100]	83,475
Wages [₹ 11,000 × (110 ÷ 100) × (6 ÷ 4) × (105 ÷ 100)]	19,058
Variable Overheads (₹16,000 × 6 ÷ 4)	24,000
Fixed Overheads [₹ 10,000 + (₹ 37,000 × 10%)]	13,700
	1,40,233
III. Profit (I – II)	**9,767**

Illustration 11

Production costs of a factory for a year are as follows:

Particulars	Amount (₹)
Direct Wages	80,000
Direct Materials	1,20,000
Production Overheads: Fixed	40,000
Variable	60,000

During the forthcoming year it is anticipated that:

a. The average rate for direct labour remuneration will fall from ₹ 0.80 per hour to ₹ 0.75 per hour.

b. Production efficiency will be reduced by 5%

c. Price per unit of direct material and of other materials and services which comprise overheads will remain unchanged, and

d. Production in the coming year will increase by 33.33%

Draw up a production cost budget.

Solution:

Production Cost Budget for the Forthcoming Year

Particulars	Amount (₹)
(i) Wages [80,000 × 133.33% × (0.75 ÷ 0.80) × (100 ÷ 95)]	1,05,263
(ii) Materials (1,20,000 × 133.33%)	1,60,000
(iii) Variable Overheads (60,000 × 133.33%)	80,000
(iv) Fixed Overheads	40,000
Production cost	3,85,263

Illustration 12

With the following data for a 60 % activity prepare a budget for production at 80 % and 100 % capacity Production at 60 % capacity 300 units.

Materials ₹ 100 per unit

Labour ₹ 40 per unit

Expenses ₹ 10 per unit

Factory expenses ₹ 40,000 (40% fixed)

Administrative expenses ₹ 30,000 (60% fixed)

Solution:

Flexible Budget (₹)

Particulars	60% Capacity	80% Capacity	100% Capacity
	300 units	400 units	500 units
Material (₹ 100 per unit)	30,000	40,000	50,000
Labour (₹ 40 per unit)	12,000	16,000	20,000
Expenses (₹10 per unit)	3,000	4,000	5,000
Variable Factory Expenses (₹80 per unit)	24,000	32,000	40,000
Variable Administrative Expenses (₹40 per unit)	12,000	16,000	20,000
Fixed Factory Expenses (40 % of ₹40,000)	16,000	16,000	16,000
Fixed Administrative Expenses (60% of ₹ 30,000)	18,000	18,000	18,000
Total	**1,15,000**	**1,42,000**	**1,69,000**

Illustration 13

A Glass Manufacturing Company requires you to calculate and present the budget for the next year from the following information:

Sales: Toughened glass	₹3,00,000
Bent toughened glass	₹5,00,000
Direct Material cost	60% of sales
Direct Wages	20 workers @ ₹150 p.m.

Factory Overheads:

Indirect Labour: Works Manager	₹ 500 per month
Foreman	₹ 400 per month
Stores and spares	2½% on sales
Depreciation on machinery	₹ 12,000
Light and power	₹ 5,600
Repairs and maintenance	₹ 8,000

Other sundries 10% on direct wages

Administration, selling and distribution expenses ₹14,000 per year.

Solution:

Budget Showing Profit for Next Year

Particulars		Amount (₹)	Amount (₹)
Sales: Toughened Glass		3,00,000	
Bent Toughened Glass		5,00,000	8,00,000
Less: Cost:			
Material @ 60%		4,80,000	
Direct Wages (20 × ₹150 × 12)		36,000	5,16,000
Gross Profit			2,84,000
Less: Factory Overheads:			
Indirect Labour: Works Manager's Salary [₹ 500 × 12] =	6,000		
Foreman's Salary [₹ 400 × 12] =	4,800	10,800	
Stores & Spares		20,000	
Depreciation		12,000	
Light & Power		5,600	
Repairs & Maintenance		8,000	
Other Sundries		3,600	
Administration & Selling Expenses		14,000	74,000
Profit			2,10,000

Illustration 14

Prepare the Sales Budget from the following data:

Product	January	February
X	1200 units	1800 units
Y	3600 units	5400 units

The sales area A and B account for 60% and 40% sale of product X and 30% and 70% sale of product Y respectively.

The selling price per unit of product X: ₹ 24 and the selling price per unit of product Y: ₹ 30 in both the sales areas.

Solution:

Sales Budget for January

Product	Area	Units ₹	Amount (₹)	Amount (₹)
X	A	(@60%) 720	24	17,280
	B	(@40%) 480	24	11,520
Total		**1,200**		**28,800**
Y	A	(@30%) 1,080	30	32,400
	B	(@70%) 2,520	30	75,600
Total		**3,600**		**1,08,000**

Sales Budget for February

Product	Area	Units ₹	Amount (₹)	Amount (₹)
X	A	(@60%) 1,080	24	25,920
	B	(@40%) 720	24	17,280
Total		**1,800**		**43,200**
Y	A	(@30%) 1,620	30	48,600
	B	(@70%) 3,780	30	1,13,400
Total		**5,400**		**1,62,000**

Total Sales Budget

Product	Area	Units ₹	Amount (₹)	Amount (₹)
X	A	1,800	24	43,200
	B	1,200	24	28,800
Total		**3,000**		**72,000**
Y	A	2,700	30	81,000
	B	6,300	30	1,89,400
Total		**9,000**		**2,70,000**

Illustration 15

The following information relates to the productive activities of Omega Ltd. For 3 months ending on 31st March 2022:

Particulars	Amount (₹)
Variables Expenses: (at 50% capacity)	
– Materials	6,00,000
– Labour	6,40,000
– Salesmen's Commission	95,000
	13,35,000
Semi-variable Expenses: (at 50% capacity)	
Plant Maintenance	62,500
– Indirect Labour	2,47,500
– Salesmen's salaries	72,500
– Sundries	65,000
	4,47,500
Fixed Expense:	
– Management Salaries	2,10,000
– Rent and Taxes	1,40,000
– Depreciation of Machinery	1,75,000
– Sundry Office Expenses	2,22,500
	7,47,500

It is further noted that semi-variable expenses remain constant between 40% and 70% capacity, increase by 10% of the above figures between 70% and 85% capacity and increased by 15% of the above figures between 85% and 100% capacity.

Fixed expenses remain constant whatever the level of activity may be. Sales at 60% capacity are ₹25,50,000, at 80% capacity are ₹34,00,000 and at 100% capacity are ₹42,50,500.

Assuming that all items produced are sold, you are required to prepare a flexible budget at 60%, 80% and 100% capacity.

Solution:

In the Books of Omega Ltd.

Flexible Budget for 3 months ending 31-3-2022

Capacity	**60%**	**80%**	**100%**
A. Fixed Expenses:	₹	₹	₹
Management Salaries	2,10,000	2,10,000	2,10,000
Rent and Taxes	1,40,000	1,40,000	1,40,000
Depreciation of Machinery	1,75,000	1,75,000	1,75,000
Sundry Office Expenses	2,22,500	2,22,500	2,22,500
Total (A)	**7,47,500**	**7,47,500**	**7,47,500**

B. Semi-variable Expenses:

Capacity	60%	80%	100%
Plant Maintenance	62,500	68,750	71,875
Indirect Labour	2,47,500	2,72,250	2,84,625
Salesmen's salaries	72,500	79,750	83,375
Sundries	65,000	71,500	74,750
Total (B)	**4,47,500**	**4,92,250**	**5,14,625**

C. Variable Expense:

Capacity	60%	80%	100%
Materials	7,20,000	9,60,000	12,00,000
Labour	7,68,000	10,24,000	12,80,000
Salesmen's Commission	1,14,000	1,52,000	1,90,000
Total (C)	**16,02,000**	**21,36,000**	**26,70,000**
Total [(A) +(B) +(C)]	27,97,000	33,75,750	39,32,125
Profit/(Loss) [Bal. Fig.]	(2,47,000)	24,250	3,17,875
Sales	**25,50,000**	**34,00,000**	**42,50,000**

Illustration 16

The following information at 50% capacity is given. Prepare a flexible budget and forecast the profit or loss at 60%, 70% and capacity.

Particulars	Amount (₹)
Fixed Expenses	
Salaries	50,000
Rent and taxes	40,000
Depreciation	60,000
Administrative expenses	70,000
Variable expenses	
Materials	2,00,000
Labour	2,50,000
Others	40,000
Semi – variable expenses	
Repairs	1,00,000
Indirect labour	1,50,000
Others	90,000
Sales	9,00,000

It is estimated that fixed expenses will remain constant at all capacities. Semi –variable expenses will not change between 45% and 60% capacity, will rise by 10% between 60% and 75% capacity, a further increase of 5% when the capacity crosses by 75%.

Estimated sales:

Capacity	60%	70%	90%
(₹)	11,00,000	13,00,000	15,00,000

Solution:

Flexible Budget

Amount (₹)

Capacity Levels	50%	60%	70%	90%
Variable expenses:				
Material	2,00,000	2,40,000	2,80,000	3,60,000
Labour	2,50,000	3,00,000	3,50,000	4,50,000
Others	40,000	48,000	56,000	72,000
Total variable expenses (A)	4,90,000	5,88,000	6,86,000	8,82,000
Semi-variable expenses				
Repairs	1,00,000	1,00,000	1,10,000	1,15,000
Indirect labour	1,50,000	1,50,000	1,65,000	1,72,500
Others	90,000	90,000	99,000	1,03,500
Total Semi-variable expenses (B)	3,40,000	3,40,000	3,74,000	3,91,000
Fixed expenses:				
Salaries	50,000	50,000	50,000	50,000
Rent and taxes	40,000	40,000	40,000	40,000
Depreciation	60,000	60,000	60,000	60,000
Administration expenses	70,000	70,000	70,000	70,000
Total Fixed exp. (C)	2,20,000	2,20,000	2,20,000	2,20,000
Total cost (A+B+C)	10,50,000	11,48,000	12,80,000	14,93,000
Add/(less): profit/(loss) [Bal. Fig]	(1,50,000)	(48,000)	20,000	7,000
Sales	**9,00,000**	**11,00,000**	**13,00,000**	**15,00,000**

Notes to Solution:

Semi-variable expenses:

At 60% = same as at 50% capacity level

At 70% = 10% increases to given amount at 50% capacity level

Repairs = ₹1,00,000 + 10% = ₹1,10,000

Indirect labour = ₹ 1,50,000 + 10% = ₹ 1,65,000

Others = ₹ 90,000 + 10% = ₹ 99,000

At 90% = 15% (i.e. 10% + 5%) increases to given amount at 50% capacity level

Repairs = ₹ 1,00,000 +15% = ₹ 1,15,000

Indirect labour = ₹ 1,50,000 + 15% = ₹ 1,72,000

Others = ₹ 90,000 + 15% = ₹ 1,03,500

Variable expenses:

Material at 50% = ₹ 2,00,000

60% = ₹ 2,40,000

70% = ₹ 2,80,000

90% = ₹ 3,60,000

Labour at 50% = ₹ 2,50,000

60% = ₹ 3,00,000

70% = ₹ 3,50,000

90% = ₹ 4,50,000

Others at 50% = ₹ 40,000

60% = ₹ 48,000

70% = ₹ 56,000

90% = ₹72,000

Illustration 17

Zee Co. Ltd. wishes to arrange overdraft facilities with its bankers from the period August to October 2022 when it will be manufacturing mostly for stock. Prepare a cash budget for the above period from the following data given below**:**

(₹)

Month	Sales	Purchases	Wages	Manufacturing. Exp.	Office Exp.	Selling Exp.
June	1,80,000	1,24,800	12,000	3,000	2,000	2,000
July	1,92,000	1,44,000	14,000	4,000	1,000	4,000
August	1,08,000	2,43,000	11,000	3,000	1,500	2,000
September	1,74,000	2,46,000	12,000	4,500	2,000	5,000
October	1,26,000	2,68,000	15,000	5,000	2,500	4,000
November	1,40,000	2,80,000	17,000	5,500	3,000	4,500
December	1,60,000	3,00,000	18,000	6,000	3,000	5,000

Additional Information:

(a) Cash on hand 1-08-2022 ₹ 25,000.

(b) 50% of credit sales are realized in the month following the sale and the remaining 50% in the second month following. Creditors are paid in the month following the month of purchase.

(c) Lag in payment of manufacturing expenses half month.

(d) Lag in payment of other expenses one month**.**

Solution:

CASH BUDGET

For 3 months from August to October 2022

Particulars	August (₹)	September (₹)	October (₹)
Receipts:			
Opening balance	25,000	44,500	(66,750)
Sales [Note 2]	1,86,000	1,50,000	1,41,000
Total Receipts (A)	2,11,000	1,94,500	74,250
Payments:			
Purchases	1,44,000	2,43,000	2,46,000
Wages	14,000	11,000	12,000
Mfg. Exp. [Note 1]	3,500	3,750	4,750
Office Exp.	1,000	1,500	2,000
Selling Exp.	4,000	2,000	5,000
Total payments (B)	1,66,500	2,61,250	2,69,750
Closing Balance (A-B)	44,500	(66,750)	(1,95,500)

Notes to Solution:

1. Manufacturing Expense:

Particular	August (₹)	September (₹)	October (₹)
July (4000/2)	2,000	–	–
August (3000/2)	1,500	1,500	–
September (4500/2)	–	2,250	2,250
October (5000/2)	–	–	2,500
Total	**3,500**	**3,750**	**4,750**

2. Sales

Particular	August (₹)	September (₹)	October (₹)
June (180000/2)	90,000	–	–
July (192000/2)	96,000	96,000	–
August (108000/2)	–	54,000	54,000
September (174000/2)	–	–	87,000
Total	**1,86,000**	**1,50,000**	**1,41,000**

Illustration 18

The Sales Director of a manufacturing company reports that in the New Year, he expects to sell 27000 units of a certain product. The production manager consults the store-keeper and casts his figures as follows:

Two kinds of raw materials, A and B are required for manufacturing the product. Each unit of the product requires 4 units of A and 6 units of B. The estimated opening balances at the commencement of the next year are: Finished Product: 5000 units, A: 24000 units, and B: 30000 units. The desirable closing balances at the end of the next year are: Finished Product: 7000 units, A: 26000 units, and B: 32000 units. Draw up a Material Purchase Budget for the next year.

Solution:

Production Budget (Finished Product)

Particulars	Units
Expected Sales Volume	27,000
Add: Desired Closing Stock	7,000
Total requirements	34,000
Less: Opening Balance	(5,000)
Production (i.e., units to be produced during next year)	**29,000**

Purchase Budget (Raw Materials A and B)

Particulars	**Raw Materials**	
	A (units)	**B (units)**
Raw Materials required for producing 29000 units:		
(A: 29,000 × 4)	1,16,000	
(B: 29,000 × 6)		1,74,000
Add: Desired Closing Stock	26,000	32,000
Total requirements	1,42,000	2,06,000
Less: Opening Balance	24,000	30,000
Purchase to be made	**1,18,000**	**1,76,000**

Note to Solution:

Purchase = (Production + Closing Stock – Opening Stock)

Illustration 19

The following information is given to you. Prepare Selling and Distribution Cost Budget for six months ending 30th September, 2022.

(i) Direct Selling Expenses: 10% of Sales.

(ii) Advertising: 2% of Sales.

(iii) Distribution Expenses: 5% of Sales.

(iv) Sales office Expenses: North ₹ 10,000; South ₹ 8,000; East ₹ 12000; and West ₹ 15,000.

(v) Sales @ ₹ 50 per unit: North: 6100 units; South: 3800 units; East: 7800 units and West: 4700 units.

Solution:

Selling and Distribution Cost Budget

For the six months ended 30th Sept. 2022

Particulars	Areas				
	North	South	East	West	Total
	₹	₹	₹	₹	₹
Direct Selling Expenses	30,500	19,000	39,000	23,500	1,12,000
Advertising	6,100	3,800	7,800	4,700	22,400
Distribution Expenses	15,250	9,500	19,500	11,750	56,000
Sales Office Expenses	10,000	8,000	12,000	15,000	45,000
	61,850	40,300	78,300	54,950	2,35,400

Illustration 20

In each of the following independent situations, state with a brief reason whether 'Zero Based Budgeting' (ZBB) or 'Traditional Budgeting' (TB) would be more appropriate for year II.

(i) A company producing a certain product has done extensive ZBB exercise in year I. The activity level is expected to marginally increase in year II.

(ii) The sale manager of a company selling three products has intuitive feeling that in year II, sales will increase for one product and decrease for the other two. His expectation cannot be substantiated with figure.

(iii) The top management would like to delegate responsibility to the functional managers for their results during year II.

(iv) Resources are heavily constrained and allocation for budget requirements is very much restricted.

Solution:

(i) The company has done extensive exercise in Year-I that can be used as a basis for budgeting in year-II by incorporating increase in costs / revenue at expected activity level. Hence, Traditional Budgeting would be more appropriate for the company in year-II.

(ii) In Traditional Budgeting system budgets are prepared on the basis of previous year's budget figures with expected change in activity level and corresponding adjustment in the cost and prices, but under Zero Base Budgeting (ZBB) the estimations or projections are converted into figures. Since, sales manager is unable to substantiate his expectations into figures so Traditional Budgeting would be preferred against Zero Base Budgeting.

(iii) Zero Base Budgeting would be appropriate as ZBB allows top-level strategic goals to be implemented into the budgeting process by tying them to specific functional areas of the organization, where costs can be first grouped, then measured against previous results and current expectation

(iv) Zero Base Budgeting allocates resources based on order of priority up to the spending cut-off level (maximum level up to which spending can be made). In an organization where resources are constrained and budget is allocated on requirement basis, Zero Base Budgeting is more appropriate method of budgeting.

Illustration 21

As a newly appointed management accountant, you are aware that, the present system of Budgeting is not purposeful for the HTL Company. You are required to address to the management about the problems, the Company is facing with respect to preparation of purposeful 'Budgets' and outline the correct way of presenting the 'Budgets'.

Solution:

The budgets are 'issued to' budget holders, they clearly have very little or no input to the budget process. Budgets are set centrally by senior management and are imposed on managers without the managers participating in their preparation**.**

One of the tasks one faces as a financial officer, especially if the organization makes frequent business transactions, is that of preparing a budget. A budget is a tool used for planning and controlling the financial resources. It is a guideline for the future plan of action, expressed in financial terms within a set period of time. A budget does not have to be complex.

Budget Objectives:

1. It helps refine goals.
2. It compels members of the organization to use funds efficiently.
3. It provides accurate information to analyze, adjust and evaluate programs and activities.
4. It aids in decision making.
5. It provides a historical reference to be used for future planning

Considerations to be made pre-budget:

Knowing the organization's priorities, objectives and goals helps one to begin to prepare the budget and the following questions are to be considered:

1. What is the time period with which one is working?
2. What does the Company most want to accomplish?
3. How to accomplish this?
4. How much will it cost?
5. Where is the money coming from?

Preparing the Budget:

1. To prepare an outline of the organization's planned future activities.
2. To determine the available funds.
3. To estimate the expected income and its availability.

To define and record the needed expenses.

To make review, revise, and then to proceed for assembling into a final budget.

The budget must be flexible enough to anticipate conditions that might have been overlooked during the planning process. Budgeting and forecasting allow a business to plan accurately for its fiscal year

Controlling the Budget:

To set and maintain a minimum cash balance.

To formulate general policies and procedures needed to achieve objectives while providing internal control i.e. to allow only approved expenditures.

To keep records of actual financial transactions in terms of income and expenses.

To compare periodically the budget with the actual income and expenditures and to take corrective actions, if there are any deviations from budgets.

Note: The above points are the few steps, which are to be considered but are not exhaustive.

Illustration 22

Mr. Managing Director is surprised that his profit every year is quite different from what he wants or expects to achieve. Someone advised him to install a formal system of budgeting. He employs a fresh accountant to do this. For two years, the accountant faithfully makes all budgets based on previous year's accounts. The problem remains unsolved. Advise Mr. Managing Director and the Accountant on what steps they should take. Make assumption about what is lacking.

Solution:

(1) **Inaccuracy in formulation of budgets:**

A budget is based on a set of assumptions that are generally not too far distant from the operating conditions under which it was formulated. If the business environment changes to any significant degree, then the company's revenues or cost structure may change so radically that actual results will rapidly depart from the expectations delineated in the budget. This condition is a particular problem when there is a sudden economic downturn, since the budget authorizes a certain level of spending that is no longer supportable under a suddenly reduced revenue level. Unless management acts quickly to override the budget, managers will continue to spend under their original budgetary authorizations, thereby rupturing any possibility of earning a profit. Other conditions that can also cause results to vary suddenly from budgeted expectations include changes in interest rates, currency exchange rates, and commodity prices.

(2) **Rigidity in the decision making process:**

The budgeting process only focuses the attention of the management team on strategy during the budget formulation period near the end of the fiscal year. For the rest of the year, there is no procedural commitment to revisit strategy. Thus, if there is a fundamental shift in the market just after a budget has been completed, there is no system in place to formally review the situation and make changes, thereby placing a company at a considerable disadvantage to its nimbler competitors.

(3) **Time required for preparation of budgets:**

It can be very time-consuming to create a budget, especially in a poorly-organized environment where many iterations of the budget may be required. The time involved is lower if there is a well-designed budgeting procedure in place, employees are accustomed to the process, and the company uses budgeting software. The work required can be more extensive if business conditions are constantly changing, which calls for repeated iterations of the budget model.

(4) **Introduction of the budgetary slack:**

An experienced manager may attempt to introduce budgetary slack, which involves deliberately reducing

revenue estimates and increasing expense estimates, so that he can easily achieve favorable variances against the budget. This can be a serious problem, and requires considerable oversight to spot and eliminate.

(5) **Blaming other departments:**

If a department does not achieve its budgeted results, the department manager may blame any other departments that provide services to it for not having adequately supported his department.

(6) **Allocation of expenses:**

The budget may prescribe that certain amounts of overhead costs be allocated to various departments, and the managers of those departments may take issue with the allocation methods used. This is a particular problem when departments are not allowed to substitute services provided from within the company for lower-cost services that are available elsewhere.

(7) **Excessive expenditures:**

If a department is allowed a certain amount of expenditures and it does not appear that the department will spend all of the funds during the budget period, the department manager may authorize excessive expenditures at the last minute, irrespective of their actual need for the funds.

(8) **Consideration of financial outcomes only:**

The nature of the budget is numeric, so it tends to focus management attention on the quantitative aspects of a business; this usually means an intent focus on improving or maintaining profitability. In reality, customers do not care about the profits of a business – they will only buy from the company as long as they are receiving good service and well-constructed products at a fair price. Unfortunately, it is quite difficult to build these concepts into a budget, since they are qualitative in nature. Thus, the budgeting concept does not necessarily support the needs of customers.

Illustration 23

Following are the budgeted expenses for production of an electronic component of TV (10,000 units):

Particulars	₹
Direct materials	50
Direct labour	20
Variable overheads	20
Fixed overheads (₹ 1,00,000)	10
Variable expenses (Direct)	5
Selling expenses (10% fixed)	10
Distribution expenses (20% fixed)	5
Administration expenses (₹ 50,000)	5
Total cost of sale per unit (to make and sell)	125

Prepare a budget for production of (a) 7,000 units and (b) 9,000 units, showing distinctly marginal cost and total cost. Assume that the administration expenses are rigid for all levels of production.

Solution

NOTE: 1. Fixed and variable elements have to be segregated as follows:

(a) For selling expenses:

(i) Fixed: 10% of ₹10 = ₹ 1.

For 10,000 units = 10,000 × ₹ 1 = ₹10,000.

(ii) Variable: (₹ 10 – ₹ 1) = ₹ 9 per unit.

(b) For distribution expenses:

(i) Fixed: 20% of ₹ 5 = ₹ 1.

For 10,000 unit = 10,000 x ₹ 1= ₹10,000.

(ii) Variable = (₹ 5 – ₹ 1) ₹ 4 per unit

(c) For the other items, the respective given information has to be taken into account.

(d) Marginal costs and total costs have to be compared by preparing flexible budgets as follows:

Particulars	7,000 units		9000 units	
	Per unit (₹)	Total (₹)	Per unit (₹)	Total (₹)
Step 1: Prime cost:				
(i) Direct materials	50	3,50,000	50	4,50,000
(ii) Direct labour	20	1,40,000	20	1,80,000
(iii) Direct expenses	5	35,000	5	45,000
	75	5,25,000	75	6,75,000
Step 2: Variable overheads				
(i) General	20	1,40,000	20	1,80,000
(ii) Selling* [Note 1(a)]	9	63,000	9	81,000
(iii) Distribution [Note 1(b)]	4	28,000	4	36,000
	33	2,31,000	33	2,97,000
Step 3: Fixed overheads:				
(i) General	14.29	1,00,000	11.11	1,00,000
(ii) Administration	7.14	50,000	5.55	50,000
(iii) Selling	1.42	10,000	1.11	10,000
(iv) Distribution	1.42	10,000	1.11	10,000
	24.27	1,70,000	18.88	1,70,000
Step 4: Marginal costs (Step 1 + Step 2)	108	7,56,000	108	9,72,000
Step 5: Total cost (Step 3 + Step 4)	132.27	9,26,000	126.88	11,42,000

Illustration 24

P.C.T. Ltd. provides you the following figures for the year 2021:

Particulars		Product A	Product B
Sales (in units) :	1st Quarter	1,250	1,600
	2nd Quarter	2,950	800

	3rd Quarter	2,700	1,000
	4th Quarter	3,100	600
Selling price per unit		₹ 24	₹ 50
Targets for 2022:			
Sales quantity increase (decrease)		(20%)	25%
Selling price increase (decrease)		25%	(20%)

Sales area X, Y and Z respectively produce 10%, 20%, 70% of Product 'A' sales and 70%, 20% and 10% of Product 'B' sales.

Required: Prepare Sales Budget for the year 2022.

Solution

Sales Budget (Product - wise) for the year 2022

Product / Period	Product A			Product B		
	Units	Rate (₹)	Amount (₹)	Units	Rate (₹)	Amount (₹)
1st Quarter	1,000	30	30,000	2,000	40	80,000
2nd Quarter	2,360	30	70,800	1,000	40	40,000
3rd Quarter	2,160	30	64,800	1,250	40	50,000
4th Quarter	2,480	30	74,400	750	40	30,000
Total	8,000		2,40,000	5,000		2,00,000

Sales Budget (Area-wise) for the year 2022

	Product A				Product B			
Product & Area / Period	X 10% (₹)	Y 20% (₹)	Z 70% (₹)	Total (₹)	X 70% (₹)	Y 20% (₹)	Z 10% (₹)	Total (₹)
1st Quarter	3,000	6,000	21,000	30,000	56,000	16,000	8,000	80,000
2nd Quarter	7,080	14,160	49,560	70,800	28,000	8,000	4,000	40,000
3rd Quarter	6,480	12,960	45,360	64,800	35,000	10,000	5,000	50,000
4th Quarter	7,440	14,880	52,080	74,400	21,000	6,000	3,000	30,000
Total	24,000	48,000	1,68,000	2,40,000	1,40,000	40,000	20,000	2,00,000

Illustration 25

AB Co. Ltd. manufactures two products A and B and sells them through two Divisions-North and South. For the purpose of submission of sales budget to the budget committee the following information is available: -

Budgeted sales for the current year were:

Product	North	South
A	4,000 at ₹ 9	6,000 at ₹ 9
B	3,000 at ₹ 21	5,000 at ₹ 21

Actual sales for the current year were: -

Product	North	South
A	5,000 at ₹ 9	7,000 at ₹ 9
B	2,000 at ₹ 21	4,000 at ₹ 21

Adequate market studies reveal that Product A is popular but under-priced. It is observed that if the price of A is increased by ₹ 1 it will still find a ready market. On the other hand, B is overpriced to customers and the market could absorb more if sales price of B be reduced by ₹ 1. The management has agreed to give effect to the above price changes.

From the information based on these price changes and reports from salesmen, the following estimates have been prepared by divisional managers: -

Percentage increase in sales over current budget is :-

Product	North	South
A	+ 10%	+5%
B	+20%	+10%

With the help of an intensive advertisement campaign the following additional sales over the estimated sales of divisional managers are possible:-

Additional sales above the estimated sales of divisional managers:

Product	North (units)	South (units)
A	600	700
B	400	500

You are required to prepare a budget for sales incorporating the above estimates and also show the budgeted and actual sales of current year.

Solution:

SALES BUDGET

AB Co. Ltd.

Division		Budgeted for future period			Budgeted for current period			Actual sales for current period		
	Product	Qty	Price (₹)	Value (₹)	Qty	Price (₹)	Value (₹)	Qty	Price (₹)	Value (₹)
North	A	5000	10	50,000	4,000	9	36,000	5,000	9	45,000
	B	4000	20	80,000	3,000	21	63,000	2,000	21	42,000
Total		9,000		1,30,000	7,000		99,000	7,000		87,000
South	A	7,000	10	70,000	6,000	9	54,000	7,000	9	63,000
	B	6,000	20	1,20,000	5,000	21	1,05,000	4,000	21	84,000
Total		13,000		1,90,000	11,000		1,59,000	11,000		1,47,000
Product Total	A	12,000	10	1,20,000	10,000	9	90,000	12,000	9	1,08,000
	B	10,000	20	2,00,000	8,000	21	1,68,000	6,000	21	1,26,000
Grand Total		22,000		3,20,000	18,000		2,58,000	18,000		2,34,000

The budget may be modified according to salesman or period in months, quarter, etc.

Illustration 26

Prepare a purchase budget of A B Co. Ltd., for materials based on the materials budget and the estimated opening and closing stocks of materials:

Estimated stocks of materials for budget period

Stock	11	13	16	17	18
	Kg	kg	kg	kg	kg
On 1st Jan	180	25	90	22	12
On 31st Dec	200	60	40	20	50
Consumption during period (kg)	1480	175	330	182	92
Purchase price	₹ 90,000	₹12,000	₹3,000	₹10,000	₹2,500

Solution:

Purchase budget of AB Co. Ltd. **For the year : 2022**

Product	Mat. 11Kg	Mat. 13Kg	Mat. 16Kg	Mat. 17Kg	Mat. 18Kg
Consumption during period (kg)	1480	175	330	182	92
Required stock on 31 December (kg)	200	50	60	40	20
Total (kg)	1680	225	390	222	112
Less: Opening stock (kg)	180	25	90	22	12
Quantity to be purchased (kg)	1500	200	300	200	100
Purchase price	₹ 90,000	₹12,000	₹3,000	₹10,000	₹2,500
Price Per Kg.	60	60	10	50	25

EXERCISE

Theoretical Questions

Multiple Choice Questions

1. What is the name given to a budget that has been prepared by re-evaluating activities and comparing the incremental costs of those activities with their incremental benefits?
   A. Incremental budget
   B. Rolling budget
   C. Zero base budget
   D. Flexible budget
2. A budget is an instrument of management used as an aid in the
   A. Planning
   B. Programming
   C. Control of business activity
   D. All of the above
3. Following may be regarded as a summary budget
   A. Production budget
   B. Master budget
   C. Cash budget
   D. Sales budget
4. Purchases budget is prepared using the information from
   A. Capital expenditure budget
   B. Materials budget
   C. Both (A) and (B)
   D. None of the above
5. Following budget may be compiled on departmental basis
   A. Production budget
   B. Purchase budget
   C. Materials budget
   D. All of the above
6. Production budget is based upon
   A. Sales budget
   B. Factory capacity
   C. Availability of raw material and labour

D. All of the above

7. Budget includes
   A. Income
   B. Expenditure
   C. Employment of capital
   D. All of the above
8. Functional budget is subsidiary to
   A. Variable budget
   B. Fixed budget
   C. Master budget
   D. All of the above
9. A budget should be
   A. Rigid
   B. Flexible
   C. Both (A) and (B)
   D. None of the above
10. The object of budgetary control is _____
   A. Planning
   B. Forecasting
   C. Organizing
   D. Directing
11. The budget which is dynamic is _____.
   A. Flexible budget
   B. Sales budget
   C. Cash budget
   D. Purchase budget
12. The process of budgeting helps in the control of
   A. Cost of production
   B. Liquidity
   C. Capital Expenditure
   D. All of the above
13. Plant utilization budget and Manufacturing overhead budgets are types of
   A. Production budget

B. Sales budget

C. Cost budget

D. None of the above

14. R&D budget and Capital expenditure budget are examples of

A. Short-term budget

B. Current budget

C. Long-term budget

D. None of the above

15. The scare factors is also known as

A. Key factor

B. Abnormal factor

C. Linking factor

D. None of the above

16. A budgeting process which demands each manager to justify his entire budget in detail from beginning is

A. Functional budget

B. Master budget

C. Zero base budgeting

D. None of the above

17. While preparing sales budget, which of the following factors are considered?

A. Non-operational factors

B. Environmental factors

C. Both a and b

D. None of the above

18. _____ provides an estimate of the capital amount that may be required for buying fixed assets needed for meeting production requirements.

A. Production budget

B. Cash budget

C. Capital expenditure budget

D. None of the above

19. _____ is designed after assessment of the volume of output to be produced during budget period.

A. Cost budget

B. Sales budget

C. Production budget

(D) None of the above

20. _____ is the first step of budgetary system and all other budgets depends on it.
    A. Cost budget
    B. Sales budget
    C. Production budget
    D. None of the above
21. _____also known as subsidiary budgets.
    A. Master budget
    B. Functional budget
    C. Cost budget
    D. None of the above
22. _____ contains the picture of total plans during the budget period and it comprises information relating to sales, profit, cost, production etc.
    A. Master budget
    B. Functional budget
    C. Cost budget
    D. None of the above
23. _____ is stated as a budget which is made to change as per the levels of activity attained.
    A. Fixed budget
    B. Flexible budget
    C. Both a and b
    D. None of the above
24. _____ is prepared for single level of activity and single set of business conditions.
    A. Fixed budget
    B. Flexible budget
    C. Both a and b
    D. None of the above
25. On the basis of period, budgets may be classified into _____ groups.
    A. Five
    B. Four
    C. Three
    D. Two
26. Which of the following statements are not true about budget, budgeting & budgetary control?
    A. Budgetary control works on the basis of best option

B. Budget is one of the important mediums of communication

C. Budgeting develops the quality of objectivity in planning

D. None of the above

27. Which of the following statements are true about budget, budgeting & budgetary control?

A. Budgeting is business estimates for future periods

B. Budget is the process of preparing business estimates

C. Budgetary control is the means to achieve performance on the basis of budget

D. None of the above

28. Which of the following statements are true about budget, budgeting & budgetary control?

A. Budgetary control is a wider concept whereas Budget and budgeting are narrower concepts

B. If there is budgeting or budget, it is not necessary that there should be budgetary control also

C. If there is budgetary control, budgeting and budget are must

D. All of the above

29. According to George R. Terry, _____ may be described as a process of finding out what is being done and comparing actual results with the corresponding budget data in order to approve accomplishment.

A. Budgetary control

B. Budget

C. Budgeting

D. None of the above

30. Which of the following are not the objectives of Budgeting?

(A) To express the objectives of the firms in qualitative terms.

(B) To prepare base for evaluation of work performance.

(C) To co-ordinate organizational and managerial units of the firm.

(D) To develop a strong appraisal of objectives and policies of firm.

A. A, B and C

B. B, C and D

C. D, C and A

D. None of the above

Answers:

1- C, 2-D, 3-B, 4-B, 5-A, 6- D, 7- C, 8- D, 9- B, 10- A, 11- B, 12- D, 13- C, 14- C, 15-A, 16-C, 17-B, 18-B, 19-A, 20-B, 21-B, 22-A, 23-B, 24-A, 25-C, 26-D, 27-C, 28-D, 29-A, 30-D.

State True or False

1. A budget is often thought of as a financial plan.
2. Forecast is mainly concerned with an assessment of probable future events.
3. Forecast means estimation of future trends and outcomes, based on the past and present data.
4. Portraying with precision, the overall aims of the business and determining targets of performance for each section or department of the business.
5. Objectives should not be defined precisely.
6. Key Factor is also called as "Limiting Factor" or Governing Factor.
7. Formulation of a budget usually requires part time services of a senior executive
8. The Budget manual is a schedule, document or booklet, which shows in a written form, the budgeting organization and procedure.
9. The budget period is the length of time for which a budget is prepared and employed.
10. The standards of activity levels for future period should be laid down.

Answer:

1- True, 2- True, 3- True, 4- True, 5- False, 6- True, 7- False, 8-True, 9- True, 10-True.

Fill in the blanks:

1. For the purpose of effective budgetary control, it is imperative on the part of each entity to have definite …….
2. The budget figures should be realistic and represent logically attainable…….
3. A ……is designed to remain unchanged irrespective of the level of activity actually attained.
4. A ……is a budget which is designed to change in accordance with the various level of activity actually attained.
5. According to the principles that guide the preparation of the ……. a series of fixed budgets are drawn for different levels of activity.
6. …… are budgets prepared for each department or process within an organisation.
7. ……is the most important of the entire functional budget.
8. The alternative solution presented to the problem of inefficiency in the base is termed ……. or sometimes priority-based budgeting.
9. ……has been defined as a "budget based on functions, activities and projects."
10. A ……is an approach that seeks to separate the policy planning aspects of budgeting from the short-term financial planning process.

Answer:

1- "Plan of organization.", 2- Goals, 3- Fixed budget, 4- Flexible budget, 5- Flexible budget, 6- Functional budgets, 7- Cash budget, 8- Zero-based budgeting (ZBB), 9- Performance Budget, 10- Planning, programming budgeting system (PPBS)

Short Essay Type Questions

1. What do you understand by "Budgeting"? Mention the type of budget that the Management of a big industrial concern would normally prepare.
2. What is budget? What is sought to be achieved by Budgetary Control.
3. What factors would influence the selection of budget period between two firms carrying on diverse activities?
4. What is the mechanism of master budget? How is it prepared?
5. 'Budgetary control improves planning, aids in coordination and helps in having comprehensive control'. Elucidate this statement.
6. Describe in brief the modus operandi for the purpose of preparation of a production budget. What are the principal considerations involved in budgeting production?
7. What are different types of functional budgets which are prepared by a large scale manufacturing concern?

Essay Type Questions

1. Has 'Budgetary Control' any significance with management accounting?
2. Outline a plan for sales budget and purchases budget. What considerations are necessary in the preparation of such budgets?
3. What do you mean by budgetary control with reference to manufacturing-cum selling enterprise.
4. What do you mean by flexible budget allowance? How is it ascertained? Explain with a cogent example.
5. What do you mean by budgetary control? Explain the objectives of budgetary control with special reference to a large manufacturing concern.
6. What is the principal budget factor? Give a list of such factors and explain how you would proceed to prepare budgets in the case of a manufacturing company.
7. Are you in agreement with the view that Budgeting should better be called profit planning and control?
8. 'Why do responsible people in an organization agree to accept budgetary control in theory but resist in practice'? Explain.
9. Explain the procedure you would follow to prepare a projected Profit and Loss Account and Projected Balance Sheet. Explain also use of these statements.

   'If the sales forecast is subject to error then there is no basis of budgeting'. Do you agree? Also explain how flexible budget can be used to help control cost.
10. What is the mechanism of master budget? How is it prepared?
11. Discuss the difficulties which arise and how are they overcome in forecasting sales and preparing sales budget in a jobbing concern.
12. Write an essay on zero-based budgeting and highlight its procedure, norms and superiority over functional budgeting

Practical Questions

⊙ Multiple Choice Questions

1. Production at 60% activity is ₹ 600 units, if flexible budget needs to be calculated at 80% activity what will be units produced?

   A. ₹ 800

   B. ₹ 600

   C. ₹1200

   D. ₹ 1000

2. Given Production at 60% activity, 600 units, Material ₹ 50 per unit, Labour ₹ 20 per unit, Direct expenses Rs 5 per unit, Factory overheads ₹ 20,000 (60% variable) and Administration expenses Rs 15,000 (60% fixed). What will be the total cost per unit for production at 80% capacity?

   A. ₹1,01,000

   B. ₹ 126.25

   C. ₹122

   D. ₹1,22,000

3. A factory produces two types of articles Y and Z. Article Y takes 8 hours to make and Z takes 16 hours. In a month (25 days x 8 hours) 600 units of X and 400 units of Z are produced. Given budgeted hours 8000 per month and men employed are50. Determine Activity ratio, Capacity ratio and efficiency ratio.

   A. 112%, 140%, 140%

   B. 140%, 112%, 140%

   C. 140%, 140%, 112%

   D. None of the above

4. Given the budgeted output in second quarter are 8,000 units. In the first quarter, Fixed overheads were ₹40,000; Variable overheads were ₹ 5 per unit (₹ 40,000) and semi variable were ₹ 20,000 (60% varying @ ₹ 3 per unit). Determine the total manufacturing overhead budget for the second quarter.

   A. ₹ 1,12,000

   B. 1,12,000 units

   C. Insufficient data

   D. None of the above

5. ABC Company plans a sale of 96,000 units of TV product line in the first fiscal quarter, 1,20,000 TV units in second quarter, and 1,32,000 units and 1,50,000 units in third and fourth quarter, and 1,56,000 units in the first quarter of next year. Given that at the beginning of first fiscal quarter, the company has 16,000 units in stock. Also, at the end of each quarter, ABC Company wants to maintain an inventory equal to one-sixth of the sales for the next fiscal quarter. Determine units to be manufactured in first and second quarter of the year.

   A. 10,00,000 and 1,35,000

   B. 10,00,000 and 1,22,000

   C. Insufficient data

   D. None of the above

Answer:

1- A, 2-B, 3-C, 4-A, 5-B.

⊙ Comprehensive Numerical Problems

1. Prepare a Flexible Budget for the production at 80% and 100% activity on the basis of following information:

Production at 50% capacity	5,000 units
Raw Material	₹80 per unit
Direct labour	₹50 per unit
Direct Expenses	₹15 per unit
Factory Overhead	₹50,000 (50% fixed)
Administration Overhead	₹60,000(60% variable)

2. ABC Ltd. prepared the budget for the production of one lakh unit of the one type of commodity manufactured by them for a costing period as under: -

Raw Material Z	₹ 2.52 per unit
Direct Labour	₹ 0.75 per unit
Direct Expenses	₹ 0.10 per unit
Works overheads (60% Fixed)	₹2.50 per unit
Admn. overheads (80% Fixed)	₹0.40 per unit
Selling overheads (50% Fixed)	₹0.20 per unit

Actual production during the period was only 60,000 units. Calculate the budgeted cost per unit.

Product	As on 1st January 2022	As on 30th June 2022
A	8000	10,000
B	9000	8,000
C	10,000	14,000

3. From the following data, prepare a Production Budget for a company: Stocks for the budget period:

Requirement to fulfill sales programme:

A	60,000 units
B	50,000 units
C	80,000 units

4. The Tee Manufacturing Company has estimated its sales budget at 5,00,000 units for the quarter ending March 31, 2022. Anticipated sales for January, February, and March are 37.5%, 25%, and 37.5% of the total, respectively. The desired finished goods inventories are as follows:

	Units
January 1	90,000
January 31	87,500
February 28	93,000
March 31	95,000

Prepare a production budget for the first quarter of 2022.

5. J Manufacturing Company has estimated its 2022 production requirements to be as follows:

Month	Units
April	1,500
May	2,000
June	2,500
July	2,800

The company wants a direct materials ending inventory of 35% of the next month's production. The price per unit is₹ 20, and it takes one unit of direct materials to produce one of finished goods.

Prepare a direct materials purchase budget for the second quarter of 2022 and also prepare a direct materials usage budget.

6. The sales manager of the MR Ltd. reports that next year he anticipates to sell 50,000 units of a particular product.

The production manager consults the storekeeper and casts his figures as follows:

Two kinds of raw materials A and B are required for manufacturing the product. Each unit of the product requires 2 units of A and 3 units of B. The estimated opening balances at the commencement of the next year are:

Finished product: 10,000 units

Raw Materials A: 12,000 units Raw Materials B: 15,000 units

The desirable closing balances at the end of the next year are

Finished products: 14,000 units

Raw materials A: 13,000 units Raw Materials B: 1,000 units

Prepare production budget and materials purchase budget for the next year.

7. The following expenses were extracted from the books of M/s AB & Sons and you are required to prepare the sales overhead budget for the year 2022:

Particulars	Amount (₹)
Advertisement on Radio	2,000
Television	12,000
Salary to Sales Administrative Staff	20,000

Sales force	15,000
Expenses of the sales department	
Rent of the building	5,000
Carriage outward	5% on sales
Commission at sales	2%
Agents' commission	6.5%

The sales during the period were estimated as follows:

₹ 80,000 including Agents Sales	₹ 8,000
₹1,00,000 including Agents Sales	₹10,500

8. The expenses for budgeted production of 10,000 units in a factory are furnished below:

Particulars	Per unit ₹
Material	70
Labour	25
Variable overheads	20
Fixed overheads ₹ 1,00,000	10
Variable expenses (Direct)	5
Selling expenses (10% fixed)	13
Distribution expenses (20% fixed)	7
Administration expenses ₹50,000	5
Total cost per unit	155

Prepare a budget for production of:

(a) 8,000 units

(b) 6,000 units

(c) Calculate the cost per unit at both levels.

Assume that administration expenses are fixed for all level of production.

9. A company manufactures product - A and product - B during the year ending 31st December 2022, it is expected to sell 15,000 kg of product A and 75,000 kg of product B at ₹ 30 and ₹ 16 per kg respectively. The direct materials P, Q and R are mixed in the proportion of 3: 5: 2 in the manufacture of product A, Materials Q and R are mixed in the proportion of 1:2 in the manufacture of product B. The actual and budget inventories for the year are given below:

	Opening Stock	Expected Closing stock	Anticipated cost per Kg.
	Kg	Kg	₹
Material – P	4,000	3,000	12
Material – Q	3,000	6,000	10

Material – R	30,000	9,000	8
Product – A	3,000	1,500	—
B	4,000	4,500	—

Prepare the Production Budget and Materials Budget showing the expenditure on purchase of materials for the year ending 31-12-2022.

10. The following details apply to an annual budget for a manufacturing company.

QUARTER	1st	2nd	3rd	4th
Working Days	65	60	55	60
Raw material purchases (% by weight of annual total)	30%	50%	20%	—
Budgeted purchase price/Kg. (₹)	1	1.05	1.125	—

Quantity of raw material per unit of production 2 kgs. The budgeted closing stock of raw material 2,000 kg. Budgeted opening stock of raw material 4,000 kg. (Cost₹4,000). Issues are priced on FIFO Basis. Calculate the following budgeted figures.

(a) Quarterly and annual purchase of raw material by weight and value.

(b) Closing quarterly stocks by weight and value.

11. For production of 10,000 units the following are budgeted expenses:

	Per Unit ₹
Direct Materials	48
Direct Labour	24
Variable Overheads	20
Fixed Overheads ₹1,20,000	12
Variable Expenses (Direct)	4
Selling Expenses (10% fixed)	12
Administration Expenses ₹40,000 fixed	4
Distribution Expenses (20% fixed)	4
	128

Prepare a budget for production of 7,000 units and 9,000 units.

12. The profit for the year of Push On Ltd. works out to 12.5% of the capital employed and the relevant figures are as under: -

	Amount (₹)
Sales	5,00,000
Direct Materials	2,50,000
Direct Labour	1,00,000
Variable Overheads	40,000
Capital Employed	4,00,000

The new sales manager who has joined the company recently estimates for the next year a profit of about 23% on capital employed, provided the volume of sales is increased by 10% and simultaneously there is an increase in selling price of 4% and an overall cost reduction in all the elements of cost by 2%.

Find out by computing in detail the cost and profit for next year, whether the proposal of sales manager can be adopted.

Unsolved Cases

1. The ABC Company planned to make 1,000 units of product in June. The static budget showed a per-unit cost of ₹10, which consisted of ₹ 3 for variable costs and ₹ 7 for allocated fixed overhead. The company actually made 1,100 units. The actual per-unit cost was ₹ 10, which consisted of ₹ 3 for variable costs and ₹ 7 for allocated fixed overhead. As a Cost Accountant of the company, you are requested to guide the Production Manager in calculating the total flexible budget variance for June. You are also requested to find the same as favourable or unfavourable?

2. The sales budget for the Highland Company for the first six months of the year is:

	Amount (₹)
January	12,000
February	13,000
March	14,000
April	13,500
May	12,600
June	11,100

There are no debtors at the start of January. One month's credit is allowed to customers.

The management of the company is unable to understand, what is the budgeted cash received in each month? This is very important for the company concerned for projecting its Cash Budget.

As a head of Budgeting Team, you are required to advise management about the amount of budgeted cash to be received in each month.

3. Explain what is meant by flexible budget and its utility? Prepare a proforma of flexible budget of a manufacturing concern for their imaginary activity, levels in a suitable form.

Key Terms

Annual Budget: A budget prepared for a calendar or fiscal year. Long-Term Budget.

Administrative Budget: A formal and comprehensive financial plan through which management can control day-to-day business affairs and activities.

Activity-Based Budgeting (ABB): A budgeting approach that focuses management's attention on activities with the goal of improving customer value, reducing costs, and increasing profit.

Budget: A plan of financial operation embodying an estimate of proposed expenditures for a given period of time or purpose and the proposed means of financing them.

Budget drivers: Caseload, economic, or demographic factors that have a significant effect on the state budget. Examples include inflation rate changes and state population changes in certain age groups.

Budget Control: Budgetary actions carried out according to a budget plan. Through the use of a budget as a standard, an organization ensures that managers are implementing its plans and objectives. Their activities are appraised by comparing their actual performance against budgeted performance. Budgets are used as a basis for rewarding or punishing them, or perhaps for modifying future budgets and plans

Budgeted accounts: Accounts that are subject to the appropriation and/or allotment process.

Budgeted income statement: An estimate of the expected profitability of operations for the budget period.

Budget Variance: (1) Any difference between a budgeted figure and an actual figure. (2) Flexible budget variance. This is the difference between actual factory overhead costs and standard (flexible budget) costs, multiplied by the standard units of activity allowed for actual production. The budget variance is used in the two-way analysis of factory overhead. It includes the fixed and variable spending variances and the variable overhead efficiency variance that are used in the three-way analysis.

Budgeted balance sheet: A projection of financial position at the end of the budget period.

Budgetary slack: The amount by which a manager intentionally underestimates budgeted revenues or overestimates budgeted expenses in order to make it easier to achieve budgetary goals.

Budget committee: A group responsible for coordinating the preparation of the budget.

Budgetary control: The use of budgets to control operations.

Critical Success Factors (CSFs): A management term for an element that is necessary for an organization or project to achieve its mission

Cash Budget: A budget for cash planning and control, presenting expected cash inflow and outflow for a designated time period. The cash budget helps management keep cash balances in reasonable relationship to its needs. It aids in avoiding idle cash and possible cash shortages.

Direct labour budget: A projection of the quantity and cost of direct labor necessary to meet production requirements.

Direct materials budget: An estimate of the quantity and cost of direct materials to be purchased.

Flexible budget: A projection of budget data for various levels of activity.

Factory Overhead Budget: A schedule of all expected manufacturing costs except direct material and direct labor. Factory overhead items include indirect material, indirect labor, factory rent, and factory insurance. Factory overhead may be variable, fixed, or a combination of both.

Financial Budget: A budget that embraces the impacts of the financial decisions of the firm. It is a plan including a budgeted balance sheet, which shows the effects of planned operations and capital investments on assets, liabilities, and equities. It also includes a cash budget, which forecasts the flow of cash and other funds in the business.

Incremental budgeting: Any budget development approach that focuses on incremental changes to a previous spending level or other defined expenditure base.

Long-Term Budget: A projection that covers more than one fiscal year. It is also called a strategic budget. The five-year budget plan is the most commonly used.

Manufacturing overhead budget: An estimate of expected manufacturing overhead costs for the budget period.

Master (Comprehensive) Budget: A plan of activities expressed in monetary terms of the assets, equities, revenues, and costs that will be involved in carrying out the plans. Simply put, a master budget is a set of projected or planned financial statements.

Operating budget: A biennial plan for the revenues and expenditures necessary to support the administrative and service functions of state government.

Performance budgeting: The act of considering and making funding choices based on desired outcomes. Performance budgeting focuses on the results to be gained through investment decisions.

Participative Budgeting: A budgeting system that gets employees involved throughout an organization in the budgetary process. It is a bottom-up approach to budgeting.

Production Budget: A schedule for expected units to be produced. It sets forth the units expected to be manufactured to satisfy budgeted sales and inventory requirements. Expected production volume is determined by adding desired ending inventory to planned sales and then subtracting beginning inventory.

Rolling Budget: A budget that is always available for a specified future period. It is created by continually adding a month, quarter, or year to the period that just ended. In this process, budget allocations can be constantly adjusted to meet changing market conditions.

Sales Budget: An operating plan for a period expressed in terms of sales volume and selling prices for each class of product or service. Preparation of a sales budget is the starting point in budgeting, since sales volume influences nearly all other items.

Selling and administrative expense budget: A projection of anticipated selling and administrative expenses for the budget period.

Static budget: A projection of budget data at one level of activity.

Zero-Base Budgeting (ZBB): A planning and budgeting tool that uses cost benefit analysis of projects and functions to improve resource allocation in an organization. Traditional budgeting tends to concentrate on incremental change from the previous year. It assumes that the previous year's activities and programs are essential and must be continued. Under zero-base budgeting, however, cost and benefit estimates are built up from scratch, from the zero level, and must be justified.

SECTION - F

DIVISIONAL PERFORMANCE MEASUREMENT

Divisional Performance Measurement

8

This Module includes -

8.1 Organisations with Multiple divisions, Benefits of Decentralization

8.2 DuPont Analysis

8.3 Divisional Performance Measurement tools – ROI, Residual Income

8.4 Economic Value Added – Definition, EVA Centre, EVA Drivers

8.5 Introduction to Learning Curve

8.6 Balanced Score Card for Variable Pay Management

Divisional Performance Measurement

SLOB Mapped against the Module

To attain detailed knowledge of measures to improve divisional performance and profit optimisation at entity level. (CMLO 3c, 4c)

Module Learning Objectives:

After studying this module, the students will be able to

- Gather knowledge of the various tools and techniques of divisional performance measurement like DuPont analysis, Residual Income and Economic Value Added.
- Understand some fundamental aspects of the Learning Curve and the Balanced Score Card.

Organisations with Multiple Divisions, Benefits of Decentralization

8.1

As an organisation grows, its customer-base size and locations, product and service offerings, level of technology, distribution channels, and number of employees change. To cope with such changes, managers must recognize when and how the company's authority structure should be altered to support decision making, communication, and employee motivation.

Global operations demand that managers in all regions effectively use corporate human and physical resources; product customization demands that managers be in close touch with customers; and co-ordination of larger and more diverse workforces demands that managers be more adept at employee training and development. Decisions often need to be made rapidly at a "grass-roots" level rather than at "the top" of the organizational hierarchy. Thus, one of the most common progressions made by high-growth companies is from highly centralized organizational structures to highly decentralized structures.

When an organization has a centralized structure, top management retains the majority of decision-making authority. When top management delegates decision-making authority to sub-unit managers, decentralization exists. To increase overall efficiency, many companies choose to decentralize. The essence of decentralization is decision-making freedom. In a decentralized organization, lower-level managers make and implement decisions, whereas in a centralized organization, lower-level managers are responsible only for implementing decisions. Reasons for decentralization are numerous. Companies decentralize because local managers can make better decisions using local information.

Local managers can also provide a timelier response to changing conditions. Additionally, decentralization for large, diversified companies is necessary because of cognitive limitations—it is impossible for anyone central manager to be fully knowledgeable about all products and markets. Other reasons include training and motivating local managers and freeing top management from day-to-day operating conditions so that they can spend time on more long-range activities, such as strategic planning.

A decentralized company sets up responsibility centers. The four types of responsibility centers are cost centers, revenue centers, profit centers, and investment centers. The actual results for each responsibility center can be compared with expected results.

The degree of centralization can be viewed as a continuum. With centralization, a single individual (usually the company owner or president) makes all major decisions and retains full authority and responsibility for that organization's activities. Alternatively, a purely decentralized organization would have virtually no central authority, and each sub-unit would act as a totally independent entity. Decentralization is a transfer of authority, responsibility, and decision-making rights from the top to the bottom of the organizational structure. Decentralization has both advantages and disadvantages.

Either extreme of the centralization–decentralization continuum represents a clearly undesirable arrangement.

In the totally centralized company, a single individual would have neither the expertise nor sufficient and timely information to make effective decisions in all functional areas. In the totally decentralized firm, sub-units could act in ways that are inconsistent with the organization's goals. Organizations tend to structure themselves according to the pure centralization versus pure decentralization factors.

Most businesses are somewhere along the continuum. A company usually determines the appropriate degree of decentralization based on a combination of the:

- Managers' personal characteristics,
- Nature of decisions required for organizational growth, and
- Types of organizational activities in which the company is engaged.

Decentralization does not necessarily mean that a unit manager has the authority to make all decisions concerning that unit. Top management selectively determines the types of authority to delegate to, and withhold from, lower-level managers. Decentralized companies often have certain organizational functions, such as cash management and purchasing, made at a central location. A survey found that one-third of financial executives listed centralization of the treasury function as a top priority of their companies because centralization provided:

- Better cash control,
- Better control of operational risk,
- A layer of oversight for reviewing information and transactions,
- Lower costs, and
- Reduction of redundant operations

Even when functions and the decision-making authority for those functions are delegated, top management retains ultimate responsibility for decision outcomes. Thus, a sophisticated accounting and reporting system must be implemented to provide top management information about overall sub-unit accountability as well as the ability to measure it.

Disadvantages of Decentralization

The major disadvantages are as follows:

- Can result in a lack of goal congruence or sub optimization by sub-unit managers.
- Requires more effective communication abilities because decision making is removed from the home office.
- Can create personnel difficulties upon introduction, especially if managers are unwilling or unable to delegate effectively.
- Can be extremely expensive, including costs of training and of making poor decisions.

An organization is a group of people with a common purpose. The purpose is defined by the entity for which they work. In smaller businesses, such as partnerships and small companies, it is common for those who work for the organization to have created it, or to have had some part in creating it. By contrast, larger organizations have to employ or involve more people, the majority of which will have little or no connection with the founders or owners.

Every organization exists for the purpose of carrying out certain predetermined objectives and its structure must be necessarily to promote these objectives. Thus an organizational structure is not fixed, it can change as the

need requires. It is also important to note that in different organizations one might find different organizational structures whilst one may also find different structures in the same organization.

In any given case the organization structure owns much to the historical background of the firm and to the personalities of those who managed it in its formative years.

Other influences which are equally relevant and possibly more persistent in determining organization structure are the type of markets and customers to which the business sells, the type of product sold and the system of technology in used to produce the product.

In small organizations, decision-making and management of a business are often done by a single individual. However, in a large organization, especially organizations engaged in manufacturing/ undertaking multiple products and activities, successful management of it by the top management becomes more difficult. In order to overcome this difficulty, the large organization may be decentralized or divisionalized.

Many large organizations have divisionalized structures. In these organizations, a vital part of the head office management's role is measuring the performance of the divisions and of divisional managers.

In this context, it is important to recognize the distinction between divisional performance and managerial performance. An important question is the extent to which a manager's performance should only be evaluated in relation to factors they can control, rather than the overall performance of their division.

Decentralization means decisions are made at divisional and departmental levels. In centralization, decisions are handed down from the top echelon of management and subordinates carry them out. The process of delegating decision authority and responsibility in an organization is known as decentralization. In any organization, in fact, some authority can be found delegated to lower level management. In this way almost every organization can be said to be 'decentralized.' However, decentralization or divisionalization is found in case of companies producing multiple products. Divisions in companies mean different things in different companies. In some companies, divisions are organized on the basis of product lines whereas in some decentralized companies divisions may be created on the basis of geographical areas. Also, the term decentralization or divisionalization refers to those situations where individual managers of decentralized sub-units are given responsibility for profit and not just costs or revenues. In decentralized organizations, top management handles broad corporate policies, establishes long range plans, raises capital and conducts other coordinating activities.

Benefits of Decentralization:

Decentralization helps in the following manner:

- Helps top management recognizes and develop managerial talent.
- Greater awareness of local problems
- Allows managerial performance to be comparatively evaluated.
- Decisions are delegated and resulting less stress for senior management
- Develops skill level of junior managers
- Can often lead to greater job satisfaction and provides job enrichment.
- Makes the accomplishment of organizational goals and objectives easier.
- Reduces decision-making time.
- Allows the use of management by exception.
- Separate responsibilities

DuPont Analysis

8.2

The DuPont methodology (also known as the DuPont identification or DuPont model) is a model popularized by the DuPont Corporation for analyzing fundamental results. In 1920, the DuPont Corporation started the DuPont analysis as a means to measure assets at their gross book value rather than at net book value, thereby producing a higher 'Return on equity (ROE)'. DuPont analysis is a useful technique to break down the different return on equity (ROE) generators. The ROE decomposition helps investors to concentrate separately on key indicators of financial success to define strengths and weaknesses. This model analysis is considered useful to avoid misleading conclusions when it comes to corporate profit analysis. DuPont analysis is a multi-step framework of financial equations that provide insight into business's fundamental performance. The single most important ratio over which management has control is the 'Return on equity (ROE)', the other ratios are also important, but mainly because they affect the ROE. The objective is to identify the company's strong area that can be capitalized upon and/or its weak area that must be improved upon.

The DuPont analysis is an extended return on equity model, determined by multiplying the net profit margin with the asset turnover and the equity multiplier. The component parts of a firm's return on equity (ROE) are calculated using a DuPont analysis. This allows an investor to assess, which financial activities contribute the most to the ROE changes. The model was developed in order to analyze the current ROE and determine which area of the business is struggling. The DuPont Model can be used by management to pinpoint problem areas.

An investor may use these analyses to compare two identical firms' operating performance. The DuPont review may be used by managers to recognize strengths or weaknesses that should be tackled. In simple words, it breaks down the ROE to analyze how corporate can increase the return for their shareholders.

According to this analysis, the formula for calculation of the 'Return on Equity; can be presented as under:

Return on Equity = Net Profit Margin × Asset Turnover Ratio × Financial Leverage; or

= (Net Income ÷Sales) × (Sales ÷Total Assets) × (Total Assets ÷Total Equity).

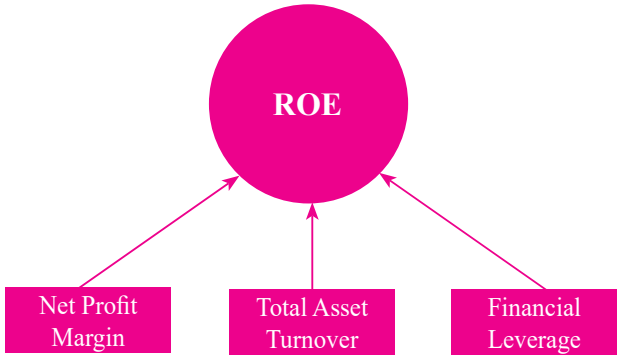


Figure 8.1 : DuPont Chart

According to DuPont methodology, three main financial parameters that drive Return on Equity (ROE) are:

(1) Operating performance,

(2) Asset usage performance, and

(3) Financial leverage.

(1) Operating performance:

This is a very basic profitability ratio. This is calculated by dividing the net profit by total revenues. This resembles the profit generated after deducting all the expenses. The primary factor remains to maintain healthy profit margins and derive ways to keep growing it by reducing expenses, increasing prices, etc., which impacts 'Return on Equity (ROE)'. Net profit margin (operating performance), which measures operating efficiency.

(2) Asset usage performance:

This means, Total Asset Turnover (Turnover ÷ Total Assets). This ratio depicts the efficiency of the company in using its assets. This ratio differs across industries but is useful in comparing firms in the same industry. If the company's asset turnover increases, this positively impacts the ROE of the company.

(3) Financial leverage:

Financial leverage is the use of debt to acquire additional assets or fund projects. To create debt, individuals or businesses borrow money. In return, borrowers promise lenders to pay back the principal amount and interest on their loans. Financial leverage is also called leverage or trading on equity.

To determine the financial health and strength of a company, there are a variety of leverage ratios analysts and lending institutions can use. A leverage ratio is a financial measurement that examines how much capital a company has in the form of debt, or determines if a company can pay off its debts. Each ratio focuses on one or more of the following factors: debt, equity, assets and interest expenses.

Again, Financial Leverage refers to the debt used to finance the assets. The companies should strike a balance in the usage of debt. The debt should be used to finance the operations and growth of the company. However, usage of excess leverage to push up the ROE can turn out to be detrimental to the health of the company.

Significance of Du Pont Analyses

The company can increase its Return on Equity if it-

1. Generates a high Net Profit Margin.
2. Effectively uses its assets so as to generate more sales
3. Has a high Financial Leverage

It is useful for company business heads to understand how their segment is contributing to the overall ROE of the company. In fact, this can be used as a reliable indicator of performance measurement of divisional managers.

For the top management this is useful in capital allocation decisions. After all, the capital has to be allocated to that business which contributes most to the ROE of the company with minimal risk. Increasing ROE by increasing leverage is not a good idea.

DuPont analysis helps the analyst tracking the stock to pin point the actual triggers that are driving the performance of the company and whether these factors are sustainable or not. That is what ultimately matters when it comes to valuation of the company.

Lastly, the fund manager will take a decision on comparative investments based on the ROE analysis. Over a longer period of time it is ROE that drives valuations and also the P/E ratio re-rating. That only happens when the ROE boost is sustainable. That is exactly what DuPont analysis captures

Disadvantage of DuPont Analysis

The main disadvantage of the DuPont analysis is that it still relies on accounting equations and data that can be manipulated despite being comprehensive. However, the DuPont study, even with its comprehensiveness, lacks meaning as to why the individual ratios are high or low, or whether they should be considered high or low at all.

Illustration 1 (DuPont Analysis)

An investor is interested to invest in any one of the two similar companies within the same industry. The investor wants to use the DuPont analysis method to compare each company's strengths and areas of opportunity and help him decide which company is the better investment option.

The following financial information about each company:

Company	**A**	**B**
Net income	₹2,000	₹2,500
Revenue	₹8,000	₹20,000
Average assets	₹5,000	₹8,000
Average equity	₹2,000	₹1,000

The investor uses each company's net income and revenue to calculate their net profit margins:

Company A's net profit margin = (₹2,000 / ₹8,000) × 100 = 0.25

Company B's net profit margin = (₹2,500 / ₹20,000) × 100 = 0.125

The investor uses each company's revenue and average assets to calculate their total asset turnover:

Company A's total asset turnover = ₹ 8,000 / ₹ 5,000 = 1.6 times

Company B's total asset turnover = ₹ 20,000 / ₹ 8,000 = 2.5 times

The investor uses each company's average assets and average equity to calculate their equity multiplier:

Company A's equity multiplier = ₹ 5,000 / ₹ 2,000 = 2.5

Company B's equity multiplier = ₹ 8,000 / ₹ 1,000 = 8

According to DuPont analysis:

Company A: ROE = 0.25 × 1.6 × 2.5 = 1

Company B: ROE = 0.125 × 2.5 × 8 = 2.5

Remarks:

DuPont analysis model allows the investor to see that although company B has a higher return on equity ratio than company A, a large portion of company B's ROE results from its equity multiplier. The investor can also see that a large portion of company A's ROE ratio results from its 25% net profit margin, because of this information, the investor invests with company A.

Solved Case 1

Mrs. EuCheu is an investor who has decided to invest her money in the business of either Retailer A and Retailer B. She researches their financial numbers and finds that the ROE for the both the Retailers are same at 45%. Thus she decides to look further and finds the following data; Retailer A's profit margin is 30%, asset turnover is 0.50, and equity multiplier is 3. Retailer B's Profit Margin of 15%; Asset Turnover is 3; and Equity Multiplier is 1.

She is confused as both the company's profitability is same when measured in terms of ROE. She seeks the advice of her friend Mr Dune who is a qualified accountant.

Mr Dune makes the following observations

He breaks down the ROE to identify the meaning and value of the different variables in this problem.

In order to compare the profitability of Retailer A (ROE = 45%) with that of Retailer B (ROE = 45%) Mr Dune uses the DuPont Framework which states that

DuPont ROE = Margin on Sales × Asset Turnover × Equity Multiplier

$$\Rightarrow \text{DuPont ROE} = \frac{\text{Net Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Asset}} \times \frac{\text{Total Asset}}{\text{Shareholders' Equity}}$$

In case of Retailer A

DuPont Return on Equity (ROE) [45%]

= Margin on Sales (30%) × Asset Turnover (0.50) × Equity Multiplier (3)

In case of Retailer B

DuPont Return on Equity (ROE) [45%]

= Margin on Sales (15%) × Asset Turnover (3) × Equity Multiplier (1)

On the basis of the above analysis, Mr Dune reports to Mrs EuCheu that;

a) Retailer A's business is more profitable in terms of rupee return generated against sales.

b) Regarding utilisation of assets at disposal, retailer B is better as its asset turnover is three against 0.50 of retailer A. This implies that management of retailer B is able to utilise more return against the assets at its disposal.

c) The equity multiplier of retailer B is one (shareholders' equity equals total assets) implying that it is an all equity firm. Thus it may be inferred that the financial risk perception is nil. Whereas, the equity multiplier of retailer A is three, implying that the total assets (debt + shareholders' equity) is three times the shareholders' equity. And a portion of financing total asset is debt financing implying some amount of financial risk.

The analysis presented through the 3 component DuPont analysis may not suffice the financial information need of Mrs EuCheu, but provides her with analytical information about the financial health of the two retailers.

Solved Case 2

An investor has been watching two similar companies, Lotus Inc., and ASA Inc. that have recently been improving their return on equity compared to the rest of companies in the industry. This could be a good thing if the two companies are making better use of assets or improving profit margins. But if the companies have increased the debt proportion in the capital structure, this would also be reflected in the ROE but would actually mean an increase in the financial risk perception of the companies.

In order to decide which company is a better opportunity, the investor decides to use DuPont analysis to determine the efforts of each company in improving its ROE and whether that improvement is sustainable.

The relevant calculation for DuPont analysis of Lotus Inc. and ASA Inc., over two-year period is presented which is based on the excerpts of financial data of the two companies.

Excerpts from the financial records and DuPont analysis of Lotus Inc. and ASA Inc.

Sl. No.	Particulars	figures in '000			
		Lotus Inc.		ASA Inc.	
		Year 1	Year 2	Year 1	Year 2
a	Net Income	1,000	1,200	2,100	2,100
b	Revenue from operation	10,000	10,000	17,500	17,500
c	Profit Margin (a ÷ b)	0.1	0.12	0.12	0.12
d	Revenue from operation	10,000	10,000	17,500	17,500
e	Average Assets	5,000	4,800	8,750	8,750
f	Asset Turnover (d ÷ e)	2	2.08	2	2
g	Average Assets	5,000	4,800	8,750	8,750
h	Average Equity	2,000	2,000	5,000	3,500
i	Equity Multiplier (g ÷ h)	2.5	2.4	1.75	2.5
j	ROE (c ×f × i)	50%	60%	42%	60%

DuPont Analysis of Lotus Inc. and ASA Inc.

It is obvious from the above table that, Lotus Inc. improved its profit margins by increasing net income and reducing its total assets. Shareholders' equity has remained stable at ₹2000. The equity multiplier ha marginally fallen as the average assets is reduced. Simply, Lotus Inc. improved its profit margin and asset turnover while equity remained constant. It can be also inferred that there is partial reduction of debt since average total asset has declined while equity has remained constant.

While the situation at ASA Inc. is very dissimilar. It may be observed that the profit margin and the asset turnover both has remained the same over the years. ROE has significantly risen from 42% to 69% over the two-year period. The entire change in ROE is due to an increase in equity multiplier which increased from 1.75 to 2.5. This is also projected in the fact that though the average asset remained same at ₹8750, equity decreased from ₹5000 to ₹3500 implying that there is debt instrument in the capital structure.

The investor is concerned because the additional borrowings has increased the ROE but actually it didn't change the company's net income, revenue, or profit margin, which means that high financial leverage makes the firm more lucrative to the shareholders' but fails to create real value.

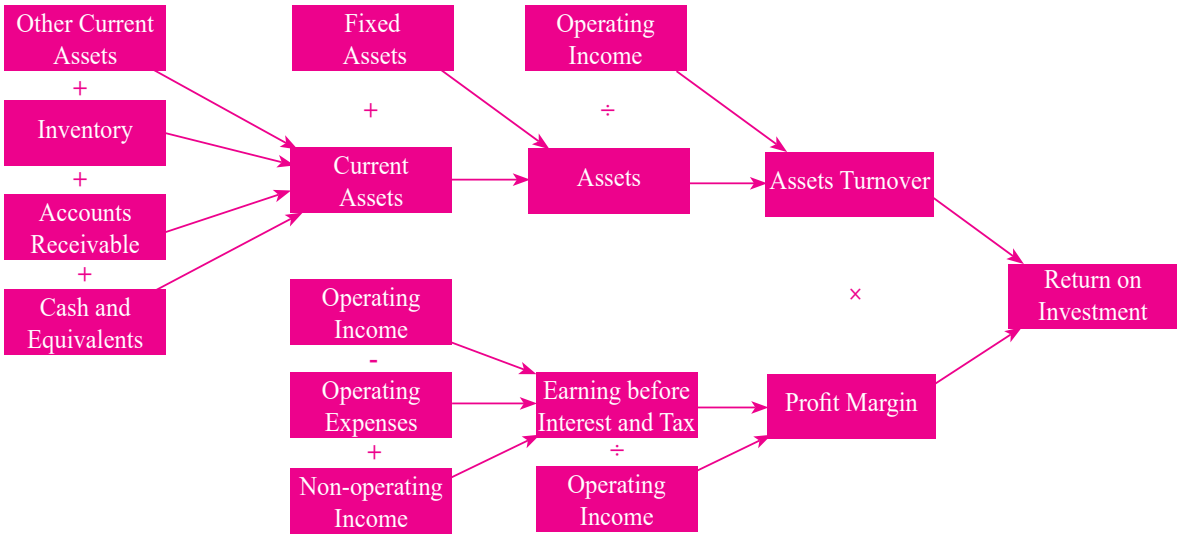


Figure 8.2 DuPont Model

The DuPont equation can be further decomposed to have an even deeper insight where the net profit margin is broken down into EBIT Margin, Tax Burden, and Interest Burden.

It gives a broader view of the Return on Equity of the company. It highlights the company's strengths and pinpoints the area where there is a scope for improvement. Say if the shareholders are dissatisfied with the lower ROE, the company with the help of the DuPont Analysis formula can assess whether the lower ROE is due to low-profit margin, low asset turnover, or poor leverage.

Once the management of the company has found the weak area, it may take steps to correct it. The lower ROE may not always be a concern for the company as it may also happen due to normal business operations. For instance, the ROE may come down due to accelerated depreciation in the initial years.

Five Step DuPoint Model Analysis to Test Impact and Efficacy of Strategic Cost and Financial Management Initiatives

$$\text{ROE} = \frac{\text{Net Income}}{\text{Shareholder Equity}}$$

$$= \frac{\text{Net Income}}{\text{Pre-tax Income}} \times \frac{\text{Pre-tax Income}}{\text{Operating Income}} \times \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Shareholder Equity}}$$

= Tax burden × Interest burden × Operating margin × Asset Turnover × Financial Leverage

Solved Case 3

Sulekha Ltd is planning to take over the buisness of Krishna LLP. For the purpose they appoint Mr Dune, a professional accountant to analyse the profitability of Krishna LLP for the period ended 31st March 2021. The following balances are extracted from statement of Profit and Loss and Balance Sheet of Krishna LLP for the year ended 31st March 2021 and presented to Mr Dune for analysis.

Particulars	Amount (₹)
Sales	7,100
Depreciation	200
Interest Expenses	20
Tax Expenses	900
Net Income	1,650
Current Assets	4,600
Fixed Assets, net	2,650
Total Assets	7,250
Current Liabilities	3,000
Long term debt	150
Sahreholders' Equity	4,100
Total Liabilities and Shareholder's equity (current liabilities + long term debt + shareholders' equity)	7,250

Mr Dune begins the profitablity analysis with the calculation of the traditional financial ratio of return on equity (ROE). For the purpose he assumes that there is no preference dividend as no such data is presented to him.

$$\text{ROE} = \frac{\text{Net Return}}{\text{Equity}} \times 100 = \frac{1650}{4100} \times 100 = 40.24\%$$

Conceptually, Net return = EBIT – (Interest + Taxes) = EAT

In order to get an indepth analysis of the ROE, Mr Dune proceededed with the 5 – component DuPont analysis which seggreagtes the ROE into its five component. For the purpose, he proceeds as follows;

$$\text{Dupont ROE} = \frac{\text{EBIT}}{\text{Sales}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{EAT}}{\text{EBT}} \times \frac{\text{Sales}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Equity}}$$

$$\frac{\text{EBIT}}{\text{Sales}} = \frac{2570}{7100} = 0.3619718314^{1}$$

[where, net income (1650) + interest (20) + Tax (900) = EBIT (2570)]

[1] *Approximation is avoided as otherwise it would not tally with the ROI calculated in the first step.*

$$\frac{EBT}{EBIT} = \frac{2550}{2570} = \mathbf{0.992217899}$$

EBT (2550) = EBT (2570) - Interest (20)

$$\frac{EAT}{EBT} = \frac{1650}{2550} = 0.647058824$$

[EAT (1650) = EBT (₹2550) - Tax (₹900)]

$$\frac{Sales}{Total\ Assets} = \frac{7100}{7250} = 0.979310345$$

$$\frac{Total\ Assets}{Equity} = \frac{7250}{4100} = 1.768292683$$

Thus, DuPont ROE = **0.361971831**× **0.992217899** × **0.647058824** × **0.979310345** × **1.768292683**

= 0.402439024 = 40.24%

The following inferences are drawn by Mr Dune and the same is presented before the board of Sulekha Ltd for their perusal.

a) $\frac{EBIT}{Sales}$, which measures the operational efficiency is satisfactory at 36.20% approximately

b) The EBT and the EBIT are almost same (as the ratio, $\frac{EBT}{EBIT}$ is 0.99 implying that the interest burden is minimal. This is also reflected in the information given which shows that long term debt in the capital structure is very low, only ₹150 while the equity is ₹4100

c) Tax burden is significant as the ratio $\frac{EAT}{EBT}$ indicates. The ratio stands at 64.71% (approximately) implying that a significant portion of the income (35.29%) is the tax burden.

d) Assets are managed efficiently as the $\frac{Sales}{Total\ Assets}$ indicates.

e) Equity multiplier of 1.77 (approximately) indicates that the firm depends primarily of equity for its financing. This is also represented in the low long term loan (₹150) in the capital structure of Krishna LLP.

Divisional Performance Measurement Tools – ROI, Residual Income

8.3

A successful performance measure evaluates how well an organization performs in relation to its objectives. Since the primary objective of commercial organizations is normally assumed to be the maximization of the wealth of its shareholders, it follows that performance measures should evaluate this. In practice, many organizations use profit-based measures as the primary measure of their financial performance. Two problems relating to profit in this area are:

Profit ignores the cost of equity capital. Companies only generate wealth when they generate a return in excess of the return required by providers of capital – both equity and debt. In financial statements, the calculation of profit does take into account the cost of debt finance, but ignores the cost of equity finance. Profits calculated in accordance with accounting standards do not truly reflect the wealth that has been created, and are subject to manipulation by accountants.

In a divisional structure each division is self-contained and based on geography or product/service area. There is good communication between functions within the division but, crucially, divisional managers have more authority to act autonomously than in a functional structure where planning and control are exercised centrally. Divisional organizations tend to be more decentralized than functional ones. In this respect, it is important that divisional managers are clear about an organization's strategy and objectives, so that they can ensure that their divisions perform according to that strategy. Once again, the idea of goal congruence is very important here.

Equally, because managers throughout the organization have a key role in budgeting and monitoring performance, performance information needs to be available to all these managers (for example, so that they can monitor costs and revenues for their division).

Conversely, because divisional managers have a relatively high degree of autonomy, the corporate centre (head office) needs to have information about divisional performance, to assess whether the divisions are performing in line with head office's objectives. In this respect, performance will be measured on the basis of divisions or strategic business units, rather than according to business processes.

Managers will be accountable for, and rewarded on the basis of, divisional performance. Accordingly, divisional performance measures, such as return on investment (ROI) or residual income (RI)) can be appropriate here.

Whereas in a functional structure performance information tends to be aggregated for the corporate centre to review and then give feedback to functions, in a divisional structure it is important that performance information is available at a lower level so that the divisions can provide feedback on performance upwards to senior management.

The relationship between short-term and longer-term objectives also has significant implications for the way organizations measure performance and the performance measures they use to do so. The phrase 'What gets measured, gets done' is an important one in relation to performance measurement, and its implications

are important here as well. For example, if return on investment (ROI) is one of a company's key financial performance measures, then its managers will have a keen interest in maximizing the company's ROI.

As a result, however, this choice of performance measure may also encourage the managers to focus on short-term performance rather than longer-term performance. For example, they may decide to dispose of some machinery which is not currently in use, thereby reducing depreciation charges and asset values, and in doing so immediately increasing ROI. However, the potential flaw in such a short-term plan could be exposed if the managers later realize they need to use the machinery again and so have to buy some new equipment (at a higher cost than the equipment they had previously disposed of).

ROI:

Instead of focusing purely on the absolute size of a division's profits, most organizations focus on the return on investment (ROI) of a division. ROI expresses divisional profit as a percentage of the assets employed in the division. Assets employed can be defined as total divisional assets, assets controllable by the divisional manager or net assets.

This measure expresses divisional profit as a percentage of the firm's investment in the division and is similar to the widely accepted 'return on capital employed' measure used in the external analysis and interpretation of accounts. Measures relating to profit include sales margin, EBITDA and EPS. More sophisticated measures (ROCE, ROI) take the size of investment into account. A major attraction of ROI is that it can be used as a common denominator for comparing the returns of dissimilar businesses, such as other divisions within the group or outside competitors. ROI has been widely used for many years in all types of organization so that most managers understand what the measure reflects and consider it to be of considerable importance.

Return on investment (ROI) is a form of ROCE and is calculated as:

(Profit before interest and tax ÷ Operations management capital employed) × 100

The ROI compares income with the operational assets used to generate that income. Profit is taken before tax and interest because tax is an appropriation of profit made from the use of the investment, and the introduction of interest charges introduces the effect of financing decisions into an appraisal of operating performance.

ROI is normally used to apply to investment centres or profit centres. These normally reflect the existing organization structure of the business.

The breakdown of ROI into turnover and margin gives management insight into planning for profit improvement. Generally speaking, management can:

1. Improve margin
2. Improve turnover
3. Improve both

Use of ROI:

(a) Financial reporting:

It ties in directly with the accounting process, and is identifiable from the income statement and statement of financial position (balance sheet), the firm's most important communications media with investors.

(b) Aggregation:

ROI is a very convenient method of measuring the performance for a division or company as an entire unit.

Other advantages include its ability to permit comparisons to be drawn between investment centres that differ in their absolute size.

Measurement problems: non-current assets

(a) It is probably most common to use return on net assets.

(i) If an investment centre maintains the same annual profit, and keeps the same assets without a policy of regular non-current asset replacement, its ROI will increase year by year as the assets get older. This can give a false impression of improving 'real' performance over time.

Using ROI as a performance measure may also encourage short-termism, because managers may choose not to replace assets. ROI increases as the assets get older, because depreciation reduces the net book value of the assets.

(ii) It is not easy to compare fairly the performance of one investment centre with another. Non-current assets may be of different ages or may be depreciated in different ways.

(iii) Inflation and technological change alter the cost of non-current assets

(iv) Measuring ROI as return on gross assets ignores the age factor. Older non-current assets usually cost more to repair and maintain. An investment centre with old assets may therefore have its profitability reduced by repair costs.

If a group of companies sets a target return for the group as a whole, or if a company sets a target return for each strategic business unit, it might be company policy that no investment project should go ahead in any subsidiary or investment centre unless the project promises to earn at least the target return. Here is an example.

(a) There should be no new investment by any subsidiary in the group unless it is expected to earn at least a 15% return.

(b) Similarly, no non-current asset should be disposed of if the asset is currently earning a return in excess of 15% of its disposal value.

(c) Investments which promise a return of 15% or more ought to be undertaken.

Problems with such a policy include:

(a) Investments are appraised by discounted cash flow (DCF) whereas actual performance will probably be measured on the basis of ROI.

(b) The target return makes no allowance for the different risk of each investment centre.

(c) In a conglomerate, an identical target return may be unsuitable to many businesses in a group.

Since managers will be judged on the basis of the ROI that their centre earns each year, they are likely to be motivated into taking those decisions which increase their center's short-term ROI.

Summary:

(a) An investment might be desirable from the group's point of view, but would not be in the individual investment center's 'best interest' to undertake. Thus there is a lack of goal congruence.

(b) In the short term, a desire to increase ROI might lead to projects being taken on without due regard to their risk.

(c) Any decisions which benefit the company in the long term but which reduce the ROI in the immediate short term would reflect badly on the manager's reported performance.

Residual Income (RI)

To overcome some of the dysfunctional consequences of ROI, the residual income approach can be used. For the purpose of evaluating the performance of divisional managers, residual income is defined as controllable profit less a cost of capital charge on the investment controllable by the divisional manager. If residual income is used to measure the managerial performance of investment centres, there is a greater probability that managers will be encouraged, when acting in their own best interests, also to act in the best interests of the company.

Residual income also can be defined as the net income of a division, less the 'imputed' capital charge on the assets used by division. The capital charge is the minimum acceptable rate of return and is calculated by applying this required (or target) rate of return to the division's investment base. Theoretically, rate of return should be the division's cost of capital; in most cases, however it is a cut-off rate based on the firm's objectives and strategies and will be somewhat higher than the divisional cost of capital

Residual Income (RI) attempts to overcome the weakness in ROI by measuring the rupees amount of return that is provided to the company by a department or division. RI for a division is calculated as the amount of return (operating income before taxes) that is in excess of a targeted amount of return on the investments employed by that division. Residual income is the operating income earned after the division has covered the required charge for the funds that have been invested by the company in its operations.

The following two items those are important in regard to the calculation of RI:

(1) The targeted amount of return is usually some percentage of, or rate of return on, the total employed assets of the division, or the invested capital in the division, and

(2) The percentage used in the calculation is the required rate of return that management has set.

Note:

If the required rate of return is not available in the question, use the company's weighted average cost of capital (which will be given in the question).

Any project that has a positive RI will be accepted, even if it will reduce the overall company or division ROI.

RI is calculated as under:

RI = Divisional profit — (Percent capital charge × Divisional investment)

Further reason cited in favour of residual income over the ROI measure is that residual income is more flexible, because different cost of capital percentage rates can be applied to investments that have different levels of risk. Not only will the cost of capital of divisions that have different levels of risk differ – so may the risk and cost of capital of assets within the same division. The residual income measure enables different risk-adjusted capital costs to be incorporated in the calculation, whereas the ROI cannot incorporate these differences.

Advantages of RI:

The main advantages of RI are as:

(1) It avoids suboptimal decisions as investments are not rejected merely because they lower the divisional manger's ROI.

(2) It maximizes growth of the company and increases shareholders' wealth by accepting opportunities which earn a rate of return in excess of the cost of capital.

(3) The cost of capital charge on divisional investments ensures that divisional managers are aware of the opportunity cost of funds.

(4) Charging each division with the company's cost of capital ensures that decisions taken by different divisions are compatible with the interests of the organization as a whole.

The decision whether to use ROI or RI as a measure of divisional performance affects managers' investment decisions. Under the ROI method, division managers tend to accept only the investments whose returns exceed the division's ROI; otherwise, the division's overall ROI would decrease. Under the RI method, on the other hand, division managers would accept an investment as long as it earns a rate in excess of the minimum required rate of return. The addition of such an investment will increase the division's overall RI.

Disadvantage of RI:

Residual income suffers from the disadvantages of being an absolute measure, which means that it is difficult to compare the performance of a division with that of other divisions or companies of a different size. For example, a large division is more likely to earn a larger residual income than a small division. To overcome this deficiency, targeted or budgeted levels of residual income should be set for each division that are consistent with asset size and the market conditions of the divisions. Residual income, like ROI, can encourage a short-run orientation.

Illustration 2 (Example on Residual Income)

Sales	₹4,80,000
Cost of goods sold	₹2,22,000
Gross margin	₹2,58,000
Selling and administrative expense	₹2,10,000
Operating income	**₹48,000**
January 1 net book value of operating assets	₹2,77,000
December 31 net book value of operating assets	₹3,23,000

Minimum rate of return 12%

Residual income = Operating income - (Minimum rate of return × Average operating assets)

= ₹48,000 - (0.12 × ₹3,00,000)

= ₹48,000 - ₹36,000

= ₹12,000.

Illustration 3

Acme, a division of Ace Manufacturing, has assets of ₹2,25,000 and an operating income of ₹55,000.

(i) What is the division's ROI?

(ii) If the minimum rate of return is 12 percent, what is the division's residual income?

Solution:

(i) ROI = (₹ 55,000 ÷ ₹2,25,000) × 100 = 24.44%

(ii) RI= Operating income ₹55,000 - Minimum required rate (12% × ₹2,25,000) ₹ 27,000 = ₹28,000

Illustration 4

Consider the following:

	Division A	Division B
Operating assets	₹50,00,000	₹1,25,00,000
Operating income	₹10,00,000	₹ 22,50,000
ROI	20%	18%

(i) Which is the more successful division in terms of ROI?

(ii) Using 16 percent as the minimum required rate of return compute the residual income for each division. Which division is more successful under this rate?

Solution:

(i) Division A is more successful as since it returns ₹0.20 for each rupee invested (as compare to ₹ 0.18 for Division B).

(ii) The residual income at 16 percent for each division is computed as follows:

	Division A	Division B
Operating income	₹10,00,000	₹ 22,50,000
Minimum required income	₹ 8,00,000	₹20,00,000
	(16% × 50,00,000)	(16% × ₹1,25,00,000)
RI	₹ 2,00,000	₹2,50,000

Division B is more successful.

Illustration 5

The following data are given for the Delhi division for 2022:

Return on investment (ROI) 25%

Sales ₹ 12,00,000

Margin 10%

Minimum required rate of return 18%

(i) Compute the division's operating assets.

(ii) Compute the division's residual income (RI).

Solution:

(i) By definition, ROI= Margin × Turnover

25% = 10% × Turnover

Therefore, the turnover must be 2.5 times.

Since, the turnover is sales/operating assets,

2.5 times = ₹ 12,00,000 ÷ Operating assets

Therefore, Operating assets = ₹ 4,80,000

(ii) RI = Operating income - Minimum required operating income

Margin = 10% = Operating income ÷ Sales = Operating income ÷ ₹ 12,00,000

Therefore, the operating income must be ₹1,20,000.

RI = ₹1,20,000 - (18% × ₹4,80,000) = ₹1,20,000 - ₹86,400 = ₹33,600

Illustration 6

XYZ Corporation has three divisions whose income statements and balance sheets are summarized below:

	Division X	Division Y	Division Z
Sales	₹5,00,000	(d)	(g)
Operating income	₹25,000	₹30,000	(h)
Operating assets	₹1,00,000	(e)	₹2,50,000
Asset Turnover	(a)	(f)	0.4
Margin	(b)	0.4%	5%
Return on investment (ROI)	(c)	2%	(i)

(i) Supply the missing data in the table above and summarize the results.

(ii) Comment on the relative performance of each division. What questions can be raised as a result of their performance?

Solution:

(i) Return on investment (ROI) = Operating income ÷ Operating assets

= (Operating income ÷ Sales) × (Sales ÷ Operating assets) = Margin × Asset Turnover

(a) Asset Turnover = ₹5,00,000 ÷ ₹1,00,000 = 5 times

(b) Margin = (₹ 25,000 ÷ ₹ 5,00,000) × 100 = 5%

(c) ROI = Asset Turnover × Margin = 5 times × 5% = 25%

(d) Margin = 0.4% = 0.004 = Operating income ÷ Sales (d); d = ₹30,000 ÷ 0.004 = ₹ 75,00,000

(e) ROI = 2% = Operating income ÷ Operating assets (e) = 30,000 ÷ Operating assets (e)

or, e = ₹30,000 ÷ 0.02 = ₹15,00,000

(f) Asset Turnover = d ÷ e = ₹ 75,00,000 ÷ ₹15,00,000 = 5 times

(g) Asset Turnover = 0.4 = Sales (g) ÷ ₹ 2,50,000 or, g = 0.4 × ₹ 2,50,000 = ₹ 1,00,000

(h) Margin = 5% = Operating income (h) ÷ Sales (g) = (h) ÷ ₹ 1,00,000, h = ₹ 1,00,000 × 5% = ₹ 5,000

(i) ROI = 0.4 times × 5% = 2% or = 5,000 ÷ ₹ 2,50,000 = 2%

(ii) Division X performed best. It appears that Divisions Y and 2 are in trouble. Division Y turns over its assets as often as Division X, but Y's margin on sales is much lower. Thus, Division Y must work on improving its margin. The following questions are raised about Division Y Is the low margin due to inefficiency? Is it due to excessive material, labour, and/or overhead costs? Division 2, on the other hand, does just as well as Division X in terms of profit margin- both divisions earn 5 percent on sales.

But Division 2 has a much lower turnover of capital than Division X. Therefore, Division 2 should take a close look at its investment. Is too much tied up in inventories and receivables? Are there unused fixed assets? Is there idle cash sitting around?

Illustration 7

An investment centre has reported a profit of ₹28,000. It has the following assets and liabilities:

		₹
Non current assets (at NBV)		1,00,000
Inventory	20,000	
Trade receivables	30,000	
	50,000	
Less: Trade payables	8,000	42,000
		1,42,000

Required:

Calculate the ROI for the division. State any additional information that would be useful when calculating the ROI.

Solution:

ROI might be measured as: ₹ 28,000 ÷ ₹1,42,000 = 19.7%.

However, suppose that the centre manager has no responsibility for debt collection. In this situation, it could be argued that the centre manager is not responsible for trade receivables, and the centre's CE should be ₹1,12,000. If this assumption is used, ROI would be ₹28,000 ÷ ₹1,12,000 = 25.0%.

Illustration 8

Nielsen Ltd has two divisions with the following information:

	Division A	Division B
Profit (₹)	90,000	10,000
Capital employed (₹)	3,00,000	1,00,000
ROI	30%	10%

Division A has been offered a project costing ₹1,00,000 and giving annual returns of ₹20,000. Division B has been offered a project costing ₹1,00,000 and giving annual returns of ₹12,000. The company's cost of capital is 15%. Divisional performance is judged on ROI and the ROI related bonus is sufficiently high to influence the managers' behaviour

Required:

(a) What decisions will be made by management if they act in the best interests of their division (and in the best interests of their bonus)?

(b) What should the managers do if they act in the best interests of the company as a whole?

Solution:

(a)	Division A	Division B
	(₹'000)	(₹'000)
Old ROI	90/300	10/100
	= 30%	= 10%
New ROI	(90 + 20)/ (300 + 100)	(10 + 12)/(100 + 100)
	= 27.5%	= 11%
Will manager want to accept project?	No	Yes

The manager of Division A will not want to accept the project as it lowers her ROI from 30% to 27.5%. The manager of Division B will like the new project as it will increase their ROI from 10% to 11%.

Although the 11% is bad, it is better than before.

(b) Looking at the whole situation from the group point of view, we are in the ridiculous position that the group has been offered two projects, both costing ₹1,00,000. One project gives a profit of ₹20,000 and the other ₹12,000. Left to their own devices then the managers would end up accepting the project giving only ₹12,000.

This is because ROI is a defective decision-making method and does not guarantee that the correct decision will be made.

Illustration 9

An investment centre has net assets of ₹8,00,000, and made profits before interest and tax of ₹1,60,000. The notional cost of capital is 12%.

Required:

Calculate and comment on the RI (Residual Income) for the period.

Solution:

If performance is measured by RI, the RI for the period is:	₹
Profit before interest and tax	1,60,000
Less: Notional interest (12% ×₹8,00,000)	96,000
RI	64,000

(Note: Capital employed is not available in this question and therefore net assets should be used as a substitute value).

Investment centre managers who make investment decisions on the basis of short-term performance will want to undertake any investments that add to RI, i.e. if the RI is positive.

Illustration 10

An investment centre has net assets of ₹8,00,000, and made profits before interest of ₹1,60,000. The notional cost of capital is 12%. This is the company's target return.

An opportunity has arisen to invest in a new project costing ₹1,00,000.

The project would have a four-year life, and would make profits of ₹15,000 each year.

Required:

(a) What would be the ROI with and without the investment? (Base your calculations on opening book values). Would the investment centre manager wish to undertake the investment if performance is judged on ROI?

(b) What would be the average annual RI with and without the investment? (Base your calculations on opening book values).Would the investment centre manager wish to undertake the investment if performance is judged on RI?

Solution:

(a) ROI

	Without the investment	With the investment
Profit	₹ 1,60,000	₹ 1,75,000
Capital employed	₹ 8,00,000	₹ 9,00,000
ROI $(\frac{\text{Profit}}{\text{Capital Employed}} \times 100)$	20.0%	19.4%

ROI would be lower; therefore the centre manager will not want to make the investment. Since his performance will be judged as having deteriorated. However, this result in dysfunctional behaviour since the company's target is only 12%.

(b) RI

		Without the Investment		With the investment
Profit		1,60,000		1,75,000
Less: Notional Interest		96,000		1,08,000
RI	(₹ 8,00,000 × 12%)	64,000	(₹ 9,00,000 ×12%)	67,000

The investment centre manager will want to undertake the investment because it will increase RI. This is the correct decision for the company since RI increases by ₹3,000 as a result of the investment.

Illustration 11

A Company had the best year ever, with sales of ₹45,00,000 and operating profit of ₹9,50,000. The balance sheet at the beginning of the year showed assets used in production with a cost of ₹2,00,00,000 and accumulated depreciation of ₹50,00,000. The company didn't buy any assets during the year but did have depreciation expense of ₹10,00,000. Calculate the ROI for the year.

Calculate ROI by dividing operating profit by the average book value of assets. Average assets are the sum of the book values divided by 2. The book value is cost less accumulated depreciation.

Solution:

Beginning of the year book value:

$$2,00,00,000 - 50,00,000 = ₹1,50,00,000$$

End of year book value:

$$2,00,00,000 - (50,00,000 + 10,00,000) = ₹1,40,00,000$$

So, the average book value of assets is $= \frac{1,50,00,000 + 1,40,00,000}{2} = ₹1,45,00,000$

ROI = Operating Profit ÷ Average Book Value of Assets = 9,50,000 ÷ 1,45,00,000 = 0.0655

or, ROI of 6.55%.

Economic Value Added – Definition, EVA Centre, EVA Drivers

8.4

A Company as an organization has the objectives to achieve some goals planned with the staff. They can determine whether the Company has achieved its objectives or not by understanding the performance. A firm's management creates value when it makes decisions that provide benefits exceeding costs. These benefits may be received in the near or distant future, and the costs include the direct cost of the investment and a less obvious cost, the cost of capital.

In a market-driven economy many Companies will create wealth. Other firms however will undoubtedly destroy it. Discovering those economic factors that lead to wealth creation and destruction among Companies is important to many constituencies, not the least of which is corporate officials and investment managers. For corporate managers, wealth creation is fundamental to the economic survival of the firm.

Managers who fail (or refuse) to see the importance of this imperative in an open economy do so at the peril of the organization and their own careers of finding the "best" Companies and industries in the marketplace is of primary importance to investment managers.

With the proper financial tools, portfolio managers may be able to enhance their active performance over-and-above the returns available on similar risk indexed passive strategies. A new analytical tool called EVA is now assisting this wealth-discovery and Company-selection process. The innovative changes that this financial metric have spawned in the twin areas of corporate finance and investment management is the driving force behind what can be formerly called the EVA revolution.

EVA is a value based financial performance measure, an investment decision tool and it is also a performance measure reflecting the absolute amount of shareholder value created. It is computed as the product of the "excess return" made on an investment or investments and the capital invested in that investment or investments.

A refinement of the residual income measure that incorporates adjustments to the divisional financial performance measure. EVA was developed by the US consulting firm Stern Stewart & Co, and it has gained widespread use among many well-known companies such as Siemens, Coca Cola and Herman Miller.

EVA measures the firm's ability to earn more than the true cost of capital. EVA is a measure of economic profit that exceeds investor expectations, and as such is a performance measure that, by removing accounting anomalies, enables a direct comparison of companies of similar risk profiles. As examples of anomalies, through the EVA calculation expenses such as research and development and training are expensed: according to the theory these are investments and should be treated as such.

Economic value (or 'shareholder value') is defined as 'the present value of the future cash flows of a company, of a particular project or decision'. That means the calculation of economic value may be applied to something much smaller than an entire business's valuation, such as a specific commercial decision. Such a decision could be whether to invest in a brand, whether to make some organizational change or simply whether to hire in some special skills. It is often referred to as EVA or 'economic value added'.

Central to the ability to compare performance accurately is the focus on the cost of capital. According to the EVA approach, organizations only make a profit when they take the cost of capital into the calculation of their financial performance. Capital is not free. There is an opportunity cost of capital, in that investors can put their money in many places (for instance into government bonds, the bank or equity markets). It is important to deduct the cost of capital in order to see the actual profitability of the enterprise, so a charge for the cost of capital is made. Capital accounts for both debt and equity. Capital is a measure of all the cash that has been deposited in a company over its lifetime, irrespective of its financing source.

Positive EVA indicates that a company surpassed the expectations of its shareholders. On the other hand, if the EVA is zero, this should be treated as sufficient achievement because the shareholders have earned a return that compensates the risk. The concept of EVA is based on common accounting items like interest-bearing debt, equity capital and net operating profit. It differs from traditional measures mainly in that it takes into account the cost of equity.

EVA overcomes some of the limitations associated with ROI and other measures of performance. It considers incremental wealth that a particular investment division creates or destroys. EVA provides more useful information to the managers for making correct decisions. Investment centre managers are encouraged to use EVA as a tool of performance measurement to take decisions and formulate strategies that enhances EVA.

EVA is also used extensively as a measure by which to set and assess incentive compensation payments to managers. Particularly interesting in this post-credit crunch world is that the bonus structure encourages the careful balancing of the delivering of short-term financial results and longer-term performance (thus safeguarding the interests of shareholders that have made long-term investments in the enterprise).

EVA = NOPAT − (C × K)

Where:

NOPAT is net operating profit after tax

'C' is the weighted average cost of capital (WACC), which represents the rate that a company is expected to pay on average to all its security holders to finance its assets 'K' is the economic capital employed.

Normally, the equity cost of capital for an organization is measured through the Capital Asset Pricing Model (CAPM). A firm's nominal equity cost of capital is calculated as a base risk-free rate plus 'beta' – the latter being a general equity risk premium adjusted for a firm-specific risk measure. In short, therefore, the equity rate is the return investors are seeking to achieve when buying a company's common shares. This is expressed as: the firm's equity investors' expected return (future) = risk-free return (future) + the firm's beta (a relative measure of volatility) × general equity risk premium (history).

The equity risk premium represents the excess return above the risk-free rate that investors demand for holding risky securities. So, with a risk-free rate of 7%, a beta of 1.1 and an assumed equity risk premium of 4%, a company would have the following cost of equity: Cost of equity = 7% + (1.1 × 4%) = 11.4%.

The cost of debt is the rate of return that debt-holders require in order to hold debt. To determine this rate, the yield has to be calculated. This is typically worked out using discounted cash flow analysis, i.e. the internal rate of return.

The cost of tax should be calculated after tax as follows:

Cost of debt after tax = Cost of tax before tax × (100 − marginal tax rate).

Illustration 12

A person made a Capital Investment of ₹2,00,000 in a company. Operating profit, after taxes, is ₹ 28,000. The opportunity cost of that investment is 10%. Calculate EVA.

Solution:

EVA = Net Operating Profit after taxes – Cost of Capital

i.e. ₹28,000 - 10% of ₹2,00,000 = ₹ 8,000.

The goal of EVA is to take into account the cost of capital invested in the company.

Enhancing EVA:

1. Increasing operating profits without adding further capital in the business.
2. Ensuring that ROI on additional funds invested is more than weighted average cost of capital.
3. Liquidating non-productive capital by releasing capital from those activities that do not cover even the cost of capital.

EVA Centre

This comprises of the following:

(1) Divisionalization of an organization allows performance measurement through responsibility accounting.

(2) Responsibility accounting segregates costs and revenues into areas of responsibility, and a specific manager is made responsible for each area.

(3) This assigning of different aspects of the budget to different managers is known as responsibility accounting, and the area of operations assigned to a manager is known as a responsibility centre.

Types of responsibility centres:

- Cost centre: a responsibility centre where only costs are aggregated. The manager of the cost centre will be responsible for the costs under his charge.
- Profit centre: a responsibility centre where not only costs but also revenues are accumulated and accounted for. Thus, the manager of this centre will be responsible for the profits of his area.
- Investment centre: a responsibility centre where the manager will be accountable for costs, revenues and the investment decisions made. The manager is held responsible for both profits and return on investment.

Note: There can be several cost centres within a profit centre and several profit centres within each investment centre, each centre having its own budget and performance targets.

EVA Drivers

These are as under:

1. Decisions with impact on EVA
2. Overview
3. Operative decisions
4. Investment decisions
5. Financing decisions

Behavioral Aspects of EVA

EVA helps to encourage the right kind of behavior from their divisions in a way that emphasis on operating income alone cannot. The underlying reason is EVA's reliance on the true cost of capital. In many companies,

the responsibility for investment decisions rests with corporate management. As a result, the cost of capital is considered a corporate expense. If a division builds inventories and investment, the cost of financing that investment is passed along to the overall income statement and does not show up as a reduction from the division's operating income. The result is to make investment seem free to the divisions, and of course, they want more.

Illustration 13

The following information is available of a concern. Calculate Economic Value Added (EVA).

12% Debt ₹ 2,000 crores

Equity capital ₹500 crores

Reserves and Surplus ₹7,500 crores

Risk-free rate 9%

Beta factor 1.05

Market rate of return 19%

Equity (market) risk premium 10%

Operating profit after tax ₹ 2,100 crores

Tax rate = 30%

Solution:

Capital Employed = 2000 + 500 +7500 = ₹10,000 Crores

Cost of Debt (K_d) = Interest × (1- Tax Rate) = 12% × (1- 0.3) = 8.40%

Cost of Equity (K_e) = Risk free rate + (Beta × Market Risk Premium)

= 9% +1.05(19% - 9%) =19.5%

Debt equity ratio (as given in the question) 20% & 80%

WACC= [(K_d) × Debt % + (K_e) × Equity %] = (8.40% × 20%) + (19.5% × 80%) = 17.28%

Operating Profit after tax ₹2,100 crores.

EVA = NOPAT – Cost of Capital Employed

= [(₹2,100 crores) – (17.28%) × ₹10,000 crores]

= ₹2,100 crores – ₹1,728 crores

= ₹372 crores

Illustration 14

H Ltd.'s current financial year's income statement reports its net income as ₹15,00,000. H's marginal tax rate is 40% and its interest expense for the year was ₹15,00,000. The company has ₹ 1,00,00,000 of invested capital, of which 60% is debt.

In addition, H Ltd. tries to maintain a Weighted Average Cost of Capital (WACC) of 12.6%.

(i) Compute the operating income or EBIT earned by H Ltd. in the current year.

(ii) What is H Ltd.'s Economic Value Added (EVA) for the current year?

Solution:

(i) Taxable income = Net Income ÷ (1 – Tax Rate) or, Taxable income = ₹15,00,000 ÷ (1 – 0.40) = ₹ 25,00,000

Again, taxable income = EBIT – Interest or, EBIT = Taxable Income + Interest = ₹25,00,000 + ₹ 15,00,000 = ₹40,00,000

(ii) EVA = EBIT (1 – T) – (WACC × Invested capital)

= ₹40,00,000 (1 – 0.40) – (0.126 × ₹1,00,00,000)

= ₹24,00,000 – ₹12,60,000 = ₹11,40,000.

Illustration 15

The following information is supplied by ABC Ltd. for the year 31-03-2022:

Sl. No.	Particulars	(₹ In Crores)	(₹ In Crores)
(i)	Profit after tax (PAT)		205.90
(ii)	Interest		4.85
(iii)	Equity Share Capital	40.00	
	Accumulated Surplus	700.00	
	Shareholders fund	740.00	
	Loans (Long term)	37.00	
	Total long term funds		777.00
(iv)	Market Capitalization		2892.00
Additional information			
(a)	Risk free rate		12.00 percent
(b)	Long Term Market Rate (Based on BSE Sensex)		15.50 percent
(c)	Effective tax rate for the company		25 percent
(d)	Beta (β) for last few years		
	Year		
	1	0.48	
	2	0.52	
	3	0.60	
	4	1.10	
	5	0.99	

You are required to calculate the Economic Value Added of ABC Ltd. as on 31st March, 2022

Solution:

Net Operating Profit after Tax (NOPAT) = Profit After Tax (PAT) + Interest (net of tax)

= 205.90 + 4.85 × (1-0.25)

= ₹209.54 crores

Debit Capital		₹37 crores
Equity capital (40 + 700)	=	₹740 crores
Capital employed	=	₹37 + 740 = ₹777 crores
Debt to capital employed	=	₹37 crores / ₹777 crores = 0.0476
Equity to capital employed	=	₹740 crores / ₹777 crores = 0.952
Interest cost before tax		₹4.85 crores
Less: Tax (25% of ₹4.85 crores)		(₹1.21 crores)
Interest cost after tax		₹3.64 crores
Cost of debt	=	(₹3.64 crores / ₹37 crores) × 100
	=	9.83%

According to Capital Asset Pricing Model (CAPM)

Beta for calculation of EVA should be the highest of the given beta for the last few years.

Accordingly,

Cost of Equity Capital = Risk Free Rate + Beta (Market Rate - Risk Free Rate)
= 12% + 1.10 × (15.50% - 12%)
= 12% + 1.10 × 3.5%
= 15.85%

Weighted Average Cost of Capital (WACC) = Equity to Capital Employed (CE) x Cost of Equity capital + Debt to CE × Cost of Debt
= 0.952 × 15.85% + 0.0476 × 9.83%
= 15.09% + 0.47%
= 15.56%

Cost of Capital Employed (COCE) = WACC × Capital Employed
= 15.56% × ₹777 crores
= ₹120.90 crores

Economic Value Added (E.V.A.) = NOPAT – COCE
= ₹209.54 crores – ₹120.90 crores
= ₹88.64 crores

Illustration 16

XYZ LTD furnishes the following information, from which you are required to calculate the Economic Value Added of the company:

Equity shares of ₹1,000 each	Nos. 1,58,200
12% Debentures of ₹10 each	Nos. 50,00,000
Tax rate	30%
Financial Leverage	1.1 times
Securities Premium Account (₹ in lakhs)	155
Free reserves (₹ in lakhs)	154
Capital Reserve (₹ in lakhs)	109

It is a prevailing practice for companies in the industry to which XYZ belongs to pay at least a dividend of 15% p.a. to its Equity shareholders.

Solution:

Computation of Economic Value Added

Particulars	₹ In lakhs
Profit after tax (WN 1)	420
Add: Interest net of tax = 60 × {(100-30)/100}	42
Return to providers of funds	462
Less: Cost of Capital (WN 2)	(342)
Economic Value Added	120

Working Note:

1. Calculation of Net Profit after interest and tax

Interest on Debentures = 50,00,000 × ₹10 × 12% = ₹60,00,000

Therefore, Financial Leverage = $\frac{\text{Profit before Interest \& taxes (PBIT)}}{\text{PBIT less Interest}}$

or, $1.10 = \frac{\text{PBIT}}{\text{PBIT - ₹60,00,000}}$

or, 1.10 (PBIT – ₹ 60,00,000) = PBIT

or, 1.10 PBIT – ₹66,00,000 = PBIT

or, 1.10 PBIT – PBIT = ₹66,00,000

or, 0.10 PBIT = ₹66,00,000

∴ PBIT = ₹6,60,00,000

Profit after interest but before tax = ₹6,60,00,000 – ₹60,00,000 =	₹6,00,00,000
Less: Income Tax @30%	(₹1,80,00,000)
Profit After Interest & Tax	₹4,20,00,000

2. Calculation of Weighted Average Cost of Capital (WACC)

Particulars	₹ In lakhs	Amount (₹) (1)	Weight (2)	Cost % (3)	WACC % (4) = 2×3
Equity Shareholders fund					
Common Shares (1,58,200 × ₹1,000)	1,582				
Securities Premium	155				
Free Reserves	154				
Capital Reserves	109	2,000	0.80	15	12.00
Debenture holders fund (50,00,000 × ₹10)		500	0.20	8.4*	1.68
		2,500	1.00		13.68

* Cost of Debt = 12% (1 - Tax Rate) = 12% (1 - 30%) = 8.4.

Cost of Capital = Capital Employed × WACC%
= ₹2,500 lakhs × 13.68%
= ₹342 lakhs

Illustration 17

ABC Ltd. has provided the following data for the Financial Year ending 31.3.2022:

Liabilities	₹ In lakhs	Assets	₹ In lakhs
Share Capital	1,000	Fixed Assets	3,000
Reserve & Surplus	2,000	Investments	150
Long Term Debt	200	Current Assets	100
Trade Payables	50		
	3,250		3,250

Additional information provided is as follows:

Profit before Interest and Tax is	₹1,000 lakhs
Interest is	₹20 lakhs
Tax Rate	35.875%
Risk Free Rate	10%
Market Rate	15%
Beta (β) factor	1.4

Calculate the Economic Value Added.

Solution:

Computation of Economic Value Added

Particulars	₹ In lakhs
Profit after taxes (as per Profit and Loss A/c W.N.5)	628.425
Add: Interest on long term borrowing adjusted net of tax (W.N.2)	12.825
Total return to Providers of funds	641.250
Less: Cost of Capital (WN 4)	(522.825)
Economic value Added	118.425

Working Notes:

1. Cost of Equity = Risk Free Rate + β Factor (Market Rate - Risk Free Rate)
= 10% + 1.4 (15% - 10%)
= 10% + 7%
= 17%

2. Cost of Debt (post tax)

Particulars	₹ In lakhs
Interest	20.000
Less: Tax saving (20 × 35.875%)	(7.175)
Interest after tax savings	12.825

$$\text{Cost of Debt} = \frac{\text{Interest on Long term Debt}}{\text{Long term Debts}}$$

$$= \frac{₹12.825 \text{ Lakhs}}{₹200 \text{ Lakhs}} = 6.4125\%$$

3. Capital employed

Particulars	₹ In lakhs	₹ In lakhs
Share capital	1,000	
Reserves and Surplus	2,000	3,000
Long term Debts		200
Total Capital employed		3,200

4. Weighted Average Cost of Capital

	Particulars	Weight × Cost %	WACC %
a.	Cost of Equity	$\frac{3,000}{3,200}$ × 17% (WN 1)	15.9375
b.	Cost of Debt	$\frac{200}{3,200}$ × 6.4125% (WN 2)	0.40078
c.	WACC (a + b)		16.33828

Cost of Capital = 3,200 × 16.33828% = ₹ 522.825 Lakhs.

5. Profit after Tax

Particulars	₹ In lakhs	₹ In lakhs
Profit before interest & tax	1,000	
Less: Interest	(20)	980.000
Less: Tax (980 × 35.875%)		351.575
Profit after Tax		628.425

Illustration 18

Prosperous Bank has a criterion that it will give loans to companies that have an "Economic Value Added" greater than zero for the past three years on an average. The bank is considering lending money to a small company that has the economic value characteristics shown below. The data relating to the company is as follows:

(i) Average operating income after tax equals ₹ 25,00,000 per year for the last three years.

(ii) Average total assets over the last three years equals ₹ 75,00,000.

(iii) Weighted average cost of capital appropriate for the company is 10% which is applicable for all three years.

(iv) The company's average current liabilities over the last three years are ₹ 15,00,000. Does the company meet the bank's criterion for a positive economic value added?

Solution:

Calculation of Economic Value Added

Particulars	₹
Net Operating Profit After Tax	25,00,000
Less: Cost of capital employed (Refer W.N.)	6,00,000
Economic Value Added	19,00,000

Economic Value added is greater than zero. Therefore, the company qualifies for the loan.

Working Note: Calculation of Cost of Capital Employed

Particulars	₹
Average total assets	75,00,000
Less: Average current liabilities	15,00,000
Capital Employed	60,00,000

Cost of capital = Capital employed × Weighted average cost of capital

= ₹60,00,000 ×10%

= ₹6,00,000

Introduction to Learning Curve

8.5

The term "learning curve" refers to the idea that efficiency increases the more experience a person has with a given task. As a result, the time required for performing the task decreases as increases occur in the number of times the task has been performed.

Higher costs per unit early in production are part of the start-up costs when a new activity is begun. It is commonly accepted that new products and production processes experience a period of low productivity followed by increasing productivity. However, the rate of productivity improvement declines over time until the improvement stops. The required production time reaches a level where it remains until another change in production occurs.

Learning curve analysis is used in planning, budgeting, and forecasting and also to determine estimated labour costs when bidding on a contract. A company needs to be able to estimate what the long-term costs of production will be.

In case of a job which is repetitive in nature and the working time is not scheduled by the speed of machinery, an individual is likely to become more confident and knowledgeable about his work as he gains more experience. As a consequence of his learning effect he can do the job in less time than when he initially commenced the first job. Ultimately when he has acquired more experience the learning process will lend to stop. The speeding up of a job with repeated performance is known as learning effect or learning curve effect. The reduction in the required labour time thus can be quantified. Learning curve theory was first developed in the United States aircraft industry. It has been extended to other labour-oriented industries and has been extended to no production activities such as marketing efforts. Learning curve effect is not only restricted to individual but it also applies to a group of workers. However, the learning effect is not an automatic natural phenomenon. All production process win not show rate of increased efficiency and there may be cases where the differences in the learning rates will be substantial. 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 man-hours to 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 limits for learning curve percentages are as follows:

(1) The learning curve will always be less than 100%, because if the learning curve is 100% then no learning and no decrease in time required is taking place. This upper limit applies to both the cumulative average-time learning model and the incremental unit-time learning model because both assume that the time required to perform a task decreases as the task is performed multiple times.

(2) When the cumulative average-time learning model is being used, the learning curve percentage must be greater than 50%. If the learning curve percentage is less than or equal to 50%, it would mean one of two impossible scenarios exists:

- If the learning curve is less than 50%, the total time required to produce the additional units when production doubles plus the time required to produce the initial units would be less than the time required for production of the initial units.
- If the learning curve is equal to 50%, the total time required to produce the additional units when production doubles plus the time required to produce the initial units would be equal to the time required for production of the initial units.
- Neither of the two scenarios above is possible. The additional units must require some added amount of time, so the total time for the additional units plus the time for the initial units must be greater than the time required for the initial units.
- This lower limit applies to only the cumulative average-time learning model. No similar restriction exists for the incremental unit-time learning model because that model results only in an estimate of the time needed to produce just the last unit in a quantity of units. Theoretically, at least, the time required for the last unit produced could require less than 50% of the time required for the last unit before production doubled.

These limits are demonstrated below.

Cumulative Average-Time Learning Model

The cumulative average-time learning model assumes a constant rate of decline in the estimated average time per unit each time the quantity of units produced doubles.

For example, if the learning curve is 70%, every time the total number of units produced doubles the estimated cumulative (total) production time for all units produced decreases to 70% of what it would have been if no learning had taken place.

This model can be used to calculate three things:

1) The estimated average time per unit for the entire quantity produced, from the very first unit to the very last unit produced. This is the "cumulative average."
2) The estimated total time required for the entire quantity produced, from the very first unit to the very last unit produced.
3) The estimated total production time required for a certain block of units can be calculated by finding the total time required for all the units produced through the end of that block and subtracting from that the total time required for the units up to that block. This calculation is possible only if the block of units represents the units that are produced in a doubling of production.

For example, to calculate the total time that is required to produce units 5 through 8, to calculate the total time required to produce units 1 through 8 and to subtract from that the time required to produce units 1 through 4. Since the jump from 4 units to 8 units represents a doubling of production, the time requirement can be calculated for just the additional units 5 through 8.

Mathematically, two methods are used to calculate the estimated total time required for all units produced and the estimated average time required per unit for all units produced using the cumulative average model:

(1) To calculate the estimated total time required for all units produced, then to use the estimated total time to calculate the estimated cumulative average time per unit;

(2) To calculate the estimated cumulative average time per unit, and then to use the estimated average time per unit to calculate the estimated total time required for all units produced.

The learning curve ratio can be calculated with the help of the following formula:

Learning curve ratio = Average labour cost of first 2 units ÷Average labour cost of first units

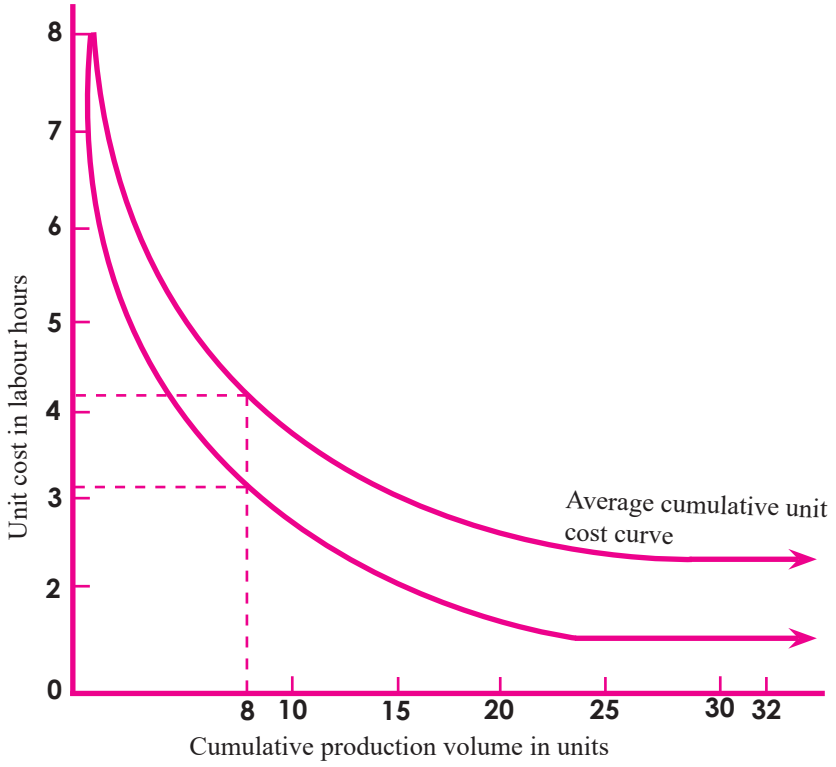


Figure 8.3 : Learning curve graph

The quantitative average time per unit produced is normally considered to be reduced by a constant percentage every time total output of the product is doubled. The following table the working of which is based on 80% learning effect can exemplify this.

Number of Units (Cumulative)	Cumulative average time Per unit	Total Time in hours	Incremental time for additional units.
1	100	100	–
2	80	160	60
4	64	256	96
8	51.2	409.6	153.6

The Learning curve can also be expressed as $y = ax^b$

Where, y = is the average time per unit for x units

a = the time for first unit

x = the cumulative number of units

b = the learning coefficient and is equal to log 0.8 ÷ log2 = - 0.322 for a learning rate of 80%.

Note: If a learning rate of 90% is applied, then the value of will change.

Learning curve theory can be used:

- To calculate the incremental cost of making extra units of a particular products,
- To set standards for labour,
- To prepare realistic production budgets and to report labour cost variances, and
- To quote contact price.

Direct labour cost and time as well as variable overhead costs, which vary with direct labour hours, are affected by learning curve. On the other hand, material cost will not be affected. In case where absorption costing system in vogue, the fixed overhead application rate may be affected due to higher production or use of capacity. Besides the above cases where learning curve will have effect directly a management accountant should bear in some other considerations, such as:

1. Sales promotion and advertising expenditure,
2. Delivery date commitments,
3. Budgeting and standard cost,
4. Cash budget,
5. Work scheduling and overtime decisions, and
6. Economics of scale.

Application of Learning Curve

The areas in which the application of learning curve can help an organization are:

1. Improvement of Productivity:

   As the experience is gained the performance of workers improves, time taken per unit reduces and thus his productivity goes up.

2. Cost Predictions:

   Learning curve provides better cost predictions to enable price quotations to be preferred for potential orders.

3. Work scheduling:

   Learning curve enables us to predict the inputs required more effectively and helps in the preparation of accurate delivery schedules.

4. Standards setting:

   If budgets and standards are set without considering learning curve, it is meaningless because variances will arise.

The theory of learning curves will only hold if the following conditions apply:

(1) There is a significant manual element in the task being considered.

(2) The task must be repetitive.

(3) Production must be at an early stage so that there is room for improvement.

(4) There must be consistency in the workforce.

(5) There must not be extensive breaks in production, or workers will 'forget' the skill.

(6) Workforce is motivated.

The following are some examples of decisions that can be aided by learning curve analysis:

- Development of production plans and labour requirements:

  Learning curves should be used in the development of production and labour budgets when changes such as new products are planned.

- Management control:

  Recognizing that higher costs will occur in the early phase of the product life cycle allows more effective evaluation of managers.

- Development of standard costs:

  Labour costs should be adjusted regularly in recognition of the fact that learning causes standard costs to decrease over time.

- Life-Cycle costing:

  In calculating the cost of a contract, learning curve analysis can ensure that the cost estimates are accurate over the life of the contract, leading to better bidding.

- Cost-Volume-Profit analysis:

  If learning is not considered in determining a breakeven point, the result may be an overstatement of the number of units required to break even.

- Capital budgeting:

  Costs can be projected more accurately over the life of the capital investment when expected improvements in labour productivity due to learning are included.

- Make or buy decisions:

  The analysis of the cost to make the product will be affected by the learning curve in effect.

Limitations and problems associated with learning curve analysis include:

- Learning curve analysis is appropriate only for labour-intensive operations involving repetitive tasks where repeated trials improve performance. If the production process primarily relies on robotics and computer controls, little repetitive labour is involved and thus little opportunity exists for learning to take place.
- The learning rate is assumed to be constant. In real life, the decline in labour time might not be constant. For example, the time required might decline at the rate of 70% for the first 75,000 units, followed by 80% for the next 50,000 units, and 95% for the next 25,000 units.
- The reliability of a learning curve calculation can be jeopardized because an observed change in productivity might actually be associated with factors other than learning, such as a change in the labour mix, the product mix, or other factors. If some factor or factors other than learning are affecting productivity, a learning model developed using the affected historical data will produce in-accurate estimates of labour time and cost.

Illustration 19

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.

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 needed to make first machine = 1000 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:

For Answer of the questions, (i) to (iii), please go through the relevant theory parts of this Study Material.

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 20

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 wage 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:

(i) 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 × ₹ 12/hr = ₹ 491.52

(ii) 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 (104.86 - 40.96)

Labour cost for 24 units = 63.90 hours × ₹12/hr = ₹ 766.80

Illustration 21

C has designed a new type of sailing boat, for which the cost and sales price of the first boat to be produced has been estimated as follows:

	₹
Materials	5,000
Labour (800 hrs @ ₹5 per hr)	4,000
Overhead (150% of labour cost)	6,000
	15,000
Profit mark-up (20%)	3,000
Sales price	18,000

It is planned to sell all the yachts at full cost plus 20%. An 80% learning curve is expected to apply to the production work. Only one customer has expressed interest in buying the yacht so far, but he thinks ₹18,000 is too high a price to pay. He might want to buy two or even four of the yachts over the next six months.

He has asked the following questions:

(a) If he paid ₹18,000 for the first yacht, what price would he have to pay later for a second yacht?

(b) Could C quote the same unit price for two yachts, if the customer ordered two at the same time?

(c) If the customer bought two yachts now at one price, what would be the price per unit for a third and fourth yacht, if he ordered them both together later on?

(d) Could C quote a single unit price for the following numbers of yachts if they were all ordered now?

(i) Four yachts

(ii) Eight yachts

Assuming there are no other prospective customers for the yacht, how would the questions be answered?

Solution:

Number of yachts		Cumulative average time per yacht (Hours)		Total time for all yachts to date (Hours)		Incremental time for additional yachts (Hours)
1		800.00		800.00		
2	(×80%)	640.00	(×2)	1,280.00	(1,280.00 - 800.00)	480.00
4	(×80%)	512.00	(×4)	2,048.00	(2,048.00 - 1,280.00)	768.00
8	(×80%)	409.60	(×8)	3,276.80	(3,276.80 - 2,048.00)	1,228.80

(a) Separate price for a second yacht:

	₹
Materials	5,000
Labour (480 hrs @ ₹5)	2,400
Overhead (150% of labour cost)	3,600
Total cost	11,000
Profit (20%)	2,200
Sales price	13,200

(b) A single price for the first two yachts:

	₹
Materials cost for two yachts	10,000
Labour (1,280 hrs @ ₹5)	6,400
Overhead (150% of labour cost)	9,600
Total cost for two yachts	26,000
Profit (20%)	5,200
Total sales price for two yachts	31,200
Price per yacht (÷ 2)	15,600

(c) A price for the third and fourth yachts:

	₹
Materials cost for two yachts	10,000
Labour (768 hours @ ₹5)	3,840
Overhead (150% of labour cost)	5,760
Total cost	19,600
Profit (20%)	3,920
Total sales price for two yachts	23,520
Price per yacht (÷ 2)	11,760

(d) A price for the first four yachts together and for the first eight yachts together

Particulars		First four yachts		First eight yachts
Materials		20,000		40,000
Labour	(2,048 hrs × ₹5)	10,240	(3,276.80 hours × ₹5)	16,384

Overhead	(150% of labour cost)	15,360	(150% of labour cost)	24,576
Total cost		45,600		80,960
Profit (20%)		9,120		16,192
Total sales price		54,720		97,152
Price per yacht	(÷ 4)	13,680	(÷ 8)	12,144

Balanced Score Card for Variable Pay Management

8.6

Organizations in today's change-filled, highly competitive environment must devote significant time, energy, and human and financial resources to measuring their performance in achieving strategic goals. Most do just that, but despite the substantial effort and related costs, many are dissatisfied with their measurement efforts. In fact, at any given time, as many as 50 percent of organizations are making changes to their performance measurement systems.

The Balanced Scorecard has emerged as a proven and effective tool in our quest to capture, describe, and translate intangible assets into real value for all of an organization's stakeholders and, in the process, to allow organizations to implement their differentiating strategies successfully.

Characteristics

Balanced scorecards to be effective and useful should have the following characteristics:

1. Balanced scorecards should highlight a company's strategy by focusing on cause-and-effect relationship. Assume LG Ltd. aims to be a low-cost manufacturer and accelerate growth. The balanced scorecards should pinpoint specific objectives and measures in 'learning and growth perspective' which could improve internal business processes. These, in turn, would result into greater customer satisfaction, larger market share, higher operating income and shareholder wealth.
2. Balanced scorecards should help in communicating the strategy formulated to all members of an organization by translating the strategy into a coherent and linked set of understandable and measurable operational targets. Subsequently, managers and employees take actions, based on scorecard, to achieve the firm's strategy. To facilitate decisions and actions in accordance with scorecards, it is preferable to develop scorecards at the division and department levels.
3. In profit-seeking companies, the balanced scorecard gives strong emphasis on financial objectives and measures. Sometimes managers give too much importance to innovation, quality and customer satisfaction though they may not produce tangible benefits. A good balanced scorecard considers non-financial measures as a part of a strategy or programme to achieve and improve future financial performance. When financial and non-financial performance measures are properly linked in balanced scorecards, many non-financial measures serve as leading indicators of future financial performance.
4. The balanced scorecard limits the number of measures used by identifying only the most critical ones. Avoiding a proliferation of measures focuses management's attention on those that are key to the implementation of strategy.
5. The scorecard highlights sub-optimal trade-offs that managers may make when they fail to consider operational and financial measures together. For example, a company for which innovation is key, could achieve superior short-run financial performance by reducing spending on R&D. A good balanced scorecard

would signal that the short-run financial performance may have been achieved by taking actions that hurt future financial performance because a leading indicator of that performance, R&D spending and R&D output, has declined.

A Scorekeeper, the management accountant designs reports to help managers track progress in implementing strategy. Many organizations have introduced a balanced score card approach to manage the implementation of their strategies.

The balanced scorecard does not focus solely on achieving financial objectives. It also highlights the non-financial objectives that an organization must achieve to meet its financial objectives. The Scorecard measures an organization performance from four perspectives:

- Financial
- Customer
- Internal business processes
- Learning and growth

A Company's strategy influences the measures it uses to track performance in each of this perspective.

It's called the balanced scorecard because it balances the use of financial and non-financial performance measures to evaluate short-run and long-run performance in a single report. The balanced scorecard reduces managers' emphasis on short-run financial performance such as quarterly earnings. That is because the non-financial and operational indicators, such as product quality and customer satisfaction measure changes that a company is making for the long run. The financial benefits of these long-run changes may not appear immediately in short-run earnings, but strong improvement in non-financial measures is an indicator of economic value creation in the future. For example, an increase in customer satisfaction, as measured by customer surveys and repeat purchases, is a signal of higher sales and income in the future. By balancing the mix of financial and non-financial measures, the balanced scorecard broadens management's attention to short-run and long-run performance.

The four Perspectives of the Balanced Scorecard:

1. **Financial Perspective**:

   This perspective evaluates the Profitability of the strategy. Because cost reduction relative to competitors, costs and sales growth are key strategic initiatives, the financial perspectives focuses on how much of operating income and return on capital results from reducing costs and selling more units.

2. **Customers Perspective:**

   This perspective identifies the targeted market segments and measures the company's success in these segments. To monitor its growth objectives, number of new customers and customer's satisfaction.

3. **Internal business process Perspective:**

   This perspective focuses on internal operations that further the customers' perspective by creating value for customers and further the financial perspective by increasing shareholder value. Chipset determines internal business process improvement targets after benchmarking against its main competitors.

   The internal business process perspective comprises three sub processes:

   1. The innovation process:

      Creating products, services and processes that will meet the needs of customers, aiming at lowering costs and promote growth by improving the technology of its manufacturing.

2. The operations process:

   Producing and delivering existing products and services that will meet the needs of customers. The strategic initiatives are (a) improving manufacturing quality reducing delivery time to customers and (b) Meeting specified delivery dates.

3. Post sales service providing service and support to the customer after the sale of a product of service. Although customers do not require much post sales service.

4. Learning & Growth Perspectives:

This perspective identifies the capabilities of the organization must excel at to achieve superior internal processes that create value for customers and shareholders.

A Company's learning and growth perspectives emphasize three capabilities:

1. Employee Capabilities measured using employee education and skill levels.
2. Information system capabilities, measured by percentage of manufacturing processes with real-time feedback and
3. Motivation measured by employee satisfaction and percentage of manufacturing and sales employees (line employees) empowered to manage processes.

Balanced Scorecard: Implementation

Implementation of a balanced scorecard system of performance measurement is most successful when the entire organization is aware of it and supports it. The manner in which the organization's management communicates the role, the use, and the benefits of the balanced scorecard to its employees is one of the most important factors in successful implementation of a balanced scorecard. The balanced scorecard needs to be introduced by illustrating the sequence of cause-and-effect relationships, the way the perspectives are linked, and the reasons why meeting the goals at the bottom level make it possible to meet the goals at the next level up, which in turn make the next level of goals possible, and so forth.

It is important for senior management to support the program, even as high as the board of directors. The board of directors can also have balanced scorecard goals. Having balanced scorecard goals for the board of directors creates support at the very top of the organization, and the support filters down.

Each business unit and division should be involved in developing its own customized scorecard, based on the company's overall objectives and the action items that the unit needs to achieve in order to contribute to those objectives. Involvement of the scorecard users builds their support. However, the scorecards as developed by middle managers need to be reviewed and approved with input from senior management to make sure they are congruent with the company's goals.

The actual scorecard report for a business unit should be organized according to the four perspectives, with each selected scorecard measure on a line and classified within its perspective. The target can be in one column followed by the actual results in the next column. Results that are in line and out of line can be identified, perhaps by color. Each manager should be accountable for specific lines on each report, and a division head is accountable for all the lines on the divisional report. A good, balanced scorecard report can also identify trade-offs that managers might make, for instance by reducing R&D spending to achieve short-run financial goals, or making other trade-offs that could hurt future financial performance. The decline of R&D spending or other problems would be signaled.

The balanced scorecard needs to be marketed to both management and staff to garner support. Internal promotion of the program should take place through various media, such as print, verbal, and electronic means.

- A brochure can be used to explain how the balanced scorecard will help achieve the company's long-term goals in a way that merely tracking financial performance cannot. Employee newsletters can be utilized to feature the balanced scorecard program and report on results. If improvement in market share is one of the metrics and market share in fact improves, an article can be written to highlight the factors that contributed to the positive results. On the other hand, if a metric is not met, an article can explain the reasons and outline a plan to correct the situation.
- Verbal communication can occur in regular employee meetings where management reviews the results and gives employees the opportunity to ask questions. One-on-one conversations between supervisors and employees can provide opportunities for the employees who are closest to the work to point out ways in which the program can be improved. Suggestion systems, programs inviting employee comments, and employee training programs can also be used to enlist employee support, and managers must be willing to listen to criticism and to make changes. It is essential that employees get the sense that management takes their ideas seriously, responds to them, and rewards useful ideas, because if employees feel that their input is ignored they may conclude that the pro-gram is a wasted initiative.
- General results of the balanced scorecard program can be posted on the company's intranet, with links to the overall corporate goals that each balanced scorecard result supports. In addition, the company can give senior managers password access to detailed results on the company's intranet (internal network) for their use in decision-making. Linking employees' bonuses to their goal attainment can align employee interests with the goals. Aligning compensation with balanced scorecard results maximizes the balanced scorecard's use and effectiveness.

Balanced Scorecard: Reporting

Software can be used to provide balanced scorecard performance information to interested parties. However, installing dedicated balanced scorecard software does not mean that the balanced scorecard has been implemented. Specialized software merely tracks the results of a balanced scorecard program. A business must develop its own balanced scorecard for each unit, undertake the implementation project, and follow up on the results.

Difficulties with Balanced Scorecard for measuring Performance

There are several problems with the balanced scorecard:

- The efficacy of the balanced scorecard in achieving the organization's strategic goals must be monitored closely. If all of the non-financial targets are achieved but the financial targets are not achieved, then probably a strong causal relationship does not exist between the non-financial indicators chosen for monitoring and the financial goals. The non-financial indicators may need to be re-evaluated and changed.
- In order to implement balanced scorecard performance measurement, a firm must have extensive enterprise resource planning
- If the balanced scorecard is used as a "command and control" document that is used to control behaviour, employees may "make the numbers" but not be committed to achieving the organization's goals. Instead, the balanced scorecard should be used to create an environment in which everyone can learn and grow.
- Non-financial data is not subject to control or audit and thus its reliability could be questionable.
- It is difficult to use scorecards for comparisons across business units because each business unit has its individualized scorecard. Scorecard evaluation is more effective when it is used to judge the progress of an individual business unit relative to the prior year or relative to its goals rather than when used to compare a manager's performance with that of other managers or a segment's performance with that of other segments.

Remark and Conclusion:

If developed and used properly, the balanced scorecard is an effective method of developing strategies and evaluating progress toward meeting goals.

8.6.1 Balanced Score Card for Variable Pay Management

The balanced scorecard is a performance evaluation technique that takes into consideration a number of financial and non-financial performance indicators. When combined with a pay for performance system, the balanced scorecard provides a strong management tool for driving organizational success.

The Balanced Scorecard states that linkage with compensation plans brings cultural change, improved financial performance and increased employees' understanding of strategic objectives, resulting in improved organizational performance. Though creating this linkage is a complex process, it is essential for successful and efficient implementation of the Balanced Scorecard. There is an increasing trend in firms to shift from traditional financial based performance measurement and incentive compensation system to integrating financial and non-financial measures.

Use of Balanced Scorecard for this purpose is an example of this trend. Kaplan and Norton suggest that the Balanced Scorecard should be aligned with the organizational incentive or reward management system at the final stage of its implementation. Others also support the claim for consistency and alignment of the performance measurement system with reward and incentive structure in organization. Traditional compensations systems focus on short-term goals and objectives making it impossible to achieve long-term strategic objectives. Linking the rewards and incentives to Balanced Scorecard would allow better alignment of organization towards its strategies. This would also result in coherence of individual's personal goals and objectives with the overall goals and objectives of the organization.

Employee compensation, one of the largest expenses in any organization, is also one of the least managed. While transparent data and scorecards have improved the management of other aspects of performance greatly, compensation often goes unevaluated beyond the fundamental measure of incremental costs. The invisible nature of compensationT leads to problems. These include failing to differentiate pay for performance, over- and/or underpaying jobs relative to the market, having compensation spending grow faster than revenue and allowing employees to suspect that they are not being paid fairly.

A compensation scorecard collects and displays the results for all the measures that an organization uses to monitor compensation and compare compensation among internal departments or units. It can be used to:

- Help organizations detect and prevent compensation problems.
- Make compensation decisions and actions more transparent.
- Improve the quality of compensation decisions.

While the process of measuring and communicating results on a balanced scorecard of performance metrics likely will drive a degree of organizational success, many organizations add to this motivation by linking the scorecard to pay rewards.

The final step in the process of building a pay-for-performance program from the balanced scorecard foundation is to develop a reward structure. In the conceptual reward structure, a variable pays reward structure (red line) is built around the achievement of goals ranging from a threshold to maximum level of performance.

Performance at the target level results in a market level of reward. Performance at the threshold results in a below-market reward. Performance at a maximum level results in an above-market reward.

Companies using this concept of a reward structure predetermine the threshold, target and maximum performance levels they want to reward, and the range of market level rewards they intend to provide matched to the range of performance levels.

Typically, the pay-for-performance reward is in the form of a lump-sum cash award so that rewards have to be re-earned each year; however, some companies have factored the balanced scorecard results into the determination for making annual salary increases, as well.

Because most organizations have a salary structure with ranges built around market-based midpoints, the reward structure above may be designed as a mix of salary increases and lump-sum payments. A greater mix of salary increases are provided when an employee's salary is below the midpoint; and a greater mix of lump sums are provided when an employee's salary is above the midpoint.

Using a compensation scorecard can greatly increase an organization's compensation effectiveness. Because it is true that what gets measured gets done, it is critically important to measure and manage compensation. With the right measures, organizations can use what they spend on compensation more effectively to help execute their strategy.

PERSPECTIVE	QUESTION	EXPLANATION
Customer	What do existing and new customers value from us?	Gives rise to targets that matter to customers : Cost, Quality, Delivery, Inspection, Handeling and so on.
Internal	What processes must we excell at to achieve our financial and customer objectives?	Aims to improve internal processes and decission making.
Innovation and Learning	Can we continue to improve and create future value?	Considers the business's capacity to maintain its competitive position through the acquisition of new skills and the development of new products.
Financial	How do we create value for our shareholders?	Covers traditional measures such as growth, profitability and shareholder value but through talking to the shareholder or shareholders director.

Figure 8.4 : Balance Scorecard

Illustration 22

"Taj Laguna Royal" is an exclusive resort located in a famous place of Andaman & Nicobar Island that vows to isolate its guests from the hustle and bustle of everyday life. Its leading principle is "all contemporary amenity wrapped in old-world charisma". Each of the resort's 20 villas has a separate theme like Castle, Majestic, Ambassador, Royal Chateau, Coconut, Lemon, Balinese etc. and guests often ask for a specific villa when they make reservations. Villas are Ideal for families or friends travelling together and these villas feature luxurious accommodation spanning two floors. Since it is located within a 100-acre estate on white sand beach, the resort offers its guests a wide variety of outdoor activities such as horseback riding, hiking, diving, snorkeling, sailing, golf and so on.

Guests could also while away the day relaxing in the pool and availing themselves of the resort's world-famous spa "Taj Heaven Spa". The dining room, which only has three tables for the public, is acceptable proud of its 5-star rating.

Required

Develop a Balanced Scorecard for "Taj Laguna Royal". It is sufficient to give two measures in each of the four perspectives.

Solution:

Balanced Scorecard of "Taj Laguna Royal"

Objectives	Performance Measures
Financial Perspective	(i) Economic Value Added (ii) Revenue generation per villa
Customer Perspective	(i) Percentage of repeat customers (ii) Customers' complaints
Internal Business	(i) Rating of Spa for its services (ii) Staff hours per guest (iii) % cost spent for maintenance (iv) Rank for restaurant in the context of services
Innovation and Learning	(i) Retention of employees (ii) New types of services to offered in near future

Solved Illustrations & Cases

Illustration 23

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 for a learning rate of 80%. Given that a = 10 hours and learning rate 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) $y = ax^b$ or, $y = 10(20)^{-0.322}$

Taking log on both sides

Log y = log 10 + log $20^{(-0.322)}$

Log y = log 10 – (0.322) log 20 = 1 – (0.322) log 20 = 1- (0.322) × log (2×10) = 1- (0.322) × (log2 + log10) = 1- (0.322) × (1.3010) = 1- 0.41892 = 0.5811

Log y = 0.5811

y = Anti log (0.5811) = 3.812 hrs (average time)

Total Time = 3.812 × 20 = 76.24 hours

(ii) Log y = log 10 + log $30^{(-0.322)}$

Log y = 1- (0.322) × (1.4771)

= 1 - (0.4756) = 0.5244

y = anti log (0.5244) = 3.345 hrs (average time)

Total time = 3.345 × 30 = 100.35 hrs

(iii) Log y = log 10 + log $40^{(-0.322)}$

= 1- (0.322) × (1.6021)

Log y = 0.4841

y = anti log (0.4841) = 3.049 hrs

Total time = 40 × 3.049 = 121.96 hrs

Time from 31 to 40 units = 121.96 – 100.35 = 21.61 hrs.

Illustration 24

MI Ltd. has earned a net profit of ₹ 15 lakhs after Tax at 30%. Interest cost charged by the financial institutions was ₹ 10 Lakhs. The Invested capital is ₹ 95 Lakhs of which 55% is debt. The company maintains a weighted average cost of capital of 13%.

(i) Compute the Operating Income.

(ii) Compute the Economic Value Added.

(iii) The company has 6 lakhs equity shares outstanding. How much dividend can the company pay before the value of the entity starts declining?

Solution:

Taxable Income = ₹15 lakhs ÷ (1- 0.30)

= ₹21,42,857 or ₹21.43 lakhs

(i) Operating Income = Taxable Income + Interest= ₹21,42,857 + ₹10,00,000 = ₹31,42,857 or ₹31.43 lakhs

(ii) EVA = EBIT (1 - Tax Rate) – WACC × Invested Capital = ₹31,42,857 (1 – 0.30) – 13% × ₹ 95,00,000

= ₹ 22,00,000 – ₹12,35,000 = ₹9,65,000

(iii) EVA Dividend = ₹9,65,000 ÷ 6,00,000 = ₹1.6083

Illustration 25

Division X of ABB Company currently has capital employed of ₹1,00,000 and earns an annual profit after depreciation of ₹18,000. You as a divisional manager is considering an investment of ₹10,000 in an asset which will have a 10 years life with no residual value and will earn a constant annual profit after depreciation of ₹1,600. The cost of capital is 15%.

President of the Company has asked you to evaluate the above, for necessary evaluation of the investment, so that he can approve the same.

Solution:

The evaluation process should consider the following important points and necessary calculation:

(1) The return on divisional investment, before and after the new investment

(2) The divisional residual income before and after the new investment

The residual income (RI) for a division is calculated by deducting from the divisional profit an imputed interest charge, based on the investment in the division.

The return on investment (ROI) is the divisional profit expressed as a percentage of the investment in the division.

Both methods use the same basic figure for profit and investment, but residual income produces an absolute measure whereas the return on investment is expressed as a percentage.

Both methods suffer from disadvantages in measuring the profit and the investment in a division which include the following.

(i) Assets must be valued consistently at historical cost or at replacement cost. Neither valuation basis is ideal.

(ii) Divisions might use different bases to value inventory and to calculate depreciation.

(iii) Any charges made for the use of head office services or allocations of head office assets to divisions are likely to be arbitrary.

In addition, return on investment suffers from the following disadvantages.

(i) Rigid adherence to the need to maintain ROI in the short term can discourage managers from investing in new assets, since average divisional ROI tends to fall in the early stages of a new investment. Residual income can overcome this problem by highlighting projects which return more than the cost of capital.

(ii) It can be difficult to compare the percentage ROI results of divisions if their activities are very different: residual income can overcome this problem through the use of different interest rates for different divisions.

(1) Return on Divisional Investment (ROI)

	Before investment	After investment
Divisional profit	₹ 18,000	₹ 19,600
Divisional investment	₹ 1,00,000	₹ 1,10,000
Divisional ROI	18.0%	17.8%

The ROI will fall in the short term if the new investment is undertaken. This is a problem which often arises with ROI.

(2) Divisional Residual Income

	Before investment	After investment
Divisional profit	₹18,000	₹19,600
Less imputed interest:		
₹1,00,000 × 15%	₹ 15,000	-
₹1,10,000 × 15%	-	₹ 16,500
Residual income	₹3,000	₹3,100

The residual income will increase if the new investment is undertaken. The use of residual income has highlighted the fact that the new project returns more than the cost of capital (16% compared with 15%).

EXERCISE

Theoretical Questions

Multiple Choice Questions

1. A company has two divisions. The divisions are identical in terms of the number and type of machines they have and the operations they carry out. However, one division was set up four years ago and the other was set up one year ago. Head office appraises the division using both return on the investment (ROI) and residual income (RI).

   Which of the following statements is correct in relation to the outcome of the appraisal for each division?

   A. Both ROI and RI will favour the older division

   B. ROI will favour the older division, but RI will treat each fairly

   C. RI will favour the newer division and ROI will favour the older division

   D. Both RI and ROI will favour the newer division

2. Residual income is a better measure for performance evaluation of an investment center manager than return on investment because:

   A. The problems associated with measuring the assets base are eliminated.

   B. Desirable investment decisions will not be rejected by divisions that already have a high ROI.

   C. Only the gross book value of assets needs to be calculated.

   D. Returns do not increase as assets are depreciated.

3. A company that is seeking to increase ROI should attempt to decrease:

   A. Sales.

   B. Turnover.

   C. Margin.

   D. Average operating assets.

4. Which of the following would be considered an operating asset in return on investment computations?

   A. Land being held for plant expansion.

   B. Treasury stock.

   C. Accounts receivable.

   D. Common stock.

5. Which of the following would be an argument for the use of net book value in the computation of operating assets in return on investment calculations?

   A. It allows the manager to replace old, worn- out equipment with a minimum adverse impact on ROI.

   B. It allows ROI to decrease over time as assets get older.

   C. It is consistent with how plant and equipment items are reported on the balance sheet.

   D. It eliminates both age of equipment and method of depreciation as factors in ROI computations.

6. According to Kaplan and Norton, what should be the main perspective of the balanced scorecard?

   A. Financial.

   B. Customer.

   C. Internal business process.

   D. Learning and growth.

7. According to Norton and Kaplan, the balanced scorecard should be used as

   A. A control system.

   B. A diagnostic system.

   C. A strategic system.

   D. A and B.

8. The various stakeholders include vendors, employees, distributors, customers, stockholders and society. According to Norton and Kaplan, which of these should be represented on the balanced scorecard?

   A. All stakeholders are important and should be included.

   B. All except society which is too general to be included.

   C. Only employees, customers and stockholders.

   D. Only those are vital for achieving the company's strategy.

9. Norton and Kaplan recommend that a separate balanced scorecard be developed for

   A. Each department within the company.

   B. Each product line within the company.

   C. Each division or business unit with the company.

   D. The whole company.

10. Norton and Kaplan argue that balanced scorecard measurements should

    A. Clearly indicates the person responsible.

    B. Be linked.

    C. Be reinforcing.

    D. Both B. and C.

11. Advocates of which of the following theories would be the most likely to criticize the balanced scorecard concept?

    A. Japanese management theory.

    B. Deming's theory of management.

    C. JIT management theory.

    D. Goldratt's theory of constraints.

12. In the Balanced Scorecard, Kaplan and Norton describe four perspectives that need to be balanced for companies to become and remain competitive. Which perspective places more emphasis on investing in employees?

    A. Financial.

    B. Customer.

    C. Internal business processes.

    D. Learning & growth.

13. According to Kaplan & Norton, which of the balanced scorecard perspectives is first in the chain of cause and effect relationships?

    A. Financial.

    B. Customer.

    C. Internal business processes.

    D. Learning & growth.

14. According to Kaplan & Norton, which of the balanced scorecard perspectives serves as the focus of the other perspectives?

    A. Financial.

    B. Customer.

    C. Internal business processes.

    D. Learning & growth.

15. Which of the following is not one of the main parts of the Kaplan-Norton balanced scorecard concept? Balancing:

    A. Financial and non-financial measurements.

    B. Cash flows and non-cash flows.

    C. Short term and long term measurements.

    D. Leading and lagging indicators.

Answers:

1- A, 2-B, 3-D, 4-C, 5-C, 6- A, 7- C, 8- D, 9- C, 10- D, 11- D, 12- D, 13- D, 14- A, 15-B.

State True or False

1. The target return makes no allowance for the different risk of each investment centre.
2. To overcome some of the dysfunctional consequences of ROI, the residual income approach can be used.
3. RI = Divisional profit — (Percent capital charge × Divisional investment)
4. In a market-driven economy many Companies cannot create wealth.
5. EVA was developed by the US consulting firm Stern Stewart & Co
6. Economic value (or 'shareholder value') is defined as 'the present value of the future cash flows of a company, of a particular project or decision'.

7. Positive EVA indicates that a company surpassed the expectations of its shareholders.
8. NOPAT is net operating profit after tax
9. Cost of debt after tax = Cost of debt before tax × (100 − marginal tax rate).
10. Responsibility accounting segregates costs and revenues into areas of responsibility, and a specific manager is made responsible for each area.

Answers:

1- True, 2- True, 3- True, 4- False, 5- True, 6- True, 7- True, 8-True, 9- True, 10-True.

Fill in the Blanks

1. When an organization has a ……. structure, top management retains the majority of decision-making authority.
2. A ……. company sets up responsibility centers.
3. Most businesses are somewhere along the……
4. An……. is a group of people with a common purpose.
5. …… means decisions are made at divisional and departmental levels.
6. The ……. is an extended return on equity model, determined by multiplying the net profit margin with the asset turnover and the equity multiplier.
7. ……. is the use of debt to acquire additional assets or fund projects.
8. ……ignores the cost of equity capital.
9. ……is a form of ROCE.
10. ……. are appraised by discounted cash flow (DCF)
11 An ..... has control over both profits and investment.
12 Decentralization is the delegation of ..... to individual divisions of an organization.
13 Operating income divided by sales is referred to as.....
14 "Turnover .....is divided by .....
15 Return on investment (ROI) can be expressed as a product of two factors ..... and ..... This breakdown is often called the .....formula.
16. ..... less a minimum rate of return on operating assets is referred to as residual income (RI).
17. ..... encourages investment in projects that would otherwise be rejected under .....
18. In choosing an appropriate transfer price, the three problems of ....., and ..... must be considered simultaneously.

Answers:

1- Centralized., 2- Decentralized, 3- Continuum, 4- Organization, 5- Decentralization, 6- DuPont analysis, 7- Financial leverage, 8- Profit, 9- Return on investment (ROI), 10- Investments, 11- Investment center, 12- Decision making, 13- Margin, 14- Sales, Operating assets, 15- Margin, Turnover, Du Pont, 16 - Operating income, 17- Return on investment, Residual income, 18- Goal congruence, Performance evaluation, Autonomy.

Short Essay Type Questions

1. What is the meaning of performance measurement?
2. Explain traditional performance measurement techniques.
3. What are the shortcomings of traditional performance measures?
4. Describe the scope of the return on investment control.
5. Discuss the following perspectives of a balanced scorecard:
   (a) Financial
   (b) Customer
   (c) Internal business process
   (d) Learning and growth.
6. How is performance measures weighted?
7. In what way customer perspective is important in balanced scorecard?
8. Explain the prerequisites for adopting balanced scorecard in an organization.
9. Discuss the precautions to be taken in implementing balanced scorecards.
10. What is decentralization? What are the advantages of decentralization?

Essay Type Questions

1. Define balanced scorecard. Explain characteristics of a good balanced scorecard.
2. List the components of ROI equation, tell how they are related and identify an action a manager can take regarding each component to improve ROI.
3. Profit, Return on Investment and Residual Income have stood the test of time and are widely used for measuring the performance of a division. Describe the strengths and weaknesses of these measures of performance.
4. "The ROI measure may be based in favour of divisions with older plant and equipment."
5. Explain the importance of learning and growth perspective.
6. Give some suggestions to be followed while using balanced scorecard.
7. Are financial measures alone sufficient to measure the performance of an organization during a period and to use as a basis for compensating the senior executives of an organization? Why or why not?
8. What problems arise, if any, from monitoring and rewarding senior executives by a combination of financial and non-financial measures?
9. What is strategic measurement model? Explain the important components of a strategic measurement model.
10. Describe and compare the main performance measures that have been suggested to measure the divisional performance.

Practical Problems

⊙ Multiple Choice Questions

1. At the end of 20X1, an investment centre has net assets of ₹1m and annual operating profits of ₹ 1,90,000. However, the bookkeeper forgot to account for the following:

   A machine with a net book value of ₹40,000 was sold at the start of the year for ₹50,000 and replaced with a machine costing ₹ 2,50,000.

   Both the purchase and sale are cash transactions. No depreciation is charged in the year of purchase or disposal. The investment centre calculates return on investment (ROI) based on closing net assets.

   Assuming no other changes to profit or net assets, what is the return on investment (ROI) for the year?

   A 18·8%

   B 19·8%

   C 15·1%

   D 15·9%

2. A division is considering investing in capital equipment costing ₹ 2.7m. The useful economic life of the equipment is expected to be 50 years, with no resale value at the end of the period. The forecast return on the initial investment is 15% per annum before depreciation. The division's cost of capital is 7%.

   What is the expected annual residual income of the initial investment?

   A. ₹ 0

   B. (₹ 2,70,000)

   C. ₹ 1,62,000

   D. ₹ 2,16,000

3. The following ratios have been calculated for a company:

Gross profit margin	42%
Operating profit margin	28%
Gearing (debt/equity)	40%
Asset turnover	65%

   What is the return on capital employed for the company?

   A. 27·3%

   B. 18·2%

   C. 11·2%

   D. 16·8%

4. At the start of the year, a division has non-current assets of ₹ 4 million and makes no additions or disposals during the year. Depreciation is charged at a rate of 10% per annum on all non-current assets held at the end of the year. Working capital is ₹ 0.5 million at the start of the year although this is expected to increase by 20% by the end of the year. The budgeted profit of the division after depreciation is ₹1·2m.

   What is the expected ROI of the division for the year, based on average capital employed?

   A. 27·59%

   B. 26·37%

   C. 18·39%

   D. 31·58%

Answers:

1- B, 2-C, 3-B, 4-A.

Comprehensive Numerical Questions

1. The cost accountant for Ray Lighting Manufacturing Company is planning production costs for a new lamp. Production of the new lamp will be subject to a 60% learning curve since it involves only minimal adjustments to established processes. The initial lot of 500 lamps is expected to require 1,000 hours of labour. Costs are as follows:

   Direct Labour ₹20/hour

   Direct Materials ₹150/lot of 500

   Variable OH Applied ₹25/Direct labour hour

   What is the estimated cumulative average time per unit after 8 lots have been manufactured, if the cumulative average-time learning model is used?

2. A company which has developed a new machine has observed that the time taken to manufacture the first machine is 600 hours.

   Required

   Calculate the time which the company will take to manufacture the second machine if the actual learning curve rate is (i) 80% and (ii) 90%. Explain which of the two learning rates will show faster learning.

3. The Chief Engineer of a manufacturing plant, manufacturing parts for aircraft observed that workers performing manufacturing operations at the plant showed signs of a definite learning pattern.

   He noted that most aircraft manufacturing tasks experienced what he called a 80 percent learning rate, meaning that workers need 20 percent fewer hours to make a part each time their cumulative experience making that part doubled. Thus, if the first part took 100 minutes, the second would require 80 minutes, the fourth would require 64 minutes, and so on.

   Required

   Calculate the time required for parts 41 to 60.

   [Note: learning coefficient is -0.322 for learning rate of 80%, log2=0.30103, log3=0.47712, log5=0.69897, Antilog of 1.484 =30.48, Antilog of 1.4274 =26.75]

4. A Company makes gift items. A customer wants 4 identical pieces of gifts items. For this product, the Company estimates the following costs for the 1st unit of the product:

   Variable Costs (other than labour) ₹ 2,000

   Direct Labour (20 hours @ ₹ 50 hour) ₹ 1,000

   90 % learning curve ratio is applicable and one labourer works for one customer's order.

   (i) What is the price per piece to be quoted for this customer if the targeted contribution is ₹ 1,500 per unit?

(ii) If 4 different labourers made the 4 products simultaneously to ensure faster delivery to the customer, can the price at (i) above be quoted? Why?

5. A company has 10 direct workers, who work for 25 day a month of 8 hours per day. The estimated down time is 25% of the total available time. The company received on order for new product. The first unit of the new product required 40 direct labour hours to manufacture the product. The company expects 80% (index is – 0.322) learning curve for this type of work.

   The company uses standard absorption costing and the cost data on a under:

   Direct Materials ₹60 per unit

   Direct Labour ₹6 per direct labour hour

   Variable Overheads ₹1 per direct labour hour

   Fixed Overheads ₹7,500 per month

   (i) Calculate the cost per unit of the first order of 30 units.

   (ii) If the company receives a repeat order for 20 units, what price will be quoted to yield a profit of 25% on selling price?

6. SBI considers acquiring new computer equipment. The computer will cost ₹1,60,000 and result in a cash savings of ₹ 70,000 per year (excluding depreciation) for each of the five years of the asset's life. It will have no salvage value after five years. Assume straight-line depreciation (depreciation expensed evenly over the life of the asset). The company's tax rate is 15 per cent, and there are no current liabilities associated with this investment.

   (a) What is the ROI for each year of the asset's life if the division uses beginning-of-year net book value asset balances for the computation?

   (b) What is the economic value added each year if the weighted-average cost of capital is 25 per cent?

7. The following information relates to the operating performance of two divisions of SAIL, for last year:

	Bokaro Division (₹)	Durgapur Division (₹)
Operating Profit	8,00,000	12,00,000
Total Assets (based acquisition cost)	40,00,000	75,00,000
Total Assets (based on current replacement costs)	60,00,000	80,00,000

   (a) Compute the return on investment (ROI) of each division, using total assets stated at acquisition cost as the investment base.

   (b) Compute the ROI of each division, using total assets based on current replacement cost as the investment base.

   (c) Which of the two measures do you think gives the better indication of operating performance?

8. Calculate EVA with the help of following data:

   Financial Leverage: 1.4 times

   Capital Structure: Equity Capital ₹170 Lakhs

   Reserves and Surplus ₹130 Lakhs

   10% Debentures ₹400 Lakhs

   Cost of Equity: 17.5%

   Income Tax Rate: 30%

9. The following data is available for a concern. Compute EVA.

   Debt Capital 12%: ₹2,000 crores

   Equity Capital: ₹500 crores

   Reserves and Surplus: ₹7,500 crores

   Capital Employed: ₹10,000 crores

   Operating Profit after Tax: ₹2,100 crores

   Risk Free Rate: 9% Beta Factor: 1.05 Market Rate of Return: 19% Market Risk premium: 10% Tax Rate: 30%.

10. The following data is available for a concern. Compute EVA.

    Long Term Debt: ₹400 Lakhs

    Equity Capital: ₹2,000 lakhs

    Reserves and Surplus: ₹4,000 lakhs

    Risk Free Rate: 9%

    Beta Factor: 1.05

    Market Rate of Return: 16%

    Tax Rate: 30%

    Interest: ₹40 Lakhs

    Profit before interest and Tax: ₹2,000 lakhs

⊙ Unsolved Cases

1. Listed below are a number of scorecard measures:

   (a) Number of new customers

   (b) Percentage of customers' complaints resolved with one contact

(c) Unit product cost

(d) Cost per distribution channel

(e) Suggestions per employee

(f) Quality costs

(g) Product functionality ratings (from surveys)

(h) Cycle time for solving a customer problem

(i) Strategic job coverage ratio

(j) On-time delivery percentage

(k) Percentage of revenues from new products

(i) Lead time, product development

Classify each measure according to the following perspective: financial or nonfinancial, subjective or objective, and external or internal. When the perspective is process, identify which type of process: innovation, operations, or post-sales service.

2. Organizations in the public and non-profit sector, such as government agencies and social service entities, have financial systems that budget expenses and monitor and control actual spending. Identify why these organizations should consider developing a balanced scorecard of measurements to monitor and report on their performance. What should be the various perspectives in such a balance scorecard of measurements?

3. Should top managers be responsible for delivering excellent financial performance to shareholders, leaving the details of customer relations, engineering design, and manufacturing operations to the mid-level managers of these various departments? Explain.

4. In the last Corporate Training Programme that you, have attended as a participant, you have heard about certain terms like, EVA, ROI, RI, and DuPont Control etc. Your Divisional Head now wants to hear from you about the related terms that you have learnt in the training. Compare and contrast the use of residual income and return on investment in divisional performance measurement, stating the advantages and disadvantages of each.

Key Terms

Balance Scorecard: The balanced scorecard translates an organization mission and strategy into a set of performance measures that provides the framework for implementing the strategy.

Beta factor: The beta (β) of an investment security (i.e., a stock) is a measurement of its volatility of returns relative to the entire market.

Centralization: It refers to the extent to which authority and decision making lie at the top of a hierarchy

Decentralization: It is referred to as a form of an organizational structure where there is the delegation of authority by the top management to the middle and lower levels of management in an organization

DuPont Analyses: It is a multi-step framework of financial equations that provide insight into business's fundamental performance.

Economic Value Added (EVA): EVA is a value based financial performance measure, an investment decision tool and it is also a performance measure reflecting the absolute amount of shareholder value created.

Financial leverage: Financial leverage is the use of debt to buy more assets. Leverage is employed to increase the return on equity.

Learning Curve: The learning curve theory proposes that a learner's efficiency in a task improves over time the more the learner performs the task.

Net Operating Profit after Tax (NOPAT): It represents a company's theoretical after-tax operating income if it had no debt in its capital structure.

Return on Investment (ROI): Return on investment (ROI), also called rate of return or yield, is a measure of the performance and efficiency of an investment.

Return on Capital Employed (ROCE): The return on capital employed shows how much operating income is generated for each dollar of capital invested.

Residual Income (RI): This measure expresses divisional profit as a percentage of the firm's investment in the division and is similar to the widely accepted 'return on capital employed' measure used in the external analysis and interpretation of accounts.

SECTION - G

RESPONSIBILITY ACCOUNTING

Responsibility Accounting 9

This Module includes -

9.1 Concept of Cost, Revenue, Profit and Responsibility Centres

9.2 Preparation of Responsibility Report

Responsibility Accounting

SLOB Mapped against the Module

To gather in-depth knowledge of techniques and tools for profit planning, variance analyses, optimal utilization of resources and responsibility accounting. (CMLO 3b, 5a, 5b).

Module Learning Objectives:

After studying this module, this module will be able to

- Appreciate the nuances of responsibility accounting.
- Understand the various responsibility accounting centres within an entity.
- Cognize the contents of a responsibility report and the presentation of the report.

Concept of Cost, Revenue, Profit and Responsibility Centres

9.1

Introduction

A responsibility accounting system facilitates decentralization by providing information about the performance, efficiency, and effectiveness of organizational subunits and their managers. Responsibility accounting is the key management control tool in a decentralized organization.

The term 'responsibility accounting' refers to the accounting process that reports how well managers (of responsibility centres) have fulfilled their responsibility. It is a system that measures the plans (by budgets) and actions (by actual results) of each responsibility centre. Also known as activity or profitability accounting, it is an information system that personalizes control reports by accumulating and reporting cost and revenue information according to defined responsibility centres within a company. Responsibility accounting systems are tailored to the organizational structure so that revenue and costs are accumulated and reported by centres of responsibility within the organization.

Responsibility accounting is the system for collecting and reporting revenue and cost information by areas of responsibility. It operates on the premise that managers should be held responsible for their performance, the performance of their subordinates, and all activities within their responsibility center. Responsibility accounting, also called profitability accounting and activity accounting

A responsibility accounting system produces responsibility reports that assist each successively higher level of management in evaluating the performances of subordinate managers and their respective organizational units. The reports should be tailored to fit the planning, controlling, and decision-making needs of subordinate managers and should include both monetary and nonmonetary information.

In the past, the major emphasis in organizational planning was on optimizing economic resources to achieve company objectives. However, in recent years the value of human resources has been recognized and become an important consideration in planning. In general, a company is organized along lines of responsibility. The traditional organizational chart, with its pyramid shape, illustrates the lines of responsibility flowing from the CEO down through the vice presidents to middle- and lower-level managers. It indicates, as organizations grow larger, these lines of responsibility become longer and more numerous. The structure becomes cumbersome. Contemporary practice is moving toward a flattened hierarchy. This structure— emphasizing teams—is consistent with decentralization. Organizing divisions as responsibility centers creates the opportunity to control the divisions through the use of responsibility accounting. Revenue center control is achieved by evaluating the efficiency and the effectiveness of divisional managers on the basis of sales revenue.

Organizational planning may thus be defined as "the process of logically grouping activities, delegating authority and responsibility, and establishing working relationships that will enable both the company and the employee to realize their mutual objectives."

Responsibility accounting is the key management control tool in a decentralized organization.

A key task of the management accountant is to create accounting systems that ensure that costs are incurred in accordance with expectations. The best way to do so is through the concept of responsibility accounting, which is the assumption that every cost incurred must be the responsibility of one person somewhere in the company. For example, the cost of rent can be assigned to the person who negotiates and signs the lease, while the cost of an employee's salary is the responsibility of that person's direct manager. This concept also applies to the cost of products, for each component part has a standard cost (as listed in the item master and bill of materials), which it is the responsibility of the purchasing manager to obtain at the correct price. Similarly, scrap costs incurred at a machine are the responsibility of the shift manager.

By using this approach, cost reports can be tailored for each recipient. For example, the manager of a work cell will receive a financial statement that itemizes only the costs incurred by that specific cell, whereas the production manager will receive a different one that itemizes the costs of the entire production department, and the president will receive one that summarizes the results of the entire organization.

As one moves upward through the organizational structure, it is common to find fewer responsibility reports being used. For example, each person in a department may be placed in charge of a separate cost, and so each one receives a report that itemizes his or her performance in controlling that cost. However, when the more complex profit center approach is used, these costs are typically clumped together into the group of costs that can be directly associated with revenues from a specific product or product line, which therefore results in fewer profit centers than cost centers. Then, at the highest level of responsibility center, that of the investment center, one must make investments that may cut across entire product lines, so that the investment center tends to be reported at a minimal level of an entire production facility. Thus, there is a natural consolidation in the number of responsibility reports generated by the accounting department as more complex forms of responsibility reporting are used.

Information for Responsibility Reports

1. **Monetary**

   Monetary responsibility report are as follows

   - Budgeted and actual revenues
   - Budgeted and actual costs (computed on a comparable basis)
   - Variance computations for revenues and costs
   - Asset investment base

2. **Non-monetary**

   - Capacity measures (theoretical and that used to compute predetermined overhead rates)
   - Target rate of earnings on investment base
   - Desired and actual market share
   - Departmental or divisional throughput
   - Number of defects (by product, product line, and supplier)
   - Number of orders backlogged (by date, cost, and selling price)
   - Number of customer complaints (by type and product); method of complaint resolution

- Percentage of orders delivered on time
- Manufacturing (or service) cycle efficiency
- Percentage of reduction of non-value-added time from previous reporting period (broken down by idle time, storage time, move time, and quality control time)
- Number and percentage of employee suggestions considered significant and practical
- Number and percentage of employee suggestions implemented
- Number of unplanned production interruptions
- Number of schedule changes
- Number of engineering change orders; percentage change from previous period
- Number of safety violations; percentage change from previous period
- Number of days of employee absences; percentage change from previous period

The principal approaches to arranging company activities are by (1) function, (2) product, and (3) geographic location.

Manager's responsibility report should reflect his or her degree of influence and should include only the revenues and/or costs under that manager's control. Normally, some of an organizational unit's revenues or costs are not controllable (or are only partially or indirectly controllable) by the unit manager. In such instances, the responsibility accounting report should separately classify all reported monetary information as controllable or non- controllable by the manager. Alternatively, separate reports should be prepared for the organizational unit (showing all monetary amounts) and for the unit manager (showing only those monetary amounts under his or her control).

A responsibility accounting system helps organizational unit managers to conduct the five basic control functions:

1. Preparing a plan (e.g., using budgets and standards) and use it to communicate output expectations and delegate authority.
2. Gathering actual data classified in accordance with the activities and categories specified in the plan. Th e responsibility accounting system can be used to record and summarize data for each organizational unit.
3. Monitoring the differences between planned and actual data at scheduled intervals.

   Responsibility reports for subordinate managers and their immediate supervisors normally include comparisons of actual results with flexible budget figures. In contrast, responsibility reports can provide comparisons of actual performance to the master budget.
4. Exerting managerial influence in response to significant differences. Because of day-to-day contact with operations, unit managers should be aware of any significant variances before they are reported, identify the variance causes, and attempt to correct them. Top management, on the other hand, might not know about operational variances until it receives responsibility reports. By the time top management receives the reports, the problems causing the variances should have been corrected, or subordinate managers should have explanations as to why the problems were not or could not be resolved.
5. Continuing comparing data and responding; then, at the appropriate time, the process will begin again.

Responsibility reports reflect the upward flow of information from operational units to company top management

and illustrate the broadening scope of responsibility. Managers receive detailed information on the performance of their immediate areas of control and summary information on all organizational units for which they are responsible. Summarizing results causes a pyramiding of information. Reports at the lowest-level units are highly detailed, whereas more general information is reported to the top of the organization.

Upper-level managers desiring more detail than is provided in summary reports can obtain it by reviewing the responsibility reports prepared by their subordinates.

Each area's budget is presented for comparative purposes. Production department data are aggregated with data of the other departments under the production vice president's control.

Variances are itemized in performance reports at the lower levels so that the appropriate manager has the necessary details to take any required corrective action related to significant variances. Under the management-by-exception principle, major deviations from expectations are highlighted under the subordinate manager's reporting section to assist upper-level managers in determining whether they need to become involved in subordinates' operations. In addition, such detailed variance analyses alert operating managers to items that require explanations for superiors.

Responsibility accounting creates some managerial issues. For instance, the "rolling up" (or aggregating) of information to each successively higher level allows potentially important details to be buried. If different units within the responsibility accounting system compete with each other for resources, managers could try to "promote their own agendas" by blaming other organizational units for problems. Alternatively, the competition could lead to a lack of goal congruence between or among organizational units. (Goal congruence exists when the personal and organizational goals of decision makers throughout the fi rm are consistent and mutually supportive.) Additionally, by partitioning each responsibility unit as a separate part of the report, interdependencies among units might be obscured.

In the functional approach, company activities and responsibilities are organized according to major functions, such as marketing, manufacturing, and finance. Generally, control for each function resides at the vice-president level. For example, the marketing employees report upward from the lowest operating level to the vice-president of the Marketing Division. An important disadvantage is that key decisions are made at the top and passed downward, which a time-consuming process is often.

Originally, most cost systems were established to determine product costs. The emphasis in responsibility accounting is on who spent the money and why it was spent, rather than on what the expense was. Thus we can define responsibility accounting as "a system designed to accumulate and report costs by individual levels of responsibility, each supervisory area is charged only with the cost for which it is responsible and over which it has control".

Assumptions of Responsibility Accounting

The responsibility accounting system makes the following important assumptions:

1. The areas of responsibility are defined for which managers should be held responsible.
2. Managers are only charged with the items and responsibility over which they can exercise a significant degree of direct control.
3. Managers should actively participate in establishing the goals or budgets against which their performance is measured.
4. Goals defined for each area of responsibility should be attainable with efficient and effective performance.

5. Control (performance) reports should contain significant information related to each area of responsibility.
6. Responsibility centre managers should try to accomplish the budgets and objectives established for their respective areas of responsibility.

The proper focus of a responsibility accounting system is information. The system should identify the individual in the organization who is in the best position to explain each particular event or financial result. The emphasis should be on providing that individual and higher-level managers with information to help them understand the reasons behind the organization's performance. When properly used, a responsibility accounting system does not emphasize blame. If managers feel they are beaten over the head with criticism and rebukes when unfavorable variances occur, they are unlikely to respond in a positive way. Instead, they will tend to undermine the system and view it with skepticism. But when the responsibility accounting system emphasizes its informational role, managers tend to react constructively, and strive for improved performance.

Managerial accountants often use the responsibility accounting system to motivate actions considered desirable by upper-level management. Sometimes the responsibility accounting system can solve behavioural problems as well.

Responsibility accounting is closely related with the goal of controllability. Controllability is the degree of influence that a specific manager has over costs, revenues, or other items in question.

Accordingly, in responsibility accounting, those elements in a certain area of activity are identified which are controllable and then a person is given the responsibility for managing such elements.

Responsibility accounting implies that individuals in an organization cannot be responsible for those items which they cannot control. They should also not claim any authority over those revenues which are not the result of their actions and performances. For instance, a foreman in a production department can be held responsible only for direct material and direct labour costs, because these are the costs which are controllable by him. On the other hand, divisional manager of the production division can be held accountable for all direct and indirect costs incurred in his division. Generally, those decisions makers who are placed higher in the authority hierarchy are held responsible for a greater number of activities and financial elements. In the long run, however, all costs are controllable by someone in the organization.

According to Horngreen, Datar and Foster, "Managers should avoid overemphasizing controllability. Responsibility accounting is more far-reaching.

It focuses on information and knowledge, not control. The key question is, who is the best informed? Put another way, who is the person who can tell us the most about the specific item in question regardless of that person's ability to exert personal control? For instance, purchasing managers may be held accountable for total purchase costs, not because of their ability to affect market prices, but because of their ability to predict uncontrollable prices and explain uncontrollable price changes— performance reports for responsibility centres also may include uncontrollable items because this approach could change behaviour in the direction top management desires. A cost centre manager may emphasize production efficiency and deemphasize the pleas of sales personnel for faster service and rush orders. In a profit centre, the manager is responsible for both costs and revenues. Thus, even though the manager still has no control over sales personnel, the manager will now more likely weigh the impact of his or her decisions on costs and revenues, rather than solely on costs."

Advantages of Responsibility Accounting:

1. It facilitates delegation of decision making.
2. It helps management promote the concept of management by objective. In management by objective,

managers agree on a set of goals. The manager's performance is then evaluated based on his or her attainment of these goals.

3. It provides a guide to the evaluation of performance and helps to establish standards of performance which are then used for comparison purposes.
4. It permits effective use of the concept of management by exception, which means that the manager' attention is concentrated on the important deviations from standards and budgets.

There should be a direct relationship between responsibility and authority. If an individual is answerable for his or her actions (responsible), that individual must have the authority to carry out actions and execute decisions. There is an undermining of a person's performance and incentive when authority is not given while the person is still held accountable.

There must be a clear chain of command. Individuals must know to whom they are responsible and for what tasks or jobs they are responsible. Ideally, each individual in the organization should have only one boss. If an individual has more than one boss, the tasks for which the individual is responsible to each boss should be defined.

Responsibility Centre

A responsibility centre may be defined as an area of responsibility which is controlled by an individual. A responsibility centre is an activity such as department over which a manager exercises responsibility. Responsibility areas may be departments (drilling or maintenance department), product lines (chemicals or fertilizers), territories (North or South) or any other type of identifiable unit or combination of units.

The specific types of responsibility areas depend on the nature of the firm and its activities. A plant manager is in charge of a plant and is usually responsible for producing budgeted quantities of specific products within budgeted cost limits. A sales manager is responsible for getting orders from customers, and so on. In most cases, it is relatively easy to identify activities with specific managers. However, in some cases it is not a simple task to isolate the responsibilities of managers.

It should be noted that effective planning and control systems are structured around the implicit or explicit areas of responsibility within the organization. Further, to be held accountable for performance, managers must have clearly defined areas of responsibility—activities they control.

When an entity is divided into segments with managers having responsibility over specific areas, the segmented areas are known as responsibility centers. Four types of responsibility centers are commonly identified:

1. Cost or Expense Center,
2. Profit Center or Earnings Center, and
3. Revenue Center
4. Investment Center.

1. Cost or Expense Center

The most elementary form of responsibility center is the cost center, which itemizes all of the expenses incurred to run a specified function, but ignores the cost of capital invested in it, as well as any associated revenues. The primary form of control in a cost center is against a fixed or semi variable budget that is determined at the beginning of the year. It is not common to see a variable budget being used in a cost center, since purely variable costs tend to be most closely associated with production, for which there are associated sales; this relationship

means that variable budget costs are more commonly found in profit centers than in cost centers. Though this is a good start for a company that wants to implement controls over its expenditures, it suffers from one main flaw—those responsible for cost centers are concerned only with the tight control of costs, rather than other key company goals, such as customer service, creating new products, or acquiring new customers. This can lead to counterproductive behavior. For example, the manager of the computer services department, which is operated as a cost center, is determined to avoid any cost overruns. The sales manager, who is trying to increase profits, asks that a customized report be created that lists the margins for each existing customer, so that the sales team will know which customers are the best ones to sell to. However, the computer services manager refuses this request, for it will result in extra costs that will exceed his budget. This problem occurs regularly when a company is structured into many cost centers, each of which looks out for its own self-interest.

A cost center is an organizational unit whose manager has the authority only to incur costs and is specifically evaluated on the basis of how well costs are controlled. Cost centers commonly include service and administrative departments. For example, a company's human resources and accounting departments could be considered cost centers because these units do not generate revenues or charge for services, but they do incur costs.

In the traditional manufacturing environment, the production department is the largest cost center. Managers of cost centers often concentrate only on the unfavorable standard cost variances and ignore the efficient performance indicated by favorable variances. However, significant favorable variances should not be disregarded if the management-by-exception principle is applied properly. Using this principle, top management should investigate all variances (both favorable and unfavorable) that fall outside the range of acceptable deviations.

This is a segment of the organization that has been assigned control over only the incurrence of expenses or costs. A cost or expense center has no control over sales or marketing activities.

For example, a department within a factory may be considered a cost or expense center if the manager is responsible only for controlling costs and has no responsibility over revenues.

In some instances, a cost center can generate revenues, but the revenues are either not under the manager's control or not effectively measurable. The first situation exists in a community library that is provided a specific proration of property tax but has no authority to levy or collect the related taxes. The second situation exists in cost centers, such as research and development centers, in which the outputs (revenues or benefits generated from the cost inputs) are not easily measured. In these situations, the revenues should not be included in the manager's responsibility accounting report.

2. Profit Center or Earnings Center

A profit center is an organizational unit whose manager is responsible for generating revenues and managing expenses related to current activity. Thus, profit centers should be independent organizational units whose managers have the ability to obtain resources at the most economical prices.

- Sell products at prices that will maximize revenue.
- Have a goal of maximizing the center's profit.

The profit center resolves many of the problems just noted for the cost and revenue center concepts by combining the two. The manager of a profit center is primarily responsible for generating the highest possible profit (or least possible loss). This results in a strong incentive to pursue only those sales that have a sufficient margin, while also incurring expenses only if they will result in an incremental increase in revenue.

Costs not under a profit center manager's control are those related to long-term investments in plant assets; as such, separate evaluations should be made for the subunit and its manager.

The profit center concept is highly recommended, since it results in the strongest possible management attention to profitability. However, there are some cases where it is difficult to convert a cost center to a profit center, because there is no way for it to gain revenues by directly selling its services. Examples of such cost centers are the computer services, engineering, and production departments.

These groups are all involved in the production or support of products, but it can be difficult to attribute sales directly to them. One way around this problem is to have each department charge other departments for its services. A good example is the computer services function, where many organizations create a programming cost per hour that is charged to all other departments that request changes to computer programs; it is also common to charge for the processing time used by each department's programs, as well as the cost of report processing, generation, and distribution.

This segment of the organization is assigned control over both costs and revenues. Net income and contribution margins can therefore be computed for a profit center. For example, an entity that makes wood furniture may cut lumber in one department and assemble the furniture in another department. The first department can be considered a profit center if the cut lumber is "sold" to the second department. The selling price of this internal sale is called the transfer price and may be used as revenue for the first department.

3. Revenue Center

A revenue center is strictly defined as an organizational unit that is responsible for the generation of revenues and has no control over setting selling prices or budgeting costs. For instance, in many retail stores, each sales department is considered an independent unit and managers are evaluated based on their departments' total revenues. Departmental managers, however, might have no authority to adjust selling prices to affect volume, and often they do not participate in the budgeting process. Additionally, the departmental managers might have no ability to affect costs.

A revenue center is one where the employees located in a specific functional area are solely responsible for attaining preset revenue levels. The sales department is sometimes considered to be a revenue center. In this capacity, employees are essentially encouraged to obtain new sales without regard to the cost of obtaining them. This can be a dangerous way to run a function, unless strict guidelines are set up that control the overall spending limits allowed, the size and type of customer solicited, and the size and type of orders obtained. Otherwise, the sales staff will obtain orders from all kinds of customers, including those with poor credit records or histories of returning goods, not to mention orders that are so small that the cost of processing the order exceeds the profit gained from the sale. Other counterproductive activities associated with revenue centers are the inordinate use of travel funds to meet with customers, selling products at large discounts from the standard price, offering special promotional guarantees to customers, allowing credits on previously purchased products if the price subsequently declines, and offering to extend payment terms. For all of these reasons, revenue centers are not recommended without the addition of stringent controls to ensure that the sales staff obtains only revenues that will result in adequate levels of profitability.

In a revenue center, performance evaluations are limited because the manager has control over only one item: revenues. Actual performance in revenue centers (as well as in any other area that has revenue control) should be compared against budgeted performance to determine variances from expectations. Budgeted and actual revenues may differ because of either volume of units sold or price of units sold. To compare budgeted and actual revenues, the price and volume components of revenue must be distinguished from one another. The sales price variance is calculated by multiplying the actual number of units sold by the difference between actual and budgeted sales prices. This variance indicates the portion of the total revenue variance that is related to a change in selling price. The sales volume variance is calculated by multiplying the budgeted sales price by the difference between the actual and budgeted sales volumes.

4. Investment Center

An investment center is an organizational unit whose manager is responsible for managing revenues and current expenses. This center differs from a profit center in that it has control not only over revenues and costs but also over invested funds. If the manager of the lumber-cutting department also had control over how much was invested in the department, this segment would then be considered an investment center. In addition to net income and contribution margin, the return on investment can be computed for investment centers.

A step beyond the profit center in its level of sophistication is the investment center. This is the same as a profit center, but now the responsible manager is also held accountable for any investments in the business. This added responsibility means that one additional measure is added to the normal set of measures used for a profit center: return on investment. This measures the ability of a manager not only to generate a profit, but to also create one at a sufficiently high level to offset the cost of capital on any newly invested funds.

The investment center is particularly appropriate for those cases where investment decisions must be made very rapidly in order to take advantage of changes in local business conditions. This is a particularly important issue for those companies in rapidly expanding markets, or where consumer needs change rapidly, where waiting for investment approval from a central authority may result in lost sales.

In addition, the center's manager has the authority to acquire, use, and dispose of plant assets to earn the highest feasible rate of return on the center's asset base. Many investment centers are independent, free standing divisions or corporate subsidiaries. This independence gives investment center managers the opportunity to make decisions about all matters affecting their organizational units and to be judged on the outcomes of those decisions. Because of their closeness to daily divisional activities, investment center managers should have more current and detailed knowledge than top management has about sales prices, costs, and other market information.

After top management has delegated authority to lower-level responsibility center managers, the possibility exists that those managers will not act harmoniously to accomplish the organization's goals. Rather, each responsibility center manager may act to optimize only his or her own isolated performance and that of his or her responsibility center. Losing sight of the organizational goals while working to achieve an independent responsibility center's conflicting goal results in sub optimization or the pursuit of goals and objectives that are in the interests of individual managers and/or their segments rather than in the company's best interests.

A unique challenge for the design of responsibility centers arises from the instance in which one responsibility center supplies its outputs largely to other internal responsibility centers. In determining the responsibility classification of such an organizational unit, top management often makes judgments about the nature and extent of the costs and revenues to include in those responsibility centers. Frequently, rather than attempting to make performance assessments about cost centers, management assigns the costs incurred in cost centers to operating areas through a process of support department cost allocation. Alternatively, management can attempt to "create" revenues for the cost center by using an internal transfer pricing system for the center's tangible or intangible output that is used by other company units.

Preparation of Responsibility Report

9.2

Responsibility performance reporting implies the reporting phase of responsibility accounting.

Responsibility reporting has two purposes:

(i) To determine the degree of performance in the area of responsibility for which the responsibility manager is directly responsible.

(ii) To formulate measures to improve the performance of the responsibility centre manager.

The responsibility reporting should be suitable and relevant with respect to content, frequency of reporting and level of details required. In order to provide relevant contents in the report, only those items that are controlled by the particular responsibility centre manager should be reported. Frequency of reporting and the quantum of details in the report can be decided in terms of requirements. Generally, in a production department of a manufacturing enterprise, detailed data on production, direct costs, and indirect costs needs to be gathered and reported to foreman quite frequently. However, the same data is reported to senior management in a summarized form and at less frequent intervals. The difference in the frequency of reporting in this situation is due to the fact that the foreman has direct responsibility whereas senior managers have overall responsibility for long-term and strategic decisions. Usry and Hammer have mentioned the following as characteristics of responsibility reporting:

1. Reports should fit the organization chart, that is, the report should be addressed to the individual responsible for the items covered by it, who, in turn, will be able to control those costs under his jurisdiction. Managers must be educated to use the results of the reporting system.
2. Report should be prompt and timely. Prompt issuance of a report requires that cost records be organized so that information is available when it is needed.
3. Reports should be issued with regularity. Promptness and regularity are closely tied up with the mechanical aids used to assemble and issue reports.
4. Reports should be easy to understand. Often they contain accounting terminology that managers with little or no accounting training find difficult to understand, and vital information may be incorrectly communicated. Therefore, accounting terms should be explained or modified to fit the user. Top management should have some knowledge of the kind of items chargeable to an account as well as the methods used to compute overhead rates, make cost allocations and analyze variances.
5. Reports should convey sufficient but not excessive details. The amount and nature of the details depend largely on the management level receiving the report. Reports to management should neither be flooded with immaterial facts nor so condensed that management lacks vital information essential to carrying out its responsibilities.
6. Reports should give comparative figures, i.e., a comparison of actual with budgeted figures or of predetermined standards with actual results and the isolation of variances.

7. Reports should be analytical. Analysis of underlying papers, such as time tickets, scraps tickets, work orders, and materials requisitions, provide reasons for poor performance which might have been due to power failure, machine breakdown, an inefficient operator, poor quality of materials, or many other similar factors.
8. Reports for operating management should, if possible, be stated in physical units as well as in terms of money since monetary information may give a foreman not trained in the language of the accountant a certain amount of difficulty.
9. Reports may tend to highlight departmental efficiencies and inefficiencies, results achieved future goals or targets.

Responsibility reports help each successively higher level of management in evaluating the performances of subordinate managers and their respective organizational units. The reports should be tailored to fit the planning, controlling and decision making needs of subordinate managers and should include both monetary and non-monetary information.

Responsibility Report for Cost Centres

(₹)

General Manager	Actual Cost	Budgeted Cost	Variance
Sales Department	3,65,000	3,75,000	(+)10,000
Production Department	3,75,000	3,75,000	-
Office and Administration	1,10,000	1,15,000	(+) 5,000
Interest on loans	20,000	15,000	(-) 5,000
Total	**8,70,000**	**8,80,000**	**(+)10,000**

(₹)

Production Manager	Actual Cost	Budgeted Cost	Variance
Mfg. section	94,000	96,000	(+) 2,000
Testing section	1,20,000	1,21,000	(+) 1,000
Assembly section	1,61,000	1,58,000	(-) 3,000
Total	**3,75,000**	**3,75,000**	-

(₹)

Foreman (Manufacturing Division)	Actual Cost	Budgeted Cost	Variance
Direct materials	50,000	48,400	(–) 1,600
Direct labour	31,000	34,000	(+) 3,000
Indirect labour	12,000	12,000	-
Supplies	1,000	1,600	(+) 600
Total	**94,000**	**96,000**	**(+) 2,000**

Analysis:

It is observed from the above that, each responsibility report contains items and information which are required by the concerned responsibility centre manager and which are within his responsibility area.

Similarly, Responsibility Reports can also be prepared for other centres.

Solved Illustrations & Cases

Illustration 1

The processing department of a large company informs the marketing department that the price of processing 2,00,000 items will be ₹50,00,000. The marketing department submits the material for the item two weeks later than originally planned and tells the processing department that the scheduled date of completion has been advanced two weeks. In order to achieve the new schedule, the processing department incurs an additional production cost of ₹16,00,000.

(i) In an organization using responsibility accounting, where would the additional costs be assigned? Would these costs be considered controllable costs? What effect might this have on future printing orders from the marketing department?

(ii) In an organization that does not use responsibility accounting, where would the various costs be assigned? What effect might this have on future printing orders from the marketing department?

Solution:

(i) In an organization using responsibility accounting, the originally quoted price of ₹ 50,00,000 plus the additional cost of ₹16,00,000 would be assigned to the marketing department. This would be considered a controllable cost. The long-range effect might be that the marketing department will become more cost-conscious and will plan activities better.

(ii) In an organization that does not employ responsibility accounting; the additional production costs most probably would be assigned to the processing department. There would be no motivation by the marketing department to adhere to scheduled dates or to plan processing needs in a better fashion.

Illustration 2

The receipt of raw materials used in the manufacture of products and the shipping of finished goods to customers are under the control of the warehouse supervisor. Approximately 60% of the warehouse supervisor's time is spent on receiving activities and 40% on shipping activities. Separate employees handle the receiving and shipping operations. The labour-related costs for the warehousing function are as follows:

Warehouse supervisor's salary	₹40,000
Receiving clerks' wages	₹75,000
Shipping clerks' wages	₹55,000
Employee benefit costs (30% of wage and salary costs)	₹51,000
	₹2,21,000

The company employs a responsibility accounting system for performance reporting purposes. The costs are classified on the report as period or product costs. You are required to state the total labour-related costs to list on the responsibility accounting performance report as product costs under the control of the warehouse supervisor for the warehousing function.

Solution:

This question focuses on product costs that are under the control of the warehouse supervisor. The supervisor controls both receiving and shipping, but shipping is a selling cost. Thus shipping is a period cost that is expensed in the period in which it is incurred, so shipping costs are not product costs. Therefore, the costs for the shipping

department are not part of the answer, even though they are controllable by the warehouse supervisor. The supervisor's salary is not controlled by the supervisor, so that is not a part of the answer, either. The labour-related product costs that the supervisor can control include only the wages and benefits of the receiving department. The receiving clerks' wages are ₹75,000 and their benefits are 30% of this amount (₹22,500). Therefore, the supervisor controls ₹ 97,500 of costs (₹75,000 + ₹ 22,500).

Illustration 3

The following information for R & Co. for the prior year:

- The company produced 1,000 units and sold 900, both as budgeted.
- There were no beginning or ending work-in-process and no beginning finished goods inventory.
- Budgeted and actual fixed costs were equal, all variable manufacturing costs were affected by production volume only, and all selling variable costs were affected by sales volume only.
- Budgeted per unit revenues and costs were as follows:

Sales price		₹100
Direct materials		₹30
Direct labour		₹20
Other variable manufacturing costs		₹10
Fixed manufacturing costs		₹5
Variable selling costs		₹12
Fixed selling costs (₹3,600 total)	₹4	
Fixed administrative costs (₹1,800 total)	₹2	

Calculate the contribution margin earned by R & Co. for the prior year

Solution:

Contribution margin is calculated as sales revenue minus the variable costs for the units sold. The sales price is ₹100 per unit and the variable costs total ₹72 per unit: Direct Material - ₹30; Direct Labour - ₹20; other variable manufacturing costs - ₹10; Variable selling costs - ₹12. Thus, contribution is ₹28 per unit (₹100 − ₹72). 900 units were sold, giving a contribution margin of ₹ 25,200.

Illustration 4

The Hind Company allocates national magazine advertising cost to territories on the basis of circulation, which is determined by an index that measures relative buying power in the territories. Top management wants to know if this method of allocation gives appropriate cost and benefit figures to make the following decisions:

(a) For deciding whether or not to close an unprofitable territory

(b) For deciding whether or not a territorial manager has obtained sufficient sales volume

(c) For determining how efficiently the territorial manager has operated the territory

(d) For determining whether or not advertising costs are satisfactorily controlled

Solution:

The answers are as follows.

(a) It is not appropriate for deciding to close the territory. Closing the territory will not change the amount of national advertising expenses. For deciding what action to take with respect to the territory, the segment margin (sales less variable expenses less direct territorial fixed expenses) should be compared with the amount of cost that can be saved by closing that territory. This will show whether or not the territory is making a contribution to costs that will continue regardless of the decision.

(b) It may be appropriate for concluding that a territorial manager has obtained sufficient sales volume.

National advertising is one of the general distribution costs to be allocated to territories if there is evidence of cause-and-effect relationships.

(c) The method is not appropriate. A territorial manager should be judged on the basis of expenses that he or she has to control. By its nature, national advertising must be centrally controlled.

(d) It is not appropriate to allocate national advertising costs to territories from a control standpoint. Control can be exercised only over the total expenditure for national advertising and at the source; control is not aided by allocating this total to territories.

The following concepts are highlighted in the contribution approach to cost allocation:

- Contribution margin -Sales less variable costs.
- Contribution controllable by segment managers - Contribution margin less direct fixed costs controllable by segment managers. Direct fixed costs include discretionary fixed costs such as certain advertising, research and development, sales promotion, and engineering.
- Segment margin - Contribution controllable by segment managers less fixed costs controllable by others. Fixed costs controllable by others include such traceable and committed fixed costs as depreciation, property taxes, insurance, and the segment managers' salaries.
- Net income - Segment margin less unallocated common fixed costs.

Illustration 5

You have a client who operates a large retail self-service grocery store that has a full range of departments. Management has encountered difficulty in using accounting data as a basis for making decisions concerning possible changes in departments operated, products, marketing methods, and so forth. List several overhead costs, or costs not applicable to a particular department, and explain how the existence of such costs (sometimes called common costs or joint costs) complicates and limits the use of accounting data in making decisions in such a store.

Solution:

There are many examples of "common" costs to the sales department of a self-service grocery store. Some are rent, supervision, trucking, and advertising.

Common costs are usually apportioned on various arbitrary bases to the sales departments, but for numerous managerial decisions such apportionments produce misleading results. Decisions as to discounting a department, adding a department, enlarging a department, or decreasing a department cannot be made based on the data produced from the apportionments. For example, if a department is discontinued because it appears to be unprofitable, it may be determined that the costs of other departments will increase as a result of having to absorb more of the shared common costs. Thus, the overall operating results will be less favorable if the "unprofitable" department is discontinued.

Illustration 6

The monthly service charge a bank makes on a customer's checking account is based on the cost of handling each account. A customer disagrees with this policy because she cannot see how it is possible to determine the exact cost of handling her account. Do you agree with the customer? Discuss fully the problems involved in determining cost for such a service, including the limitations of the cost figures obtained.

Solution:

This is a problem involving fixed and common costs. Within considerable limits, the cost of operating a bank would not change because of the addition of new accounts or the loss of old ones. The depreciation and other costs associated with the bank building, fixtures and equipment, salaries of officers, and other such items are fixed costs of operation within very wide limits. There would have to be a considerable change in the number of accounts before there would be any noticeable impact on those fixed costs. There is also a question of joint use of facilities among the various phases of bank operations. For example, the vault houses not only the files of commercial accounts, but also the savings account records, collateral on loans, coins and bills, and many other types of property and records. Unless the bank is large and the work highly specialized, a teller will handle a good many types of operations during a working day. A given official may make loans, open new accounts, advice customers as to investments, and so on. It would be extremely difficult to assign many of such operating expenses to any particular type of operation, let alone any account.

The problem of determining a reasonable and useful cost for handling an account involves obtaining data related to costs of functions and number of transactions handled, so that the direct or semi direct costs may be determined. The average labour cost per transaction for tellers and for transit, clearings, and bookkeeping functions can be obtained with considerable accuracy. Then it becomes necessary to allocate costs of all other necessary functions to these and other principal banking operations. Like all allocations of fixed or indirect overhead, the allocations will be arbitrary, but they can be made in a reasonable and logical manner by using appropriate bases.

While the costs obtained from such an accounting procedure may be useful for setting service charges, it must be recognized that they do have one important limitation. They are average costs and not "differential costs." Therefore, they have limited usefulness for certain types of management decisions relating to expansion or contraction of services or changes in operations.

Illustration 7

Consider each of the following scenarios:

(i) Mr. P K. Dhawan, plant manager for the laser printer factory of Bharat Co. brushed his hair back and sighed. December had been a bad month; two machines had broken down, and some direct labourers (all on salary) were idled for part of the month. Materials prices increased, and insurance premiums on the factory increased. No way out of it —costs were going up. He hoped that the marketing VP would be able to push through some price increases, but that really wasn't his department.

(ii) Ms. Sonam Kapoor was delighted to see that her ROI figures had increased for the third straight year. She was sure that her campaign to lower costs and use machinery more efficiently (enabling her factories to sell several older machines) was the reason why she planned to take full credit for the improvements at her semi-annual performance review.

For each of the above independent scenarios, indicate the type of responsibility center involved (cost, revenue, profit, or investment).

Solution:

(i) Cost center — Total cost

(ii) Profit center — Operating Income

Hint: For explanation of the same, please read the relevant portion of the Study Module.

EXERCISE

Theoretical Question

- **Multiple Choice Questions**

1. Which of the following would be the most appropriate measure to monitor the performance of the manager of a profit centre?
   A. Gross profit margin
   B. Revenue minus all costs
   C. Revenue minus controllable costs
   D. Return on capital employed
2. In a responsibility accounting system, managers are accountable for:
   A. Incremental costs.
   B. Product costs but not for period costs.
   C. Costs over which they have control.
   D. Variable costs but not for fixed costs.
3. In designing a responsibility accounting system, one should keep in mind a certain characteristic of each cost. This characteristic is:
   A. The degree of cost controllability by the manager;
   B. How the cost behaves with respect to volume;
   C. The accuracy of cost allocation;
   D. All of the above.
4. Which of the following statements are true about responsibility accounting?
   A. Responsibility accounting results in inter-departmental conflicts
   B. In responsibility center more focus is paid on products, processes or jobs
   C. No focus is paid on controlling costs
   D. None of the above
5. Which concept (or concepts) listed below is (are) consistent with traditional responsibility accounting?
   A. Vertical structure.
   B. Cross functional measurements.
   C. Bottom up control.
   D. A and B.
6. In profit center revenue represents a monetary measure of output emanating from a profit center in a given period irrespective whether
   A. The revenue is realized or not
   B. The output is sold or not
   C. Both A and B
   D. None of the above

7. Which type of responsibility center has the greatest amount of autonomy?
   A. Revenue center.
   B. Cost center.
   C. Profit center.
   D. Investment center.
8. Which of the following is responsibility center?
   A. Expense center
   B. Profit center
   C. Investment center
   D. All of the above
9. The characteristics of a responsibility system for a JIT, or lean organization include
   A. Competition between subsystems.
   B. Independence of subsystems.
   C. Cross functional measurements.
   D. A and B.
10. The responsibility centers, for control purposes, may be classified into _____ types.
   A. Five
   B. Three
   C. Four
   D. None of the above
11. The area of focus on responsibility center is
   A. Quantum of sales
   B. Quantum of production
   C. Optimum utilization of resources
   D. All of the above
12. In responsibility cost accounting the costs in focus are
   A. Controllable costs
   B. Uncontrollable costs
   C. Both A and B
   D. None of the above
13. In responsibility accounting, responsibilities of various groups or individuals are identified in terms of
   A. Work
   B. Revenue
   C. Cost
   D. All of the above

14. Responsibility Accounting is also known as
    A. Profitability accounting
    B. Activity accounting
    C. Both A and B
    D. None of the above
15. Which of the following represent arguments against traditional responsibility accounting?
    A. It tends to promote competition between segments of a company.
    B. It tends to promote subsystem, or local optimization.
    C. It tends to ignore many of the interdependencies within an organization.
    D. All of the above.
16. Which of the following characteristics is not associated with traditional responsibility accounting?
    A. Assumes optimization of the parts will optimize the whole.
    B. Assumes independence of the parts.
    C. Places emphasis on the performance of individuals.
    D. Attempts to control processes.
17. Responsibility Accounting is also known as
    A. Profitability accounting
    B. Activity accounting
    C. Both A and B
    D. None of the above
18. Responsibility Accounting is also called ..... Accounting
    A. Profitability
    B. Management
    C. Authority
    D. None of these
19. Responsibility accounting is used for .....
    A. cost control
    B. planning
    C. decision making
    D. pricing
20. The performance of investment centre is based on .....
    A. Cost of the centre
    B. Profit of the centre
    C. Profit and investment of the centre
    D. Revenue of the centre

21. In responsibility accounting the organization is divided into different ..... centers
    A. Responsibility
    B. Cost
    C. Profit
    D. None of these
22. A cost centre is a segment of the organization where the manager is responsible for .....
    A. Costs
    B. Inputs
    C. A or B
    D. None of these
23. Both costs and revenues are measured in ..... centers
    A. Cost
    B. Profit
    C. Revenue
    D. All of these
24. A centre where the manager is responsible for sales is .....
    A. Cost centre
    B. Revenue centre
    C. Investment centre
    D. Sales Centre
25. The performance of investment centre is based on .....
    A. Cost of the centre
    B. Profit of the centre
    C. Profit and investment of the centre
    D. Revenue of the centre

Answers:

1- C, 2-C, 3-A, 4-A, 5-A, 6- C, 7- D, 8- D, 9- C, 10- B, 11- C, 12- A, 13- D, 14- C, 15-E, 16-D, 17-C, 18-A, 19-A, 20- C, 21- A, 22-C, 23- B, 24-B, 25- C.

⊙ State True or False

1. Responsibility accounting is the system for collecting and reporting revenue and cost information by areas of responsibility
2. A responsibility accounting system produces responsibility reports that assist each successively higher level of management in evaluating the performances of subordinate managers and their respective organizational units.
3. A key task of the management accountant is to create accounting systems that ensure that costs are incurred in accordance with expectations.

4. Responsibility reports for subordinate managers and their immediate supervisors normally include comparisons of actual results with flexible budget figures.
5. In the functional approach, company activities and responsibilities are organized according to major functions, such as marketing, manufacturing, and finance.
6. Goals defined for each area of responsibility should be attainable with efficient and effective performance.
7. Responsibility accounting is more far-reaching.
8. A cost center is an organizational unit whose manager has the authority only to incur costs and is specifically evaluated on the basis of how well costs are controlled
9. A profit center is an organizational unit whose manager is responsible for generating revenues and managing expenses related to current activity.
10. A revenue center is strictly defined as an organizational unit that is responsible for the generation of revenues and has no control over setting selling prices or budgeting costs.

Answers:

1- True, 2- True, 3- True, 4- True, 5- True, 6- True, 7- True, 8-True, 9- True, 10-True.

⊙ **Fill in the Blanks**

1. An ……is an organizational unit whose manager is responsible for managing revenues and current expenses.
2. A unique challenge for the design of ……. arises from the instance in which one responsibility center supplies its outputs largely to other internal responsibility centers
3. ……should be prompt and timely.
4. ……help each successively higher level of management in evaluating the performances of subordinate managers and their respective organisational units.
5. ……. of the production division can be held accountable for all direct and indirect costs incurred in his division.
6. A ……. manager may emphasize production efficiency and deemphasize the pleas of sales personnel for faster service and rush orders.
7. In most cases, it is relatively easy to identify ……...with specific managers.
8. The most elementary form of responsibility center is the …….
9. The ……resolves many of the problems just noted for the cost and revenue center concepts by combining the two.
10. A unique challenge for the design of ……arises from the instance in which one responsibility center supplies its outputs largely to other internal responsibility centers.

Answers:

1- Investment center, 2- Responsibility centers, 3- Report, 4- Responsibility reports, 5- Divisional manager, 6- Cost centre, 7- Activities, 8- Cost center, 9- Profit center, 10- Responsibility centers.

⊙ Short Essay Type Question

1. Differentiate between a cost center and a profit center.
2. What is the major shortcoming of using income from operations as a performance measure for investment centers?
3. Differentiate between a profit center and an investment center.
4. How are revenue variances computed?
5. Why and how are support department costs allocated to operating departments?

⊙ Essay Type Question

1. Why should the factors under the control of the investment center manager (revenues, expenses, and invested assets) be considered in computing the rate of return on investment?
2. The rates of return on investment for ABC Co.'s three divisions, East, Central, and West, are 26%, 20%, and 15%, respectively. In expanding operations, which of ABC Co.'s divisions should be given priority? Explain.
3. Which factors determine whether a firm should be decentralized or centralized?
4. How are decentralization and responsibility accounting related?
5. What are the four primary types of responsibility centers, and what distinguishes them from each other?

Practical Problems

⊙ Multiple Choice Questions

1. There are three departments A, B and C in a company. The sales of A, B and C are ₹ 3,52,000, ₹ 2,88,000 and ₹ 1,60,000, respectively. The variable costs of A, B and C are ₹ 2,40,000, ₹1,76,000 and ₹ 1,44,000 respectively. The direct fixed costs of A, B and C are ₹ 28,000, ₹ 22,400 and ₹12,800. Rank the different departments on basis of relative profitability.

   A. A- Rank 3, B- Rank 1 and C- Rank 2

   B. A- Rank 2, B- Rank 1 and C- Rank 3

   C. A- Rank 3, B- Rank 2 and C- Rank 1

   D. Insufficient data

2. In a company Department A recorded loss in the first half of the current year. The sale of department is ₹ 90,000 and uncontrollable costs are ₹ 91,000, Advice the management whether its operations should be continued or terminated.

   A. Continued

   B. Terminated

   C. Insufficient information

   D. None of the above

3. In a control report of Department X, it is mentioned as indirect materials are ₹1,000, indirect labour ₹900, Overtime Charges ₹100, Depreciation on equipment ₹500, Allocated factory overhead (38% of factory space) ₹4,300, Allocated overhead of repair shop is ₹ 1,200. Determine total costs treating department X as a responsibility center.

   A. ₹ 3,200

   B. ₹ 2,200

   C. ₹ 1,200

   D. None of the above

Answers:

1- A, 2-C, 3-A.

⊙ Comprehensive Numerical Questions

1. The printing department of a large company informs the marketing department that the price of printing 1,00,000 colour flyers will be ₹ 60,00,000. The marketing department submits the material for the flyer two weeks later than originally planned and tells the printing department that the scheduled date of completion has been advanced two weeks. In order to achieve the new schedule, the printing department incurs an additional production cost of ₹15,00,000.

   (1) In an organisation using responsibility accounting, where would the additional costs be assigned? Would these costs be considered controllable costs? What effect might this have on future printing orders from the marketing department?

   (2) In an organisation that does not use responsibility accounting, where would the various costs be assigned? What effect might this have on future printing orders from the marketing department?

2. A merchandising firm sells its goods through department stores and discount houses which it has setup for operating the sales. The ROI of both businesses is 20 per cent and has the following data:

Particulars	Department Stores	Discount Warehouses
	₹	₹
Divisional profit	20,000	32,000
Divisional investment	1,00,000	1,60,000
Divisional sales	2,00,000	4,80,000

   Evaluate the two Divisions.

3. A bank considers acquiring new computer equipment. The computer will cost ₹1,60,000 and result in a cash savings of ₹70,000 per year (excluding depreciation) for each of the five years of the asset's life.

   It will have no salvage value after five years. Assume straight-line depreciation (depreciation expensed evenly over the life of the asset). The company's tax rate is 15 per cent, and there are no current liabilities associated with this investment.

Required:

(a) What is the ROI for each year of the asset's life if the division uses beginning-of-year net book value asset balances for the computation?

(b) What is the economic value added each year if the weighted-average cost of capital is 25 per cent?

4. The following information relates to the operating performance of two divisions of ABC India, for last years:

	X Division	Y Division
Operating Profit	₹ 8,00,000	₹ 12,00,000
Total Assets (acquisition cost)	40,00,000	75,00,000
Total Assets (current replacement costs)	60,00,000	80,00,000

Required:

(a) Compute the return on investment (ROI) of each division, using total assets stated at acquisition cost as the investment base.

(b) Compute the ROI of each division, using total assets based on current replacement cost as the investment base.

(c) Which of the two measures do you think gives the better indication of operating performance?

Explain your reasoning.

5. The income from operations and the amount of invested assets in each division of Devon Industries are as follows:

	Income from Operations	Invested Assets
Goods Division	₹ 80,000	₹ 4,00,000
Health care Division	41,600	2,60,000
Commercial Division	70,000	3,20,000

Required:

(a) Compute the rate of return on investment for each division.

(b) Which division is the most profitable in terms of amount invested?

6. For each of the following service departments, identify an activity base that could be used for charging the expense to the profit centre.

(a) Central purchasing

(b) Legal

(c) Accounts receivable

(d) Duplication services

(e) Electronic data processing

(f) Telecommunications

7. ABC Company has income from operations of ₹ 20,125 invested assets of ₹ 87,500 and sales of ₹1,75,000. Use the DuPont formula to compute return on investment and show

   (a) the profit margin,

   (b) the investment turnover, and

   (c) return on investment.

8. The Commercial Division of Tata Company has income from operations of ₹1,35,000 and assets of ₹6,50,000. The minimum acceptable rate of return on assets is 10%. What is the residual income for the division?

9. LT Company has income from operations of ₹50,000, invested assets of ₹200,000, and sales of ₹5,00,000. Use the DuPont formula to compute the return on investment and show

   (a) the profit margin,

   (b) the investment turnover, and

   (c) return on investment.

10. XYZ Company uses economic value added (EVA) to evaluate top management performance. In 2022, ABC Company had net operating income of ₹54,580 lakhs, income taxes of ₹15,230 lakhs lion, and average noncurrent liabilities plus stockholders' equity of ₹1,55,740 lakhs. The company's capital is about 30% long-term debt and 70% equity. Assume that the after-tax cost of debt is 5% and the cost of equity is 11%.

    Required:

    1. Compute economic value added (EVA).

    2. Explain what EVA tells you about the performance of the top management of XYZ Company in 2022.

⊙ Unsolved Cases

Analyse the following cases and comment:

1. A manager of a fast food restaurant may be held responsible for reporting on variances in the profits of the unit, even though he or she does not have control over either the cost of the food or the price it is sold for. Decisions outside of the manager's control should not be part of the manager's performance evaluation. Even so, the manager can and should still be held responsible for reporting on the results because he or she is in the best position to explain the variances between actual and budgeted items.
2. Assigning some percentage of each operating department's contribution to covering common costs reminds each department that it is a part of a larger organization, and as such it has a responsibility to the larger organization to maintain earnings that are adequate to cover a portion of the firm's indirect costs;

and it formalizes their accountability for doing so.

3. In evaluating segment performance and the segment manager's performance, it is important to distinguish between the performance of the manager and the performance of the segment the manager manages. On a contribution income statement by segment, direct fixed costs controllable by others are the same as non-controllable traceable fixed costs. Costs that are traceable to a segment but controlled by someone other than the segment manager are used in evaluating the performance of the segment, but they should not be used in evaluating the performance of the segment manager.

4. When a company reports operating results according to responsibility center, each responsibility center's report contains a partial balance sheet showing the assets under its control, the liabilities incurred for the purchase of those assets, and an operating income statement showing the responsibility center's revenues and expenses. However, shareholders' equity does not appear on the individual responsibility center balance sheets because equity belongs to the whole corporation. Equity cannot be divided up among responsibility centers, and it cannot be affected by any decision made by any individual responsibility center manager.

   Since no individual responsibility center has any equity on its balance sheet, no individual responsibility center manager has any authority to determine how equity should be raised. Decisions about raising equity to finance capital investments (that is, sale of new common or preferred stock or the use of retained earnings) can be made only by senior management.

   Therefore, the operating decisions made by the individual division managers affect the total assets employed by their divisions, the working capital they have to work with, and the total assets they have available to them (whether the assets are employed or not). The operating decisions made by the individual division managers cannot affect shareholders' equity.

5. Relationship between responsibility accounting and cost control

   There is a direct relationship between responsibility accounting and cost control. Costs are easier to control when a responsibility accounting system is in effect. Department heads know immediately when cost overruns occur and can work quickly to reduce them. Department heads are aware that their supervisors are receiving data on their performance and will make efforts to perform in a more cost-efficient manner.

Key Terms

Cost Center: A cost center is the smallest segment of activity or area of responsibility for which costs are accumulated.

Investment Center: Investment center, like a profit center, is responsible for both revenue and expenses, but also for related investments of capital.

Profit Center: Some business units have control over both costs and revenues and are therefore evaluated on their profit outcomes.

Responsibility Accounting : Responsibility accounting is an underlying concept of accounting performance measurement systems.

Responsibility Center: A responsibility center is an organizational unit headed by a manager, who is responsible for its activities and results.

Revenue Center: Revenue center can be defined as a distinctly identifiable department, division, or unit of a firm that generates revenue through sale of goods and/or services.

Responsibility Reports: The responsibility accounting performance report is a budget that compares actual and budgeted amounts of controllable costs for a department and its manager.

SECTION - H

DECISION THEORY

Decision Theory 10

This Module includes -

10.1 Decision Making under Certainty

10.2 Decisions Making under Risk

10.3 Decision Making under Uncertainty

10.4 Decision Tree

Decision Theory

SLOB Mapped against the Module

To appreciate quantitative tools for decision making in dynamic environment shrouded with risks and uncertainties. (CMLO 2a, 2b).

Module Learning Objectives:

After studying this module, the students will be able to

- Appreciate the decision making process in the context of ever changing business environment.
- Fathom the process of decision making under conditions of certainty, uncertainty and risk.
- Understand the basic aspects of Decision Tree.

Decision Theory

10

Decision making is the most significant aspect of the management process. Efficacy of every aspect of management (planning, organizing, control, etc.) is pivoted on the effectivity of the decision making process. Effective decision making is linked to fulfilment of the objectives of the organization. An elaborately designed decision making process helps to make a more deliberate and effective decision. The steps of the process are discussed below:

Step 1: Identify the decision – it is important to identify the nature of decision that the decision maker is faced with. This paves way for making effective decisions.

Step 2: Gather relevant information - Before decision making, it is important to gather all relevant information. The source of information can be two types,

- Internal source- information available within the organisation.
- External source – information that are available beyond the scope of the organisation.

Step 3: Identify the alternatives – on the basis of the information collected the alternatives are zeroed upon. At this juncture it is important to make a list of all possible alternatives in order to make a correct and effective decision.

Step 4: Consider the evidence - In this step, the decision maker uses his knowledge and emotion to imagine what it would be like if one particular alternative is chosen and carried out. This would have to be thought about for all the possible alternatives. As the decision maker goes through this process (often with subtlety), he starts developing a notion as to which alternative results in the achievement of the organisational goal.

Step 5: Take action - In this step the decision maker is ready to make his call which is decided upon in the previous step.

Step 6: Review of the decision - After the above steps are undertaken and a decision is arrived at, the process of evaluation has to begin where the impact of the decision is considered. If the desired result is not achieved, the whole process has to be revisited.

The theoretical underpinnings of the decision making process is the subject matter of Decision Theory. The following aspects are noteworthy:

- Decision theory involves economic and statistical approaches for studying an individual's choices. Because it is based on ideas, attitudes, and wishes, analysts refer to it as a theory of choice.
- Decision theory enables the entity to make the most rational decision feasible in unknown and uncertain conditions, repercussions, and behaviours.
- In order to make better business decisions, companies worldwide use this theory to understand how customers and markets operate.

- Mathematicians, economists, marketers, data and social scientists, biologists, psychologists, philosophers, and politicians use two theory forms: normative and descriptive[1].

Though decision theory deals with the methods for determining the optimal course of action when a number of alternatives are available, given that the consequences cannot be forecast with certainty[2], for the purpose of this section of the study note, discussion is restricted to problems occurring in business, with consequences that can be described in Rupees of profit or revenue, cost or loss. For these problems, it is reasonable to consider that the best alternative is the one which results in the highest profit or revenue, or lowest cost or loss, on the average, in the long run.

Certainty[3], Uncertainty and Risk

It is obvious from the above discussion that the decision maker has to choose between alternatives. There are several possible alternatives (or outcomes) of an act (choosing between alternatives) which has to be endorsed in favour of, such that the end result, in terms of Rupees, is optimised. This is the fundamental aspect of decision theory. Now, the moot question is whether there is information regarding happening/ not happening of the outcomes. There can be as such two extreme cases; one where there is perfect information of happening/ not happening of the outcome. This is a situation where there is relevant past experience to enable statistical evidence for predicting the possible outcomes. This is the case of decision making under certainty. The other extreme is a situation where there are several possible outcomes, but there is no previous statistical evidence to enable the possible outcomes to be predicted. This is the case of decision making under uncertainty. In this particular situation probabilities cannot be assigned to the various states of nature (condition of happening/not happening of a particular state of the future). Thus there arises a third situation where there is predictability of happening/ not happening of future state of nature (condition of happening/not happening of a particular state of the future). This is the case of decision making under condition of risk. The terms 'risk' and 'uncertainty' are used interchangeably but there is significant difference between the two. A comparison chart is presented in the following lines which helps to understand the basic difference between the two. In making decisions under risk, the decision maker can predict the possibility of a future outcome, but when making decisions under uncertainty, the decision maker cannot. Risks can be managed while uncertainty is uncontrollable. The decision maker can assign a probability to risks events.

BASIS FOR COMPARISON	RISK	UNCERTAINTY
Meaning	The probability of winning or losing something worthy is known as risk.	Uncertainty implies a situation where the future events are not known.
Ascertainment	Measurable	Not Measurable
Outcome	Chances of outcomes are known.	The outcome is unknown.
Control	Controllable	Uncontrollable
Minimization	Yes	No
Probabilities	Assigned	Not assigned

Comparison Chart

[1] This aspect of the study of Decision Theory is beyond the scope of the study note. However, students may refer the website mentioned in parenthesis for in-depth understanding (https://www.wallstreetmojo.com/decision-theory/)

[2] It is important to note that most of the academic discussions on short term decision making (most of which is discoursed in Module 4 of this study note) occurs under conditions of certainty.

[3] It is important to note that the the distinction between risk and uncertainty is not essential for analysis in cost and management accounting and the terms are often used interchangeably in courses on Cost and Management accounting. But the distinction is essential part of Decision Theory as discussed in books on Operations Research. (Please refer Operations Research - An Introduction, Tenth Edition, by Hamdy A. Taha (Chapter 15: Decision Analysis and Games)).

In the following lines the conditions are introduced briefly:

(i) Decision making under conditions of certainty

Decision making is about selecting the best alternative from among an array of alternatives. The 'best' alternative refers to that particular alternative which helps a firm to maximise its profit[4] or minimise its cost. In decision theory, the alternatives are referred as acts and the possible events are referred as states of nature (outcomes of a random process).

The condition of certainty imply that the future is known and thus the probability of happening/ not happening of an event is one. All the models of short term decision making discoursed in Module 4 of this study note are under conditions of certainty[5]. In simple words, the decision-maker is conformed to what will happen when a decision is being made. It is a condition where the future is cent percent definite. This situation is conformed because of the availability of all reliable information. Thus the cause and effect are known with certainty. Due to known conditions, there are no conflicts in decision-making. This condition exists in routine decisions such as day-to-day activities, payment of wages, salaries, etc. Another example is when a person is going to buy a car, he can collect all the relevant information about that car, and he gets confirmed as to what type of car he is buying.

This is erroneous as the terms 'uncertainty' and 'future' are fabricated into each other. It is a well-accepted fact that the future is uncertain. In the ever changing business environment, even in the short term, nothing can be assumed to be cent percent assured, even under conditions of perfect information. As such, the notion of perfect information is also a misnomer.

The entire gamut of short term decision making that operate under conditions of certainty is often referred as the deterministic model. Though there are severe criticism for the models, they exist in the world of academia because of their simplicity and significant contribution to the knowledge base.

(ii) Decision making under condition of uncertainty

Uncertainty lies on the other end of the continuum[6]. In certainty, as discussed in the previous paragraph, the future is known and the decision maker, thus, need not worry about the happening /not happening of a particular state of nature as the future is cent percent assured. Whereas under condition of uncertainty, the future states of nature are unknown. There is no information available on the happening /not happening of the future state of nature. In decision making under uncertainty, the probability distribution associated with the states is either unknown or cannot be determined. This lack of information has led to the development of special decision criteria which would be discussed in brief, in later section of this module.

(iii) Decision making under condition of risk.

The term 'risk' is one of the most discoursed terms in finance literature. Various aspects of financial risk and its management is taken up for discussion in a later paper[7]. In simple terms, risk is a situation, where the decision maker is neither certain nor uncertain about the future states of nature. Thus there is imperfect information about the happening/ not happening of the future events. In mathematical terms, probabilities may be assigned to happening/ not happening of the future events. The probabilities may be either priori probabilities, derived from inherent symmetries, like the throw of a dice (the probability of throwing a four is one –sixth as there is one event favourable and six events that may occur) or statistical probabilities, obtained through analysis of homogenous data (for example, the chance of rain on 16th August 2022 may be assigned by looking into the weather report of last two hundred years. If rain had occurred on 60 days out of 200 days, then it may be said that the probability of rain on 16th August 2022 is 60/200=0.3 and the probability of rain not happing on 16th August 2022 is 0.7).

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4 In corporate finance, maximisation of shareholders' wealth (SWM) is preferred objective of the firm.

5 This is seldom true under conditions of long term where the impact of the uncertain future is obvious.

6 Today, the complex business environment is referred as VUCA environment which is an acronym for (V)Volatility, (U) Uncertainty, (C) Complexity and (A) Ambiguity. It applies to applied to assess the complex environments where tasks may vary and change as fast as the environment around them. Under such conditions the deterministic models (conditions of certainty) losses much of their lustre and decision making under uncertainty is considered as more significant.

7 Students may refer to Module 4 of paper 20A for in-depth knowledge of financial risk and various aspects of financial risk management.

Decision Making under Certainty

10.1

In decision theory, utility matrices are combined with various types of information about states of nature. The decision maker may or may not be able to gather prior information about the states of nature. In cases when only one state of nature is to be considered because of the nature of the problem or because of lack of information[8] are called decision-making under certainty. If the decision maker is certain as regards to the probability of happening/ not happening of an outcome, he is said to operate under condition of certainty. On the contrary, if the decision maker has imperfect information or no information about the happening/ or not happening of an event he is said to operate under conditions of uncertainty or risk. Thus it may be stated that in the realm of decision making, under condition of certainty each action will lead invariably to a specific outcome. In this situation only one state of nature exits and its probability is one. The following illustrates the understanding.

Solved Cases 1

Mr Pratap is considering setting up his stall in the playground in the evening of a particular day, say 20th August 2022. He has the option of selling ice creams or coffee. He has the option of buying Ice creams[9] from a whole seller @ ₹56 each and selling them for @ ₹60 each. Thus he would make a profit of ₹4 on each Ice cream cone. On a sunny day he sales 200 cones, but if it is a rainy day then sales fall and thus he is able to sell only 80 cones. On the contrary, he can sell coffee whereby he can make a profit of ₹6 per cup. On a sunny day he sales 100 cones, but if it is a rainy day then sales increases and thus he is able to sell 160 cups.

This can be represented in the following pay off matrix:

Particulars	States of Nature	
Acts	Sunny Day	Rainy Day
Sale Ice Cream	₹ 800[10]	₹ 320
Sale Coffee	₹ 600	₹ 960

Now, on the morning of 20th August 2022 he wakes up and find that it has been raining from the previous day night and for clarification he calls the met office and they confirm that it would rain for the whole day. Thus he faces a situation of certainty as there is only one state of nature and that is it being a rainy day. Thus his decision whether he would sell Ice cream or Coffee is based on one certain information and thus the above payoff matrix may be reduced to one with a single state of nature (Rainy Day).

[8] This is the case for various deterministic models of decision making like make or buy, shutting down of a product line, replacement of a machinery etc. This are discoursed in details in Module 4 of this study note.

[9] For simplicity it is assumed that only one type of ice creams is bought and sold namely, Strawberry ice creams in cones.

[10] This is calculated as profit per cone of ice cream (₹4) × number of cones sold (200). The other values in the payoff matrix are calculated in the same manner.

Particulars	States of Nature
Acts	Rainy Day
Sale Ice Cream	₹ 320
Sale Coffee	₹ 960

Thus Mr Pratap is better off if he sales Coffee on 20th August 2022, at the playground as the payoff (₹960) from selling coffee is higher than the payoff from selling ice cream. This is particularly because of the fact that it is known with certainty that the 20th August 2022 would be a rainy day.

Decision Matrix

The standard format for the evaluation of alternatives in decision theory is that of a decision matrix. In a decision matrix, the alternatives open to the decision-maker are tabulated against the possible states of nature. The alternatives (acts) are represented by the rows of the matrix, and the states of nature by the columns. The decision matrix is also referred as the payoff matrix when the cell values are presented in terms of net benefit. For the purpose of understanding a payoff table, or decision matrix, is shown below. The decision will be made among m of alternatives, identified as A_1, A_2, A_3…… A_m There may be more than one future "state of nature" N. The model considered here allows for n different futures. These future states of nature may not be equally likely, but each state will have some (known or unknown) probability of occurrence Since the future must take on one of the n values of the sum of the n values of must be 1.0. The outcome (or payoff, or benefit gained) will depend on both the alternative chosen and the future state of nature that occurs. For example, if the alternative A_i is chosen and state of nature N_j takes place (as it will with probability p_j), the payoff will be outcome O_{ij} A full payoff table will contain m times n possible outcomes.

Table: Decision Matrix

Alternative	States of Nature/Probability					
	N_1	N_2	-----	N_i	-----	N_n
	P_1	P_2	-----	P_i	-----	P_n
A_1	O_{11}	O_{12}	-----	O_{1j}	-----	O_{1n}
A_2	O_{21}	O_{22}	-----	O_{2j}	-----	O_{2n}
-----	-----	-----	-----	-----	-----	-----
A_i	O_{il}	O_{i2}	-----	O_{ij}	-----	O_{in}
-----	-----	-----	-----	-----	-----	-----
A_m	O_{ml}	O_{m2}	-----	O_{mj}	-----	O_{mn}

Under condition of certainty there would be only one state of nature as the future is known with certainty. Thus the decision matrix or payoff matrix would be as given below.

Pay off Matrix (under condition of certainty)

Alternative	State of nature ($p_i = 1$)
A_1	O_1
A_2	O_1
A_3	O_1
A_4	O_1
A_m	O_m

Decisions Making under Risk

10.2

In finance literature, there are various connotation of the term 'Risk'. The most frequently used has a negative, 'a condition in which there is a possibility of an adverse deviation from a desired outcome'.

In a risky environment, the decision maker operates under condition of imperfect information. A manager may understand the problem and the alternatives, but has no guarantee how each solution will work. This is a fairly common condition under which the decision maker operates.

When new and unfamiliar problems arise, non- programmed decisions are specifically tailored to the situations at hand. The information requirements for defining and resolving non-routine problems are typically high. Although computer support may assist in information processing, the decision will most likely involve human judgment. Most problems faced by higher-level manager's demand non-programmed decisions. This fact explains why the demands on a manager's conceptual skills increase as he or she moves into higher levels of managerial responsibility.

When a manager lacks perfect information risk arises. Under a state of risk, the decision maker has incomplete information about available alternatives but has a good idea of the probability of outcomes for each alternative. While making decisions under a state of risk, managers must determine the probability associated with each alternative on the basis of the available information and his experience.

In decision theory, under risk the decision maker assumes that there exist a number of possible future states of nature as is presented in the previous table. Each has a known (or assumed) probability of occurring, and there may not be one future state that results in the best outcome for all alternatives Examples of future states and their probabilities are as follows:

- Weather will affect the profitability of alternative construction schedules. In this case the probabilities of rain and of good weather can be estimated from historical data.
- Alternative economic futures (boom or bust) determine the relative profitability of conservative versus high-risk investment strategy. In this case the assumed probabilities of different economic futures might be based on the judgment of the experts.

Probabilities

Probabilities are mathematical expression which is used to denote the likelihood that an event or state of nature will occur. It is expressed in decimal and varies between 0 and 1. When the probability of occurrence of an event is 0, it denotes nil likelihood of occurrence whereas a value of 1 signifies absolute certainty – a definite occurrence. For example, the chance that 8 would come up in a throw of a dice is 0 as there are no faces of 8 in a dice. And the chance that a head or a tail would come up in a throw of a coin is 1 as those are the two events possible in a throw of a coin[11]. A probability of 0.6 means that the event is expected to occur six times out of ten.

[11] Ignoring the chance that the coin would land vertically on its edge in a throw.

The total of the probabilities for events that can possibly occur must sum to 1.0. For example, if a tutor indicates that the probability of a student passing an examination is 0.6 then this means that the student has a 60 per cent chance of passing the examination. Given that the pass/fail alternatives represent an exhaustive listing of all possible outcomes of the event, the probability of not passing the examination is 0.4. The information can be presented in a probability distribution. A probability distribution is a list of all possible outcomes for an event and the probability that each will occur. The probability distribution for the above illustration is as follows:

Outcome	Probability
Pass examination	0.6
Do not pass examination	0.4
Total	1.0

Objective and Subjective Probabilities

Probabilities are categorised either as objective and subjective. Glyn A. Holton[12] posits 'according to objective interpretations, probabilities are real. We may discover them by logic or estimate them through statistical analyses. According to subjective interpretations, probabilities are human beliefs'. Objective probabilities are either pre-defined or are arrived at from statistical inferences. This is corroborated in the works of Frank Knight who in 1921 stated that probabilities (objective) may be obtained in two manners:

- A priori probabilities are derived from inherent symmetries, as in the throw of a die.
- Statistical probabilities are obtained through analysis of homogenous data.

As such, objective probabilities are established mathematically or compiled from historical data. Tossing a coin and throwing a dice are examples of objective probabilities. For example, the probability of heads occurring when tossing a coin logically must be 0.5. This can be proved by tossing the coin many times and observing the results. And the chance of getting a 1 in a throw of dice is 1/6.

In business decisions, the probabilities (chances of a particular state of nature of happening/not happening) are often estimated based on managerial judgement. Probabilities established in this way are known as subjective probabilities because no two individuals will necessarily assign the same probabilities to a particular outcome. Subjective probabilities are also known as uncertainty16 and are based on an individual's perspectives of future events and their impact on operations of the entity.

Two important aspects of Probability

When the weather forecaster says there is a 40% probability that it will rain today, it also implicitly means there is a 60% probability that it will not rain. This illustrates the two basic requirements of probability:

1. The probability values assigned to each of the possible outcomes must be between 0 and 1; and
2. The probable values assigned to all of the possible outcomes must total 1.

Independent Events and Mutually Exclusive Events Independent Events

If the occurrence or non-occurrence of one event does not change the probability of the occurrence of the other event, the two events are said to be independent.

The addition law can be used when there are two possible events and we want to know the probability that at

[12] A comprehensive understanding about risk and uncertainty is presented in a conceptual paper titled 'Defining Risk – Perspectives' (available at https://www.glynholton.com/wp-content/uploads/papers/risk.pdf).

least one of the events will occur. In other words, for events A and B, we want to know the probability that event A or event B or both events will occur.

Events that are independent and not mutually exclusive can have sample points in common. That is, in some cases both A and B can occur. We need to include those cases in our calculation of the probability that at least one of the events will occur; but we do not want to double count them because of counting them once with A's probability and again with B's probability.

The union of events A and B is the event containing all the sample points belonging to A or B or both. It represents the probability that either A or B will occur, including the probability that both will occur.

Calculating the Joint Probability of two Independent Events

The area of the overlap—the joint probability—is the probability that both events will occur. That area qualifies to be included in the probability that either one of the events will occur, because one of the events certainly occurs in the area of the overlap. But we want to include it once, not twice, so we subtract it from the sum of the two events' probabilities.

For example, if the probability of Event X occurring is 20% and the probability of Event Y occurring is 25% and they are independent and not mutually exclusive events, the probability of both X and Y occurring is 0.20 × 0.25, or 0.05 or 5%.

Mutually Exclusive Events

If events are mutually exclusive, it means that if one of them occurs, the other event cannot occur. Either one or the other can occur but not both.

Solved Cases 2 (Independent Events and Mutually Exclusive Events)

In its sales forecasting, an appliance retailer develops a set of probabilities for sales in each of its product lines for the coming year. Sales forecasts for two of these product lines are as follows:

Refrigerators: There is a 30% probability that sales of refrigerators will be ₹50,00,000; a 50% probability that sales will be ₹75,00,000; and a 20% probability that sales will be ₹1,00,00,000.

Electric Ranges: There is a 25% probability that sales of electric ranges will be ₹20,00,000; a 55% probability that sales will be ₹30,00,000; and a 20% probability that sales will be ₹ 50,00,000.

The forecasts for these appliances relate to sales for the following year. Therefore, the actual events (sales of refrigerators and ranges) will both be occurring at the same time. The forecast for sales of refrigerators is not dependent on sales of electric ranges occurring, and the forecast for sales of electric ranges is not dependent on sales of refrigerators occurring. Thus sales of refrigerators and sales of ranges are independent of each other.

What is the probability that sales of refrigerators will be ₹75,00,000 or sales of electric ranges will be ₹30,00,000 next years? According to the above information:

(i) The probability that sales of refrigerators will be ₹75,00,000 next year is 50%.

(ii) The probability that sales of electric ranges will be ₹30,00,000 next year is 55%.

(iii) The probability that sales of refrigerators will be ₹75,00,000 and that sales of electric ranges will be ₹30,00,000 is 0.50 × 0.55, which equals 0.275 or 27.5%.

Therefore, the probability that sales of refrigerators will be ₹75,00,000 or sales of electric ranges will be ₹ 30,00,000 next year or that both events will occur next year is 0.50 + 0.55 − 0.275 = 0.775 or 77.5%

In the example above, refrigerator sales of ₹75,00,000 and electric range sales of ₹ 30,00,000 are not mutually

exclusive. In other words, it is possible for refrigerator sales to be ₹75,00,000 and for electric range sales to be ₹ 30,00,000. In fact, we calculated the probability of that occurring as 27.5%.

What if instead the retailer wanted to know the probability of refrigerator sales being either ₹50,00,000 or ₹75,00,000? That makes our probability question one of mutually exclusive events. Refrigerator sales cannot be ₹50,00,000 and ₹75,00,000 at the same time.

(i) The probability that sales of refrigerators will be ₹ 50,00,000 next year is 30%.

(ii) The probability that sales of refrigerators will be ₹ 75,00,000 next year is 50%.

Therefore, the probability that sales of refrigerators will be ₹ 50,00,000 or ₹ 75,00,000 next year is 0.30 + 0.50 = 0.80 or 80%

Note: Independent events and mutually exclusive events are very different.

Two events A and B are independent if the occurrence or non-occurrence of one event does not change the probability of the occurrence of the other event.

Two events A and B are mutually exclusive if only one of them can occur, that is, when one of them occurs, the other event cannot occur.

Dependent Events and Conditional Probability

When there are two events, A and B, and the occurrence of B depends upon the occurrence of A, the probability that both events will occur is the probability that the first event will occur, multiplied by the conditional probability that the second event will occur given that the first event has already occurred.

Three Methods of Assigning Probable Values

Three methods are used to assign probable values to possible outcomes: The Classical Method, the Relative Frequency Method, and the Subjective Method.

1. **Classical Method:** This method assumes that each possible outcome has an equal probability of occurring. Thus, if there are ten possible outcomes, each outcome is assumed to have a 10% probability of occurring. This is the method used to assign probabilities to coin tosses or dice rolls. Business decisions don't usually involve coin tosses or dice rolls, so the classical method is seldom used in situations of business uncertainty.
2. **Relative Frequency or Objective Method:** When factual information is available that can be used to determine the probability of something occurring; the use of that information to assign probabilities is called the relative frequency method. The information may come from a sample, analytical data, or any other reliable source.
3. **Subjective Method:** This method is used when neither the classical nor the relative frequency methods can be used because the possible outcomes are not equally likely and relative frequency da-ta is not available. With the subjective method of assigning probabilities, we use whatever data is available and add to that data our own experience and intuition. After considering all available information, we assign a probable value that expresses our degree of belief that the outcome will occur. Subjective probability is personally determined, and different people will assign different probabilities to the same event. Despite this relative freedom in assigning probabilities, the two necessary requirements for all probabilities must nevertheless be met:

   (i) The probable value for each possible outcome must be between 0 and 1; and

   (ii) All the probabilities for all the possible outcomes must total 1.

   Sometimes the various methods are used in combination, such as when probabilities are determined by combining estimates from the classical or relative frequency methods with subjective probability estimates.

Expected Value (or Expected Return)

The concept of expected value is very important. The expected value of an action is found by multiplying the probability of each potential outcome by its payoff. Therefore, expected value, or expected return, is a weighted average of the possible returns, with the weights being the probabilities of occurrence. The expected value of a discrete random variable is the weighted average of all the possible values of the random variable. The weights are the probabilities for each of the values. The expected value is the mean value, also known as the average value.

A weighted average can be calculated only for discrete probability distributions. It is not possible to calculate a weighted average for a continuous probability distribution because the number of possible variables is infinite.

The general model of decision making under risk when probabilities may be assigned in an objective manner to the states of nature is through the Expected Value criterion. In the below mentioned lines a Caselet is furnished for conceptualisation of the model.

Solved Cases 3

Subbuji is a small vendor who is undecided on what to sell in the fairground as a fair is to be organized in ten days. He has the option of selling tea or ice creams on a day one (16th August 2022) of the fair. He has made a projection that selling tea would fetch him a profit of ₹300 if it rains on 16th August 2022, but if it is sunny and humid on the day, he would not have much customers and then he would make a profit of ₹30. If he sells ice cream his profit is much higher (₹150) if 16th August 2022 is hot and humid, but if he decides to sell ice cream and it rains on that day then his profit would be ₹10. How would he make the decision of what to sell (tea or ice cream) on 16th August 2022?

Solution:

Subbuji has to decide on selling tea or ice – cream on 16th August 2022. These are termed as acts. On 16th August 2022 when these acts are to take place it can either be sunny and humid or rainy. These are called states of nature. Subbuji's decision (to sell tea or ice – cream) is reliant on the information he can garner on the states of nature. The information on chance of the day being 'sunny and humid' or being 'rainy' can be got from data of the last years. Subbuji can visit the met office and check the data of the last 200 years[13]. This would mean 200 data points about whether 1st June 2022 would be 'sunny and humid' or 'rainy'. After collection of the data, Subbuji finds that out of 200 days (past data) it rained for 30 days. From this he can infer that the probability of rain on 16th August 2022 as 0.15 (30/200). And the probability of the day being 'sunny and humid' is 0.85 (1 – 0.15). Once Subbuji has got this information about the state of nature he can frame the expected pay off matrix and take his decision based on expected value criterion.

Probability of Occurrence		States of Nature	
		Hot and Humid	Rainy
		0.85	0.15
Acts	Sell Tea	30	300
	Sell Ice-Cream	150	10
The 2×2 Matrix (for expected value[14] calculation)			

[13] Any number of years is possible. And it is to be noted that greater the data, higher is the accuracy of statistical inference. But collection of more data involves more cost. Thus it is to be noted that there is a cost of information. And there is a trade-off between more data and more cost of gathering data.

[14] Expected Value of an Opportunity (EV) is a term used to describe the expected value of a business opportunity.

The expected value (on the basis of which the decision is to be taken) is given as

$EV = \sum P(X_i) \times X_i$

Where $P(X_i)$ = Probability of occurrence of event i and X_i is the payoff related to the event i

in the given case, the EV (tea) = 30 × 0.85 + 300 × 0.15 = 70.5 and

EV (ice –cream) = 150 × 0.85 + 10 × 0.15 = 129.

Since this is pay off, Subbuji would choose that act which gives the highest pay off. Thus Subbuji takes his decision about which act to consider based on the highest expected value in case of pay off. This is only possible if the decision maker has access to information about the probability of occurrence of the various states of nature. Such a situation is referred as a risky situation. Information about the probability of occurrence of the state of nature is got either through statistical inference as Subbuji did, or are priori (defined from previous like in a throw of dice).

Other aspects of decision making under conditions of risk are discoursed in details in later section of this study note.

However, in a very real sense risk does not always implicitly carry a negative connotation. Where investments are concerned (both capital investments and security investments), risk is the possibility that an investment's actual return will differ from its expected return. This difference may be either positive or negative.

Investment Appraisal and Risk[15]

Condition of risk denotes situation where the decision maker have information about happening/ not happening of an event. The decision maker denotes the likelihood of happening/ not happening of an event in terms of probabilities. For example, a decision maker can assign 70 per cent probability that returns from a project will be in excess of ₹1,00,000. This also means that there is a 30 per cent probability that returns will be less than ₹1,00,000.

Risk for an investment can be measured by the variability, or dispersion, of its potential returns around the mean return. The mean return is given by the expected value of the returns. The variance and the standard deviation of a set of potential returns are measurements of their dispersion about the mean. Thus, the risk of an investment is measured by the variance and standard deviation of its potential returns.

In everyday usage the terms risk and uncertainty are not clearly distinguished. If one is asked for a definition, one should not make the mistake of believing that the latter is a more extreme version of the former. It is not a question of degree; it is a question of whether or not sufficient information is available to allow the lack of certainty to be quantified.

Such type of environment is very sure and certain by its nature. This means that all the information is available and at hand. Such data is also easy to attain and not very expensive to gather.

So the manager has all the information he may need to make an informed and well thought out decision. All the alternatives and their outcomes can also be analysed and then the manager chooses the best alternative.

Another way to ensure an environment of certainty is for the manager to create a closed system. This means he will choose to only focus on some of the alternatives. He will get all the available information with respect to such alternatives he is analysing. He will ignore the other factors for which the information is not available. Such factors become irrelevant to him altogether.

[15] This aspect is discoursed in details in Module 2 of Paper 14. For comprehensive understanding of the topic, students may look into the said module.

Standard Deviation and Variance as a Measure of Risk

The variance and standard deviation both give an idea of the variability of the possible values about the mean. The variance and the standard deviation measure how far from the mean (the expected value) the various possible values lie. The variance is used to summarize the variability in the values of a random variable. Another word for this variability is dispersion. The amount of variability in the values of the random variable around their mean (or average) is the amount by which they are dispersed, or the amount of their dispersion. The amount of dispersion is important because it is a measurement of risk. The greater the dispersion of the values around their mean, the greater the risk associated with the values because there is a larger chance that the actual results will be different from the expected value. If the values are highly dispersed about their mean, then they vary widely from their expected value.

The variance of a population is represented by σ^2 (sigma squared). The variance is the sum of the squares of all the differences or deviations from the mean (average), weighted according to their probabilities. The difference from the mean of each result is important because it indicates the distance that particular measurement is from its expected value. The variance is actually a weighted average of the squared deviations. The standard deviation is the positive square root of the variance. It is represented by σ (sigma).

Variation within the possible cash flows for each project is also important because a project with a high variability of cash flows has more risk than a project for which all the possible cash flows are close together.

The standard deviation of the probability distribution of these subjectively determined potential cash flows expresses the dispersion, or variability, of possible returns around the expected return. If the standard deviation is large, it means the variability of returns is large and the risk of the project is higher. Thus, standard deviation is a measure of risk. By expressing differences from the expected return in terms of numbers of standard deviations from the mean (expected return), we can state the probability that the actual return will fall within an interval relative to the mean, or expected return. The greater the standard deviation, the greater is the potential for loss or gain.

Standard deviation is always expressed in the same units as the distribution. Thus, if the distribution is a distribution of annual rates of return on an investment, the returns and the standard deviation of the returns are both expressed as annual percentages. If the distribution is a distribution of annual cash flows in units of currency, both the cash flows and the standard deviation of the cash flows will be expressed as currency amounts.

The variance and standard deviation of each of the expected cash flows is calculated in the same way as the variance and standard deviation. The narrower the distribution of the data, the lower the standard deviation will be. The lower the standard deviation, the lower the risk. The wider the distribution of data, the higher the standard deviation and the higher the risk. Standard deviation is a measure of the dispersion of a probability distribution and thus a measure of the riskiness of a project.

Again coefficient variation also measures the risk. Coefficient of variation is the relative measure of dispersion. It measures the standard deviation relative to the mean in percentages. The coefficient of variation is calculated simply by dividing the standard deviation by the expected return (or mean):

$$\text{Coefficient of variation} = \frac{\text{Standard Deviation of Return}}{\text{Expected Return}}$$

For example, assume that investment in financial instrument A has an expected return of 20% and a standard deviation of 15%, whereas investment in financial instrument B has an expected return of 25% and a standard deviation of 20%. The coefficients of variation for the two investments will be:

$$\text{Coefficient of variation}_{(A)} = \frac{\text{Standard Deviation of Return}}{\text{Expected Return}} = \frac{15\%}{20\%} = 0.75$$

$$\text{Coefficient of variation}_{(B)} = \frac{\text{Standard Deviation of Return}}{\text{Expected Return}} = \frac{20\%}{25\%} = 0.80$$

The interpretation of these results would be that investment in financial instrument A is less risky, as the coefficient of variation of the investment is lower. Another test statistic relating to dispersion is the standard error which is a measure often confused with standard deviation. Standard error is the measure of variability of a sample, used as an estimate of the variability of the population from which the sample is drawn. When we calculate the sample mean, we are usually interested not in the mean of this particular sample, but in the mean of the population from which the sample comes. The sample mean will vary from sample to sample and the way this variation occurs is described by the 'sampling distribution' of the mean. We can estimate how much a sample mean will vary from the standard deviation of the sampling distribution. This is called the standard error (SE) of the estimate of the mean.

Illustration 1

We are comparing two investment projects. Both have expected returns of 20%, but the standard deviation of Project A's returns is 15%, while the standard deviation of Project B's returns is 9%. Which one is relatively riskier?

Solution:

CV of Project A = 0.15 ÷ 0.20 = 0.75

CV of Project B = 0.09 ÷ 0.20 = 0.45

Because it has a higher Coefficient of Variation (CV), Project A is the relatively riskier project.

Illustration 2

Two investments have different expected returns. Project A's expected return is 20% and the standard deviation of its returns is 15%. Project B's expected return is only 10%, while the standard deviation of its returns remains at 9%. Which project is relatively riskier?

Solution:

CV of Project A = 0.15 ÷ 0.20 = 0.75

CV of Project B = 0.09 ÷ 0.10 = 0.90

Because Project B's expected return has decreased from 20% to 10%, as compared to example 1, above Project B's coefficient of variation has increased from 0.45 to 0.90. Therefore, Project B is now the relatively riskier project.

Illustration 3

You are required to select from the following two Projects, which are mutually exclusive:

Project X:

Estimated Net Cash Flows (₹)	Probability
2,000	0.3
3,000	0.4
4,000	0.3

Project Y:

1,000	0.2
2,000	0.2
3,000	0.2
4,000	0.2
5,000	0.2

The Expected value of both the Projects = ₹3,000

Solution:

Since, Expected Value of both the Projects are same, hence, we are required to compute Standard Deviation and Co-efficient of Variations of both the Projects:

Computation of SD of Project X

Cash Flow(X) ₹	Probability (p)	EV (Xp) ₹	X- $\bar{X}$ Variance	p (X- $\bar{X}$)^2 ₹
2,000	0.3	600	-1,000	3,00,000
3,000	0.4	1,200	0	0
4,000	0.3	1,200	+1,000	3,00,000
	EV	$\bar{X}$ = 3,000		6,00,000

SD of Project X = ₹ 775 $\left(\sqrt{p(X - \bar{X})^2}\right)$

On the basis of similar calculations, the SD of Project Y = ₹ 1,414. $\left(\sqrt{p(Y - \bar{Y})^2}\right)$

Decision:

Project X is selected, since SD is less, having less variability.

We can also calculate Co-efficient of Variation (CV):

Project X = (SD ÷ Mean) × 100 = (₹ 775 ÷ ₹ 3,000) × 100 = 25.83 %

Project Y = ₹ 1,414 ÷ 3,000 = 47.13 %.

Decision:

Project X is selected, since its CV is less.

Expected Value in Estimating Future Cash Flows

Expected value is a term that means a weighted average of the possible values using the probabilities as the weights. Any time the word "expected" is used in the context of an "expected value" or an "expected cash flow," it refers to the idea of calculating a weighted average of the possible values using the probability of each value as its weight.

Estimating, or projecting, future cash flows are an important application of expected value. It is used in capital budgeting analysis for evaluating potential projects. It is important to know how to calculate estimated future cash flows from a potential project for use in a capital budgeting analysis.

A budgeted amount of future cash flow is often thought of as an absolute number. Unfortunately, though, future cash flows cannot be accurately ascertained because there are many events that can affect a project's net cash flows. Every project has numerous possible future cash flows. A project has a range of estimated cash flows that reflect different possibilities that management can foresee.

In determining the various possible cash flows, management must:

1) To determine which influences have affected the net cash flows of similar projects in the past, such as economic conditions, labour conditions, or international conditions, and then

2) To make assumptions about each of those events and the manner in which those events might affect the project. For instance, if a recession is expected, management might assume that demand for the project's product will be below normal.

3) Once these specific assumptions have been formulated, the management accountant then estimates the impact that each assumption could have on the net cash flow in each year of the project's life. The manager develops several possible cash flow levels for each year, along with probabilities of each cash flow level occurring. This will be a discrete probability distribution (not a continuous one), and the probabilities for each year will all sum to 1 or 100%.

4) The management accountant will then calculate the expected value for the net cash flow for each year of the project's life by calculating the weighted average of all the possible cash flows for each year.

5) These calculated expected values of future cash flows will be the cash flows used in the capital budgeting analysis for each year.

Approaches have been developed to choose the best option when the decision maker has several alternatives and there is uncertainty with respect to future events.

Decision Models

Let us consider the case of a manufacturing company, which is interested in increasing its production to meet the increasing market demand. The following steps are required to be considered in the context of Decision Model:

Step I. To determine all possible alternatives

The first obvious step involved before making a rational decision is to list all the viable alternatives available in a particular situation. The following options are available to the manufacturer:

(a) To expand the existing manufacturing facilities (Expansion);

(b) To setup a new plant (New facilities);

(c) To engage other manufacturers to produce for him as much as is the extra demand (Sub- contracting).

Step II. To identify the future scenario

It is very difficult to identify the exact events that may occur in future. However, it is possible to list all that can happen. The future events are not under the control of the decision-maker. In decision theory, identifying the future events is called the state of nature. In the case which we have taken of a particular manufacturing company, we can identify the following future events:

(a) Demand continues to increase (High demand)

(b) Moderate demand

(c) Demand starts coming down (Low demand)

(d) The product does not remain in demand (No demand).

Step III. To prepare a pay-off table

The decision-maker has to now find out possible payoffs, in terms of profits, if any, of the possible events taking place in future. Putting all the alternatives together (Step I) in relation to the state of nature (Step II) gives the payoff table. Let us prepare the payoff table for our manufacturing company.

	State of nature			
	High Demand	Moderate Demand	Low Demand	No Demand
Expansion	1	2	3	4
New Facilities	5	6	7	8
Sub-Contact	9	10	11	12

Pay-off Table

If expansion is carried out and the demand continues to be high (one of the 12 alternatives), the payoff is going to be maximum in terms of profit of say ₹ X. However, if expansion is carried out and there is no demand (situation 4), the company will suffer a loss.

Step IV. Selecting the best alternative

The decision-maker will, of course, select the best course of action in terms of payoff. However, it must be understood that the decision may not be based on purely quantitative payoff in terms of profit alone, the decision-maker may consider other qualitative aspects like the goodwill generated which can be encashed in future, increasing market share with an eye on specially designed pricing policy which ultimately gives profits to the company, etc.

Decision Making with Probabilities

If a decision maker can estimate the probabilities of the future events, these should be incorporated into the decision model. In the steps in constructing payoff tables or decision trees, probabilities are used in determining payoffs. A common approach to decision making under uncertainty is the expected value criterion. The expected value (EV) of a decision alternative is calculated as follows:

EV (alternative) = (probability of first state of nature) × (outcome of that state of nature) + (probability of second state of nature) × (outcome of the second state of nature) + . . . for all states of nature.

In essence, the EV represents a weighted average of the outcomes, using probabilities as weights. The alternative selected is the one with the highest EV for maximization problems and the lowest EV for minimization problems.

Illustration 4

Building Ltd. owns land in Noida and intends to build a condominium development on the site. The company is deciding on whether to build a small, medium or large development. Demand is uncertain and fluctuates; demand could be low, medium or high. Management at Building Ltd. has determined profit payoffs will be:

		Demand	(all amounts in ₹ 000s)
Alternatives	Low	Medium	High
Small D_1	1,400	1,400	1,400
Medium D_2	1,100	1,600	1,600
Large D_3	(1,300)	1,200	2,100

Management has determined the probabilities of demand to be:

Low = P (low) = 0.20

Medium = P (medium) = 0.35

High = P (high) = 0.45

Solution:

The expected value of each alternative is calculated as:

Alternatives:

Small EV = 0.2(1400) + 0.35(1400) + 0.45(1400) = ₹ 1,400

Medium EV = 0.2(1100) + 0.35(1600) + 0.45(1600) = ₹1,500

Large EV = 0.2(-1300) + 0.35(1200) + 0.45(2100) = ₹ 1,105

Conclusion

Using the expected value criterion and absent of any qualitative considerations, the best alternative is to build a medium condominium complex as this provides the highest expected value.

Illustration 5

The following information is available for a Company:

Sales Volume (units)	Probability (%)
10,000	10
12,000	15
14,000	25
16,000	30
18,000	20

Projected sales and costs are as under:

Sales Price per unit: ₹ 6; Variable Cost per unit: ₹ 3.50; Fixed Costs: ₹ 34,000

Required:

(i) Probability that the Company will at least Break-even

(ii) Probability that the Profit will be at least ₹ 10,000.

Solution:

(i) Contribution per unit = ₹ 2.50 (₹ 6 - ₹ 3.50)

BEP (units) = Total Fixed Costs ÷ Contribution per unit = ₹ 34,000 ÷ ₹ 2.50 = 13,600 units.

The probability that at least Break-even = 0.25 + 0.30 + 0.20 = 0.75 = 75%.

(ii) The Profit will be at least ₹ 10,000:

Then, BEP (units) = ₹ 34,000 + ₹ 10,000 ÷ ₹ 2.50 = 17,600 units.

The required Probability = 20%

Limitations of the Expected Value Model:

- Not all future events are foreseeable and, therefore, may be omitted from the model
- The model assumes future events are independent of each other. There can be overlap between future events.
- It is difficult to accurately assess the probability of future events.
- The model ignores qualitative considerations in making a decision.
- The model ignores the decision maker's attitude towards risk. The expected value model assumes the decision maker is risk neutral. If the decision maker is risk seeking or risk averse, both the expected value of the decision and its dispersion become relevant in choosing the best decision.

Expected Value of Perfect Information (EVPI)

If we assume that an economic forecasting service is available that can reveal the future state of the economy with absolute certainty. This service has a proprietary computer model that has never been wrong, but the service costs ₹ 35,000. Should we purchase it?

Perfect information is knowledge about the future that would enable us to make the best choice today for any possible situation in the future. If we knew in advance the future state of the economy, we could make a much more informed choice between say, Project X and Project Y.

As we calculate the expected value of this perfect information, keep in mind that we do not know in advance what the perfect information will be. In other words, we must determine what it would be worth to us to know this perfect information before we know what we are buying.

Companies can sometimes obtain information that reduces or eliminates the uncertainty associated with the different future events/states of nature of a problem. The EVPI refers to the maximum amount a company would pay to obtain this information.

Formula to calculate EVPI:

EVPI = EV of best alternative with perfect information - EV of best alternative without perfect information

Illustration 6

In Illustration 4, the best alternative was to build a medium condominium complex as this resulted in the highest expected value (EV = ₹1,500). If perfect information were available, that is, the probabilities were known with certainty, the optimal decision strategy is:

If low demand occurs, build a small complex.

If medium demand occurs, build a medium complex.

If high demand occurs, build a large complex.

Findout EVPI.

Solution:

The expected value of this optimal decision strategy is:

0.20 (1,400) + 0.35(1,600) + 0.45(2,100) = ₹1,785

Therefore, the EVPI is:

EVPI = EV of best alternative with perfect information - EV of best alternative without perfect information

= ₹1,785 - ₹1,500 = ₹ 285

Limitations of EVPI

Perfect information is rarely, if ever, available. When determining whether to obtain additional information, the decision maker must weigh the additional expected value arising from perfect information against the costs of obtaining this information.

Pay-off tables

Pay-off tables identify and record all possible outcomes (or pay-offs) in situations where the action taken affects the outcomes.

Illustration 7

ABC Company Co is trying to set the sales price for one of its products. Three prices are under consideration, and expected sales volumes and costs are as follows.

Price per unit	₹4	₹4.30	₹4.40
Expected sales volume (units)			
Best possible	16,000	14,000	12,500
Most likely	14,000	12,500	12,000
Worst possible	10,000	8,000	6,000

Fixed costs are ₹ 20,000 and variable costs of sales are ₹ 2 per unit.

Which price should be chosen?

Solution:

Here we need to prepare a pay-off table showing pay-offs (contribution) dependent on different levels of demand and different selling prices.

A. Price per unit	₹ 4	₹4.30	₹4.40
B. Contribution per unit (A - ₹2)	₹2	₹2.30	₹2.40
C. Total contribution towards fixed costs (₹) (B × units):			
Best possible	32,000	32,200	30,000
Most likely	28,000	28,750	28,800
Worst possible	20,000	18,400	14,400

(a) The highest contribution based on most likely sales volume would be at a price of ₹4.40 but arguably a price of ₹4.30 would be much better than ₹4.40, since the most likely profit is almost as good, the worst possible profit is not as bad, and the best possible profit is better.

(b) However, only a price of ₹4 guarantees that the company would not make a loss, even if the worst possible outcome occurs. (Fixed costs of ₹20,000 would just be covered.) A risk averse management might therefore prefer a price of ₹4 to either of the other two prices.

Decision Making under Uncertainty

10.3

In the absence of homogenous data, neither priori probabilities nor statistical inferences can be used to define an opinion about a data set. Frank Knight (1921) used the term 'measureable uncertainty' to describe opinions based on probabilities. On the other, he used the term 'unmeasurable uncertainty' to describe opinions based on human judgements[16]. In simple terms, situations where objectives probabilities cannot be assigned to the states of the nature as no prior information is available gives rise to the condition of decision making under uncertainty.

Uncertainty, in common parlance, is a state of not knowing whether a proposition is true or false. Suppose Mr ASA went to a casino. There the dealer is about to roll a dice. If the result is a six, Mr ASA is going to lose ₹100.

What is Mr ASA's risk? What, is the subjective opinion (subjective probability) that Mr ASA will lose ₹100?

It may seem to be one chance in six (which is a general answer). But it is not known from previous how may sides the dice have. The information that the die is 10 sided one changes the perspective about probability of throwing a six. This example illustrates how one can be uncertain but not realize it. To clarify, an individual is uncertain of a proposition if she

- does not know it to be true or false or
- is oblivious to the proposition.

Probability is often used as a metric of uncertainty, but its usefulness is limited. At best, probability quantifies perceived uncertainty.

A decision problem, where a decision-maker is aware of various possible states of nature but has insufficient information to assign any probabilities of occurrence to them, is termed as decision-making under uncertainty. A decision under uncertainty is when there are many unknowns and no possibility of knowing what could occur in the future to alter the outcome of a decision.

The decision maker feels the uncertainty about a situation when he can't predict with complete confidence what the outcomes of the actions will be. The decision maker experiences uncertainty about a specific question when he can't give a single answer with complete confidence.

Launching a new product, a major change in marketing strategy or opening the first branch could be influenced by such factors as the reaction of competitors, new competitors, technological changes, changes in customer

[16] The famous definition of Frank Knight (1921) reads; 'to preserve the distinction . . . between the measurable uncertainty and an unmeasurable one we may use the term "risk" to designate the former and the term "uncertainty" for the latter'. This statement is Knight's famous definition of risk. Risk relates to objective probabilities. Uncertainty relates to subjective probabilities. (available at https://www.glynholton.com/wp-content/uploads/papers/risk.pdf)

demand, economic shifts, government legislation and a multitude of conditions which are beyond the control of the decision maker. These are the type of decisions facing the senior executives of large corporations who commits huge resources often on gut feeling.

A situation of uncertainty arises when there are more than one possible consequences of selecting any course of action.

Decision making under uncertainty, as under risk, involves alternative actions whose payoffs depend on the states of nature. Specifically, the payoff matrix of a decision problem with m alternative actions and n states of nature can be represented by a m × n matrix, as follows;

	s_1	s_2	s_3	.....	s_n
a_1	$p(a_1, s_1)$	$p(a_1, s_2)$	$p(a_1, s_3)$		$p(a_1, s_n)$
a_2	$p(a_2, s_1)$	$p(a_2, s_2)$	$p(a_2, s_3)$		$p(a_2, s_n)$
a_3	$p(a_3, s_1)$	$p(a_3, s_2)$	$p(a_3, s_3)$		$p(a_3, s_n)$
.					
.					
.					
a_m	$p(a_m, s_1)$	$p(a_m, s_2)$	$p(a_m, s_3)$		$p(a_m, s_n)$

The element a_i represents action i and the element s_j represents state of nature j. The payoff or outcome associated with action ai and state s_j is $p(a_i, s_j)$. In decision making under uncertainty, the probability distribution associated with the states s_j, j = 1, 2, c, n, is unknown as it cannot be determined. This absence of information has led to the development of some special decision criteria which may be categorised as

1. Maximin (Minimax)
2. Laplace
3. Savage
4. Hurwicz

Each of the above are discussed briefly with illustration

1. The Minimax (Maximin) Criterion

The maximin (minimax) criterion is based on the conservative attitude of making the best of the worst-possible conditions). The logic is simple. The decision maker would zero upon such a decision which will give him optimum results under the given condition.

If $p(a_i, s_j)$ is loss or cost , then selection of an action is made on the basis of minimax criterion as the objective would be to minimise loss or cost (as the payoff denotes loss or cost)

On the contrary, If $p(a_i, s_j)$ is profit or revenue , then selection of an action is made on the basis of maximin criterion as the objective would be to maximise profit or revenue (as the payoff denotes profit or revenue).

2. The Laplace Criterion

This is based on the principle of insufficient reason. The simple argument is that because the probability distributions are not known, there is no reason to believe that the probabilities associated with the states of nature are different. The alternatives are thus evaluated on the basis of the assumption that all states of nature are

equally likely to occur. Given that the payoff $p(a_i, s_j)$ represents gain, the best alternative is the one that yields the maximum expected value (using equal probability). And in situation payoff $p(a_i, s_j)$ represents loss the minimum value represents the best alternative.

3. The Savage Criterion

Under this rule, the degree of conservatism in the minimax (maximin) is moderated by replacing the (gain or loss) payoff matrix $p(a_i, s_j)$ with a loss (or regret) matrix, $r(a_i, s_j)$. The following illustration is given as to why the transformation is suggested and how it is undertaken. This is also known as minimax regret criterion.

The following loss matrix is noted from a particular decision problem. The $p(a_i, s_j)$, where the payoff is loss, is given as

	s_1	s_2
a_1	₹ 11,000	₹ 90
a_2	₹ 10,000	₹ 10,000

Since the payoff matrix represents cost, Minimax criterion is to be applied on the basis of the conservative principle. Thus maximum values of each row is considered and the minimum of them is considered and the action representing the minimax value is the best decision.

	s_1	s_2	Row Max	
a_1	₹ 11,000	₹ 90	₹ 11,000	
a_2	₹ 10,000	₹ 10,000	₹ 10,000	← Minimax

The application of the minimax criterion shows that a_2, with a definite loss of ₹10,000, is the preferred alternative. However, it may be better to choose a_1 because there is a chance of limiting the loss to ₹90 given that s_2 occurs. This is the situation which is posited by the Savage rule. Transforming the above payoff matrix into a regret would be helpful to moderate the degree of conservatism. Transforming the above payoff into a regret matrix, the following is derived at. The regret is arrived at deducting the minimum value of a column from all the values of that column. This is on the basis of the opportunity cost principle.

	s_1	s_2	Row Max	
a_1	₹ 1,000	₹ 0	₹ 1,000	← Minimax
a_2	₹ 0	₹ 9,910	₹ 9,910	

4. The Hurwicz Criterion

The minimax and the maximin criteria, discussed above, assumes that the decision-maker is either optimistic or pessimistic. These are, as such, two extreme cases and a more realistic approach would be to consider the degree of optimism or pessimism of the decision-maker. The Hurwicz criterion, is designed to represent different decision-making attitudes, ranging from the most liberal (optimistic) to the most conservative (pessimistic). This is also referred as condition of equal likelihood.

One parameter α is used as the index of optimism. If $\alpha = 0$, then the criterion reduces to conservative minimax criterion, on the basis of the best of the worst conditions. If $\alpha = 1$, then the criterion is generous because it is based on the underlying assumption of the best of the best conditions. The degree of optimism (or pessimism) can be adjusted by selecting a value of a between 0 and 1. In the absence of strong feeling regarding extreme optimism and extreme pessimism, $\alpha = 0.5$ which indicates a fair choice, neither.

Illustration 8 (Illustration on Profit Matrix)

Given the following Payoff table of profits generated by an entity under differing condition of the future state of nature.

Alternatives	States of Nature			
	S1	S2	S3	S4
A1	3	5	8	-1
A2	6	5	2	0
A3	0	5	6	4

State which can be chosen as the best act using:

(a) Maximax,

(b) Maximin,

(c) Minimax regret (Savage criterion),

(d) Equal likelihood (Laplace criterion),

(e) Hurwicz Alpha criterion α=0.4

Solution:

a) Maximax:

Max (Max Ai) = Max (8, 6, 6) = 8

Decision:

Select A1

b) Maximin:

Max (Min Ai) =Max (-1, 0 ,0) =0

Decision: Select A2 or A3

c) Savage Criterion (Minimax regret)

i. Formulation of the regret table[17]

The Regret Table

Alternatives	States of Nature			
	S1	S2	S3	S4
A1	-3	0	0	-5
A2	0	0	-6	-4
A3	-6	0	-2	0

ii. The negative signs are dropped as the table represents loss (regret) matrix while the original matrix is a profit matrix.

[17] Subtracting the maximum (since the problem refers to minimax regret) of each column from each element of that particular column.

The Regret Table

Alternatives	States of Nature			
	S1	S2	S3	S4
A1	3	0	0	5
A2	0	0	6	4
A3	6	0	2	0

iii. Min (Max Ai) = Min (5, 6, 6) = 5

Decision: Select A1

d) Laplace: Under this condition, the associated probabilities are considered to be equal for each state of nature i.e., 1/4 (as there are four states of nature).

Expected pay-offs are :

Alternatives	States of Nature				Expected Value = Payoff × Probabilities [EV= $\sum P(X_i) \times X_i$]
	S1	S2	S3	S4	
	0.25[18]	0.25	0.25	0.25	
A1	3	5	8	-1	3.75
A2	6	5	2	0	3.25
A3	0	5	6	4	3.75

From the above calculation of expected value, it is noted that A1 and A3 has the maximum expected pay-off.

Decision: Select A1 or A2

e) The Hurwicz Criterion[19]

$D = \alpha$ (Maximum in A_i) + $(1 - \alpha)$ (Minimum in A_i) [$\alpha = 0.4$]

$D(A1) = (0.4 \times 8) + (0.6 \times -1) = 2.6$

$D(A2) = (0.4 \times 6) + (0.6 \times 0) = 2.4$

$D(A3) = (0.4 \times 6) + (0.6 \times 0) = 2.4$

D(A1) has the maximum Expected Value.

Decision: Select A1

[18] These are the assumed probabilities, which is the fundamental assumption in the Laplace criterion

[19] It is important to note that α is a parameter of optimism. If α = 0, then the criterion reduces to conservative minimax criterion which seeks the best of the worst conditions. If α = 1, then the criterion is generous because it seeks the best of the best conditions. The degree of optimism (or pessimism) can be adjusted by selecting a α value between 0 and 1. From this point of view, the formula for D (expected value) would reverse if the problem is profit maximisation or cost minimisation.

Illustration 9[20] (Illustration on Cost Matrix)

Julien Point School (JPS) is preparing a summer camp in the jungles of Bagora, District of Darjeeling to train individuals in wilderness survival. JPS estimates that attendance can fall into one of four categories: 200, 250, 300, and 350 persons. The cost of the camp will be the smallest when its size meets the demand exactly. Deviations above or below the ideal demand levels incur additional costs resulting from constructing more capacity than needed or losing income opportunities when the demand is not met. Letting a_1 to a_4 represent the sizes of the camp (200, 250, 300, and 350 persons) and s_1 to s_4 the level of attendance, the following table summarizes the cost matrix (in thousands of Rupees) for the situation:

	s_1	s_2	s_3	s_4
a_1	5	10	18	25
a_2	8	7	12	23
a_3	21	18	12	21
a_4	30	22	19	15

State the best alternative using: (i) Minimax, (ii) Laplace, (iii) Savage Criterion (Minimax Regret), (iv) Hurwicz Criterion.

Solution:

The problem is analyzed using the following:

i. The Minimax Criterion

	s_1	s_2	s_3	s_4	Row Max	
a_1	5	10	18	25	25	
a_2	8	7	12	23	23	
a_3	21	18	12	21	**21**	← Minimax
a_4	30	22	19	15	30	

ii. The Laplace Criterion

Assume equal probabilities (1/4) as there are four states of nature.

	s_1	s_2	s_3	s_4	EV= $\sum P(X_i) \times X_i$	Figures in ₹ thousand
a_1	5	10	18	25	1/4 (5+10+18+25)=14.5	₹ 14,500
a_2	8	7	12	23	1/4 (8+7+12+23) =12.5	**₹ 12,500**
a_3	21	18	12	21	1/4 (21+18+12+21) =18.0	₹ 18,000
a_4	30	22	19	15	1/4 (30+22+19+15) =21.5	₹ 21,500

Since it is a cost minimisation problem, decision a_2 would be selected which implicates the lowest cost of ₹12,500.

[20] Adopted from Chapter 15, Decision Analysis and Games (Operations Research - An Introduction, Tenth Edition, by Hamdy A. Taha)

iii. The Savage Criterion

This criterion posits the formulation of a regret matrix. The regret matrix is determined by subtracting 5, 7, 12, and 15 from columns 1 to 4, respectively, and so the following regret matrix is obtained.

	s_1	s_2	s_3	s_4	Row Max	
a_1	0	3	6	10	10	
a_2	3	0	0	8	**8**	← Minimax
a_3	16	11	0	6	16	
a_4	25	15	7	0	25	

iv.The Hurwicz Criterion[19]

The following table summarizes the computation

Alternative	Row Min	Row Max	α (Row Min) + (1-α) (Row Max)
a1	5	25	25 -20α[21]
a2	7	23	23 -16α
a3	12	21	21 - 9α
a4	15	30	30 -15α

The decision maker will have to decide upon the appropriate α, and thus he can decide upon the optimum alternative.

[21] α(5) + (1-α)(25) = α5+ 25 -25α = 25 -20α, and so forth (for the remaining values in the column).

Decision Tree

10.4

A decision tree shows a complete picture of a potential decision and allows a manager to graph alternative decision paths. Decision trees are a useful way to analyse hiring, marketing, investments, equipment purchases, pricing, and similar decisions that involve a progression of smaller decisions. Generally, decision trees are used to evaluate decisions under conditions of risk. Decision making is the core function of management. New tools for analysis that aid decision making are being developed. One such tool is the decision tree. It is essentially a visual graph that uses the branching method to map every possible outcome of a particular decision.

The term decision tree comes from the graphic appearance of the technique that starts with the initial decision shown as the base. The various alternatives, based upon possible future environmental conditions, and the payoffs associated with each of the decisions branch from the trunk.

Decision trees force a manager to be explicit in analysing conditions associated with future decisions and in determining the outcome of different alternatives. The decision tree is a flexible method. It can be used for many situations in which emphasis can be placed on sequential decisions, the probability of various conditions, or the highlighting of alternatives.

Decision trees are diagrams which illustrate the choices and possible outcomes of a decision. A decision tree is a pictorial method of showing a sequence of interrelated decisions and their expected outcomes. Decision trees can incorporate both the probabilities of, and values of, expected outcomes, and are used in decision-making.

More complex probability questions, although solvable using the basic principles, require a clear logical approach to ensure that all possible choices and outcomes of a decision are taken into consideration.

Decision trees are a useful means of interpreting such probability problems.

Merits of Decision Trees

- All the possible choices that can be made are shown as branches on the tree.
- All the possible outcomes of each choice are shown as subsidiary branches on the tree.

Constructing a decision tree

There are two stages in preparing a decision tree.

- Drawing the tree itself to show all the choices and outcomes
- Putting in the numbers (the probabilities, outcome values and EVs)

Every decision tree starts from a decision point with the decision options that are currently being considered.

(a) It helps to identify the decision point, and any subsequent decision points in the tree, with a symbol. Here, we shall use a square shape.

(b) There should be a line, or branch, for each option or alternative.

It is conventional to draw decision trees from left to right, and so a decision tree will start as follows:

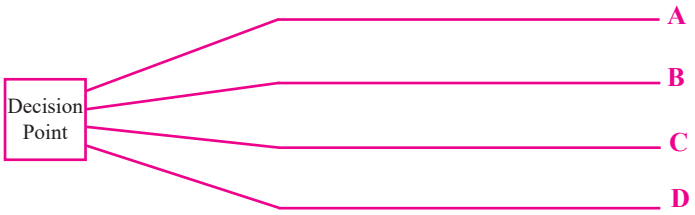

Figure 10.1 : Conventional decision tree

The square is the decision point, and A, B, C and D represents four alternatives from which a choice must be made (such as buy a new machine with cash, hire a machine, continue to use existing machine, raise a loan to buy a machine).

If the outcome from any choice is certain, the branch of the decision tree for that alternative is complete.

If the outcome of a particular choice is uncertain, the various possible outcomes must be shown.

We show the various possible outcomes on a decision tree by inserting an outcome point on the branch of the tree. Each possible outcome is then shown as a subsidiary branch, coming out from the outcome point. The probability of each outcome occurring should be written on to the branch of the tree which represents that outcome.

To distinguish decision points from outcome points, a circle will be used as the symbol for an outcome point.

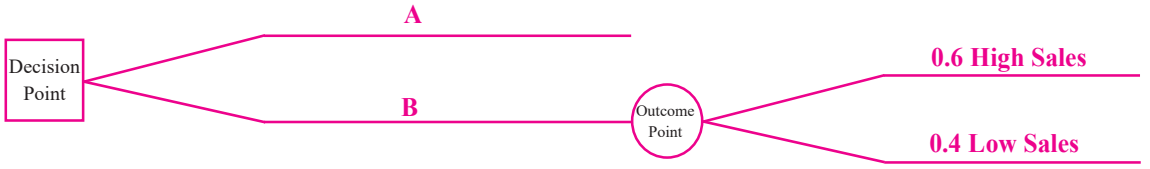

Figure 10.2 : Decision points and Outcome points

It is assumed that, there are two choices facing the decision-maker, A and B. The outcome if A is chosen is known with certainty, but if B is chosen, there are two possible outcomes, high sales (0.6 probability) or low sales (0.4 probability).

When several outcomes are possible, it is usually simpler to show two or more stages of outcome points on the decision tree.

Illustration 10

Several possible outcomes

A company can choose to launch a new product XYZ or not. If the product is launched, expected sales and expected unit costs might be as follows:

Sales		Unit costs	
Units	Probability	₹	Probability
10,000	0.8	6	0.7
15,000	0.2	8	0.3

a) The decision tree could be drawn as follows:

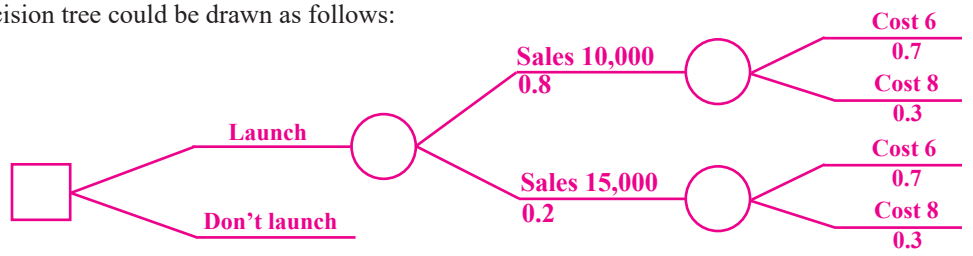

Figure 10.3 : Drawing of Decision tree

(b) The layout shown above will usually be easier to use than the alternative way of drawing the tree, which is as follows:

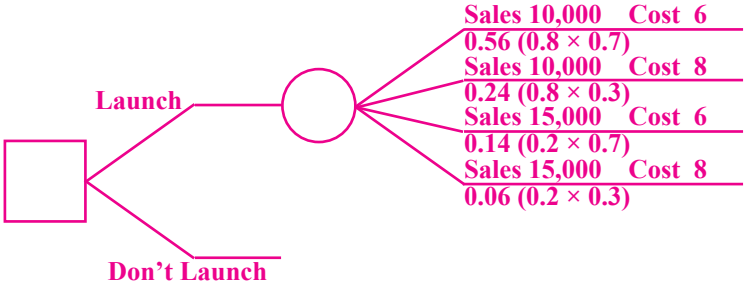

Figure 10.4 : Alternative way of drawing the Decision tree

Sometimes, a decision taken now will lead to other decisions to be taken in the future. When this situation arises, the decision tree can be drawn as a two-stage tree, as follows:

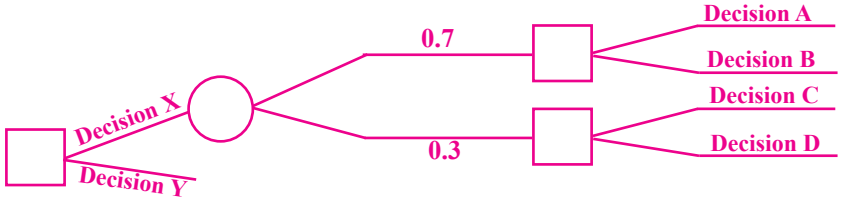

Figure 10.5 :Two-stage Decision tree

In this tree, either a choice between A and B or else a choice between C and D will be made, depending on the outcome which occurs after choosing X.

The decision tree should be in chronological order from left to right. When there are two-stage decision trees, the first decision in time should be drawn on the left.

Illustration 11 (Example of Decision Tree)

LT Ltd. owns land in Bangalore and intends to build a project development on the site. The company is deciding on whether to build a small, medium or large development. Demand is uncertain and fluctuates; demand could be low, medium or high. Management at LT Ltd. has determined profit payoffs will be:

(all amounts in ₹ 000s)

Alternatives		Demand Low	Medium	High
Small	d1	1,400	1,400	1,400
Medium	d2	1,100	1,600	1,600
Large	d3	(1,300)	1,200	2,100

Management has determined the probabilities of demand to be:

Low = P (low) = .20

Medium = P (medium) = .35

High = P (high) = .45

Then Decision Tree Approach can be applied as under:

Solution:

Decision Tree Approach

Payoff table in decision tree format

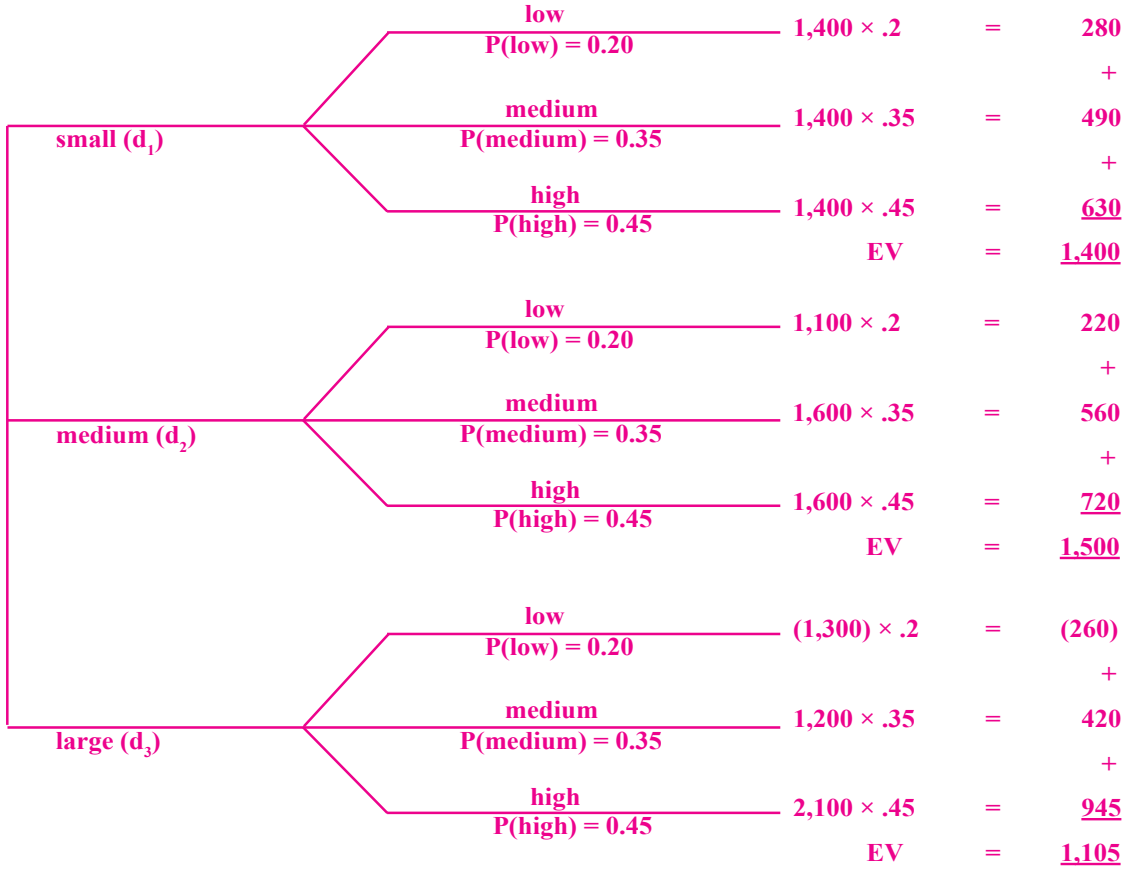

Figure 10.6 : Payoff table in Decision tree format

Conclusion: Build a medium complex as this alternative provides the highest expected value

Illustration 12

B Ltd. has a new wonder product, the V, of which it expects great things. At the moment the company has two courses of action open to it, to test market the product or abandon it.

If the company test markets it, the cost will be ₹ 1,00,000 and the market response could be positive or negative with probabilities of 0.60 and 0.40.

If the response is positive the company could either abandon the product or market it full scale.

If it markets the V in full scale, the outcome might be low, medium or high demand, and the respective net gains/ (losses) would be (200), 200 or 1,000 in units of ₹1,000 (the result could range from a net loss of ₹ 2,00,000 to a gain of ₹10,00,000). These outcomes have probabilities of 0.20, 0.50 and 0.30 respectively.

If the result of the test marketing is negative and the company goes ahead and markets the product, estimated losses would be ₹ 6,00,000.

If, at any point, the company abandons the product, there would be a net gain of ₹ 50,000 from the sale of scrap. All the financial values have been discounted to the present.

Required

(a) Draw a decision tree.

(b) Include figures for cost, loss or profit on the appropriate branches of the tree.

Solution:

The starting point for the tree is to establish what decision has to be made now. What are the options?

(a) To test market

(b) To abandon

The outcome of the 'abandon' option is known with certainty. There are two possible outcomes of the option to test market, positive response and negative response.

Depending on the outcome of the test marketing, another decision will then be made, to abandon the product or to go ahead.

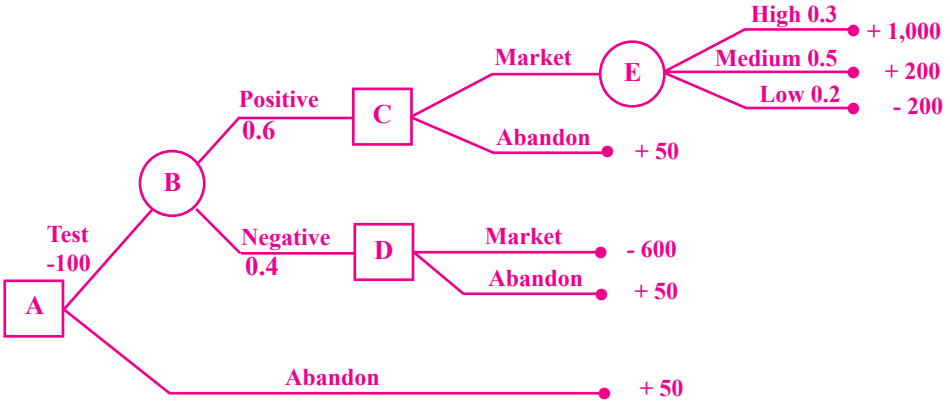

Figure 10.7 : Decision Making through Decision Tree Approach

Evaluating decisions by using decision trees has a number of limitations as follows:

(a) The time value of money may not be taken into account.

(b) Decision trees are not very suitable for use in complex situations.

(c) The outcome with the highest EV may have the greatest risks attached to it. Managers may be reluctant to take risks which may lead to losses.

(d) The probabilities associated with different branches of the 'tree' are likely to be estimates, and possibly unreliable or inaccurate.

Illustration 13 (Problem on Expected Value)

TT Newsagents stocks a weekly health magazine. The owner buys the magazines for ₹ 0.30 each and sells them at the retail price of ₹0.50 each.

At the end of the week unsold magazines are obsolete and have no value. The estimated probability distribution for weekly demand is shown below.

Weekly demand in units	Probability
20	0.20
30	0.55
40	0.25
	1.00

You are required to calculate the following:

(i) What is the expected value of demand?

(ii) If the owner is to order a fixed quantity of magazines per week how many should that be?

Assume no seasonal variations in demand.

Solution

EV of demand (units per week) = (20 × 0.20) + (30 × 0.55) + (40 × 0.25) = 30.5 units per week

The next step is to set up a decision matrix of possible strategies (numbers bought) and possible demand.

The 'pay-off' from each combination of action and outcome is then computed.

No sale = Cost of ₹ 0.30 per magazine

Sale = Profit of ₹ 0.20 per magazine (₹0.50 - ₹ 0.30)

Probability	Outcome (Numbers demanded)	Decision (Profit) (Numbers bought)		
		20	30	40
		₹	₹	₹
0.20	20	4.00	1.00*	(2.00)
0.55	30	4.00	6.00	3.00
0.25	40	4.00	6.00	8.00
	EV	4.00	5.00**	3.25

* Buy 30 and sell only 20 gives a profit of (20 × ₹0.5) – (30 × ₹0.3) = ₹1

** (0.2 ×1) + (0.55 × 6) + (0.25 × 6) = 5

The strategy which gives the highest expected pay-off is to stock 30 magazines each week.

Conclusion:

Probability is a numerical measurement of uncertainty. When a probability is based on counting and observed frequencies, it is objective. When a probability is an expression of whether an event in business will or will not occur, it may be based on the relative frequency of similar events having occurred in the past, or it may be based on someone's judgment. Either way, the determination of probability has strong subjective elements.

Therefore, the concept of probability as it is used in business is a numerical measure of the belief of an individual in the occurrence or non-occurrence of an event. The probability assigned to an event depends upon the information and knowledge that the decision-maker has and uses in assessing the probability. As such, probability assessment is clearly subjective, individual, and dependent upon information. In fact, it has been said that probability does not exist in any absolute or objective sense.

Thus, these statistical methods of dealing with risk and uncertainty are only means of obtaining a recommended decision alternative or an optimal strategy for the purpose of planning, budgeting, and decision-making. The actual results from the implementation of the decision will probably be quite different from the calculated expected value. The decision-maker's judgment is the deciding factor.

Illustration 14 (Problem on Probabilistic Budget)

The Profit Budget of ABC Company is given below:

Profit Budget for year ending 31st March 2022

		₹
Sales (1,00,000 units @ ₹10)		10,00,000
Variable costs:		
Manufacturing (₹ 5 per unit)	5,00,000	
Marketing (₹0.50 per unit)	50,000	5,50,000
Contribution:		4,50,000
Fixed costs:		
Manufacturing	2,00,000	
Marketing	50,000	
Administrative	1,00,000	3,50,000
Profit Before Tax		1,00,000
Tax (assumed at 50%)		50,000
Profit after Tax		50,000

Note: Manufacturing variable cost is:

₹ 5.10 per unit at volume of 80,000 units

₹ 5.00 per unit at volume of 1,00,000 units

₹ 4.80 per unit at volume of 1,10,000 units

The marketing manager has given the sales forecast as follows.

Probability 0.3 - 80,000 units

Probability 0.5 - 1,00,000 units

Probability 0.2 - 1,10,000 units

The production manager has indicated the variable manufacturing cost to be as follows:

Probability 0.2 - ₹ 5.10 per unit

Probability 0.6 - ₹ 5.00 per units

Probability 0.2 - ₹ 4.80 per units

The Management Accountant is to work out the profit Budget taking the above factors into account. All other costs are as given earlier.

Prepare a Probabilistic Budget.

Solution:

In the table below, a three-way forecast is given:

Description	**Pessimistic**	**Most Likely**	**Optimistic**
	₹	₹	₹
Sales	8,00,000	10,00,000	11,00,000
Variable Costs:			
Manufacturing	4,08,000	5,00,000	5,28,000
Marketing	40,000	50,000	55,000
Contribution	3,52,000	4,50,000	5,17,000
Fixed Costs:			
Manufacturing	2,00,000	2,00,000	2,00,000
Marketing	50,000	50,000	50,000
Administration	1,00,000	1,00,000	1,00,000
Profit Before Tax	2,000	1,00,000	1,67,000
Tax (assumed 50%)	1,000	50,000	83,500
Profit after Tax	1,000	50,000	83,500

The Probabilistic Profit Budget is shown below:

Budget

Volume	Variable Cost per unit	PAT	Joint probability (JP)	PAT×JP
80,000				
P = 0.3	5.10(P=0.2)	1,000	0.06	60
	5.00 (P=0.6)	5,000	0.18	900
	4.80 (P=0.2)	13,000	0.06	780
1,00,000				
P = 0.5	5.10 (P=0.2)	45,000	0.10	4,500
	5.00 (P=0.6)	50,000	0.30	15,000
	4.80(P=0.2)	60,000	0.10	6,000
1,10,000				
P = 0.2	5.10 (P=0.2)	67,000	0.04	2,680
	5.00 (P=0.6)	72,500	0.12	8,700
	4.80 (P=0.2)	83,500	0.04	3,340
EV				41,960

Thus, it can be observed that a realistic profit estimate will be ₹ 41,960 and not ₹ 50,000.

Illustration 15 (Statistical Measurements of Cash Flow Variability)

When forecasting cash flows for investment projects, we might make several sets of forecasts for each project to reflect the various alternative states of the economy that might ensue. If we are comparing two project proposals, both for one-year projects, we might make several forecasts for the cash flows, as follows:

	Project X	Project Y
	₹	₹
Economy in a deep recession	2,00,000	1,00,000
Economy in a mild recession	2,50,000	2,00,000
Economy stable	3,00,000	3,00,000
Economy in a minor expansion	3,50,000	4,00,000

Suppose economists forecast that the probability of a deep recession occurring next year is 5%, a mild recession

is 10%, a stable economy is 50%, a minor expansion is 25%, and a major expansion is 10%. Using these projections, we can calculate the expected value of the cash flows for both projects:

	Probability	Project X		Project Y	
	(P)	Cash Flow	CF x P	Cash Flow	CF x P
		₹	₹	₹	₹
Economy in a deep recession	5%	2,00,000	10,000	1,00,000	5,000
Economy in a mild recession	10%	2,50,000	25,000	2,00,000	20,000
Economy stable	50%	3,00,000	1,50,000	3,00,000	1,50,000
Economy in a minor expansion	25%	3,50,000	87,500	4,00,000	1,00,000
Economy in a major expansion	10%	4,00,000	40,000	5,00,000	50,000
Expected Value			**3,12,500**		**3,25,000**

The expected value of the cash flows for each of the two projects is simply a weighted average of the possible cash flows, with the weights being the probabilities of each occurrence. The expected value of Project Y's cash flows is higher than the expected value of Project X's cash flows.

The expected value is the average value, or mean, of the possible values. According to the data above, if the same cash flow could be repeated over and over again, 5% of the time the cash flow would be ₹ 2,00,000, 10% of the time it would be ₹ 2,50,000, and so forth. The weighted average of these potential cash flows is the expected value.

The problem with using expected value as a forecast for a specific project is that any given project has only one opportunity to achieve its cash flow for its duration and then the project is complete. The cash flow actually achieved for Project X could be anywhere from ₹ 2,00,000 to ₹ 4,00,000. Once one of the possible cash flows has been achieved, we will know that the probability of that cash flow occurring was 100% while the probability of the other cash flows occurring was zero.

An expected value is a "long-run" average value for a random variable. As a result, an expected value is more reliable as a long-run average forecast and less reliable as a forecast for the net cash flow for an individual project at any given moment in time.

Despite not being a reliable forecast, expected value is often used to project future cash flow from individual projects because it is the best method available for obtaining a forecast.

Illustration 16

A manager is considering whether to make product X or product Y, but only one can be produced. The estimated sales demand for each product is uncertain. A detailed investigation of the possible sales demand for each product gives the following probability distribution of the profits for each product.

Product X probability distribution

Outcome	Estimated Probability	Weighted Profit (₹)
Profits of ₹6,00,000	0.10	60,000
Profits of ₹7,00,000	0.20	1,40,000
Profits of ₹8,00,000	0.40	3,20,000
Profits of ₹9,00,000	0.20	1,80,000
Profits of ₹10,00,000	0.10	1,00,000
Expected value		**8,00,000**

Product Y probability distribution

Outcome	Estimated probability	Weighted Profit (₹)
Profits of ₹ 4,00,000	0.05	20,000
Profits of ₹ 6,00,000	0.10	60,000
Profits of ₹ 8,00,000	0.40	3,20,000
Profits of ₹ 10,00,000	0.25	2,50,000
Profits of ₹12,00,000	0.20	2,40,000
Expected value		**8,90,000**

Based on the information given, assumed to be perfect, the manger should make Product X, having higher expected value.

Since decision problems exist in an uncertain environment, it is necessary to consider those uncontrollable factors that are outside the decision-maker's control and that may occur for alternative courses of action. These uncontrollable factors are called events or states of nature. For example, in a product launch situation, possible states of nature could consist of events such as a similar product being launched by a competitor at a lower price, at the same price, at a higher price or no similar product being launched at all.

The likelihood that an event or state of nature will occur is known as its probability, and this is normally expressed in decimal form with a value between 0 and 1. A value of 0 denotes a nil likelihood of occurrence, whereas a value of 1 signifies absolute certainty – a definite occurrence. A probability of 0.4 means that the event is expected to occur four times out of ten. The total of the probabilities for events that can possibly occur must sum to 1.0.

For example, if an examiner indicates that the probability of a student passing an examination is 0.7 then this means that the student has a 60 per cent chance of passing the examination. Given that the pass/fail alternatives represent an exhaustive listing of all possible outcomes of the event, the probability of not passing the examination is 0.4.

The information can be presented in a probability distribution. A probability distribution is a list of all possible

outcomes for an event and the probability that each will occur. The probability distribution for the above example is as follows:

Outcome	Probability
Pass the examination	0.6
Do not pass examination	0.4
Total	1.0

Some probabilities are known as objective probabilities because they can be established mathematically or compiled from historical data. Tossing a coin and throwing a dice are examples of objective probabilities.

For example, the probability of heads occurring when tossing a coin logically must be 0.5. This can be proved by tossing the coin many times and observing the results. Similarly, the probability of obtaining number 1 when a dice is thrown is 0.166 (i.e. one-sixth). This again can be ascertained from logical reasoning or recording the results obtained from repeated throws of the dice.

It is unlikely that objective probabilities can be established for business decisions, since many past observations or repeated experiments for particular decisions are not possible; the probabilities will have to be estimated based on managerial judgement. Probabilities established in this way are known as subjective probabilities because no two individuals will necessarily assign the same probabilities to a particular outcome. Subjective probabilities are based on an individual's expert knowledge, past experience and observations of current variables that are likely to have an impact on future events. Such probabilities are unlikely to be estimated correctly, but any estimate of a future uncertain event is bound to be subject to error.

The advantage of this approach is that it provides more meaningful information than stating the most likely outcome.

EXERCISE

Theoretical Questions

Multiple Choice Question

1. A type of decision-making environment is
   - A Certainty
   - B. Uncertainty
   - C. Risk
   - D. All of these
2. Which of the following criterion is not used for decision-making under uncertainty?
   - A. Maximin
   - B. Maximax
   - C. Minimax
   - D. Minimize expected loss
3. Decision theory is concerned with
   - A. Methods of arriving at an optimal decision
   - B. Selecting optimal decision in a sequential manner
   - C. Analysis of information that is available
   - D. All of these
4. Which of the following criterion is not applicable to decision-making under risk?
   - A. Maximize expected return
   - B. Maximize return
   - C. Minimize expect regret
   - D. Knowledge of likelihood occurrence of each state of nature
5. The minimum expected opportunity loss (EOL) is
   - A. Equal to EVPI
   - B. Minimum regret
   - C. Equal to EMV
   - D. Both (A) and (B)
6. The expected value of perfect information (EVPI) is
   - A. Equal to expected regret of the optimal decision under risk

B. The utility of additional information

C. Maximum expected opportunity loss

D. None of the above

7. The value of the coefficient of optimism (a) is needed while using the criterion of

A. Equally likely

B. Maximin

C. Realism

D. Minimax

8. The decision-maker's knowledge and experience may influence the decision-making process wi.en using the criterion of

A. Maximax

B. Maximax regret

C. Realism

D. Maximin

9. The difference between the expected profit under conditions of risk and the expected profit with perfect information is called

A. The expected value of perfect information

B. Expected marginal loss

C. None of the above

D. Any one of the above

10. A situation in which a decision maker knows all of the possible outcomes of a decision and also knows the probability associated with each outcome is referred to as

A. Certainty.

B. Risk.

C. Uncertainty.

D. Strategy.

11. Which of the following methods of selecting a strategy is consistent with risk averting behaviour?

A. If two strategies have the same expected profit, select the one with the smaller standard deviation.

B. If two strategies have the same standard deviation, select the one with the smaller expected profit.

C. Select the strategy with the larger coefficient of variation.

D. All of the above are correct.

12. Which one of the following does not measure risk?
    A. Coefficient of variation
    B. Standard deviation
    C. LPP
    D. All of the above are measures of risk.
13. A situation in which a decision maker must choose between strategies that have more than one possible outcome when the probability of each outcome is unknown is referred to as
    A. Diversification.
    B.. Certainty.
    C. Risk.
    D. Uncertainty.
14. If a decision maker is risk averse, then the best strategy to select is the one that yields the
    A. Highest expected payoff.
    B. Lowest coefficient of variation.
    C. Highest expected utility.
    D. Lowest standard deviation.
15. Circumstances that influence the profitability of a decision are referred to as
    A. Strategies.
    B. A payoff matrix.
    C. States of nature.
    D. the marginal utility of money.
16. A strategy that yields an expected monetary payoff of zero is called a
    A. Risk-neutral strategy.
    B. Fair game.
    C. Zero-sum game.
    D. Certainty equivalent
17. A matrix that, for each state of nature and strategy, shows the difference between a strategy's payoff and the best strategy's payoff is called
    A. A maximin matrix.
    B. A minimax regret matrix.
    C. A payoff matrix.
    D. An expected utility matrix.

18. The sequence of possible managerial decisions and their expected outcome under each set of circumstances can be represented and analysed by using

    A. The minimax regret criterion.

    B. A decision tree.

    C. A payoff matrix.

    D. Simulation.

19. The expected value of perfect information is calculated by subtracting:

    A. The minimum expected opportunity loss from the expected opportunity loss with perfect information.

    B. The maximum EMV from the minimum expected opportunity loss.

    C. EVSI from the expected return with perfect information.

    D. The maximum EMV from the expected return with perfect information.

20. The maximin criterion is a feature of which of the following?

    A. Deterministic model

    B. Decision-making under uncertainty

    C. Optimization

    D. Decision-making under certainty

Answer:

1- D, 2-D, 3-D, 4-B, 5-D, 6- A, 7- C, 8- C, 9- A, 10- B, 11- A, 12- C, 13- D, 14- C, 15-C, 16-B, 17-B, 18-B, 19-A, 20- B.

⊙ State True or False

1. Decision theory provides a method for rational decision making when the consequences are not fully known.
2. Companies benefit most from considering their risks when they are performing well and when markets are growing in order to sustain growth and profitability.
3. A decision maker is risk neutral if he is concerned with what will be the most likely outcome.
4. The decision outcome resulting from the same information may vary from manager to manager as a result of their individual attitude to risk.
5. "Risk" can be defined in many ways. One definition has a negative connotation: "a condition in which there is a possibility of an adverse deviation from a desired outcome."
6. The variance and standard deviation both give an idea of the variability of the possible values about the mean.

7. Standard deviation is always expressed in the same units as the distribution.
8. Uncertainty is risk that can be measured.
9. If the occurrence or non-occurrence of one event does not change the probability of the occurrence of the other event, the two events are said to be independent.
10. The expected value of an action is found by multiplying the probability of each potential outcome by its payoff.

Answer:

1- True, 2- True, 3- True, 4- True, 5- True, 6- True, 7- True, 8-False, 9- True, 10-True.

⊙ Fill in the Blanks

1. ……is a term that means a weighted average of the possible values using the probabilities as the weights.
2. A ……. amount of future cash flow is often thought of as an absolute number.
3. Approaches have been developed to choose the best option when the decision maker has several …….and there is uncertainty with respect to future events.
4. If a decision maker can estimate the ……. of the future events, these should be incorporated into the decision model.
5. ……is knowledge about the future that would enable us to make the best choice today for any possible situation in the future.
6. …….is the systematic process of gathering, analysing and reporting data about markets to investigate, describe measure, understand or explain a situation or problem facing a company or organisation.
7. ……. can be either primary (collected at first hand from a sample of respondents), or secondary (collected from previous surveys, other published facts and opinions, or from experts).
8. …….data tells us why consumers think/buy or act the way they do.
9. ……tables identify and record all possible outcomes (or pay-offs) in situations where the action taken affects the outcomes.
10. The ……decision rule suggests that a decision maker should select the alternative that offers the least unattractive worst outcome.

Answer:

1- Expected value, 2- Budgeted, 3- alternatives, 4- Probabilities, 5- Perfect information, 6- Market research, 7- Data, 8- Qualitative, 9- Pay-off, 10- Maximin.

⊙ Short Essay Type Questions

1. Which are the risks faced by a company?
2. What are the determinants of the risks that a company faces?

3. What do you mean by Expected Value?
4. What is Uncertainty and Risk?
5. How a Decision Tree is constructed?
6. Briefly explain the concepts 'Perfect Information' and 'Value of Perfect Information.'?
7. What is risk in decision making?
8. What is the Difference between Risk and Uncertainty?

⊙ Essay Type Questions

1. What is Decision Theory and how is it related to other Theories?
2. What are the most important methods to quantify risk?
3. Outline important characteristics of the risk evaluation process
4. Discuss the goal in the decision-making process.
5. What do you mean by uncertainty in decision making?
6. Explain why it can be helpful to involve others when making decisions involving uncertainty.
7. What is a Decision Tree and what are its applications?
8. What do you mean by Expected Value and Perfect Information?
9. What are the examples of risk and uncertainty?

Practical Problems

⊙ Multiple Choice Question

1. A company is choosing which of three new products to make (A, B or C) and has calculated likely payoffs under three possible scenarios (I, II or III), giving the following payoff table.

Profit (Loss) Scenario	Product Chosen		
	A	B	C
I	20	80	10
II	40	70	100
III	50	(10)	40

Using maximax, which product would be chosen?

A. Product A

B. Product B

C. Product C

D. None of the Products

2. ABC Co is trying to set the sales price for one of its products. Three prices are under consideration, and expected sales volumes and costs are as follows.

Price per unit	₹4	₹4.30	₹4.40
Expected sales volume (units)			
Best possible	16,000	14,000	12,500
Most likely	14,000	12,500	12,000
Worst possible	10,000	8,000	6,000

Fixed costs are ₹20,000 and variable costs of sales are ₹2 per unit.

Which price should be chosen?

A. ₹ 4

B. ₹4.30

C. ₹4.40

D. Insufficient data

3. Suppose a manager has to choose between mutually exclusive options A and B, and the probable outcomes of each option are as follows.

Option A		Option B	
Probability	Profit (₹)	Probability	Profit (₹)
0.8	5,000	0.1	(2,000)
0.2	6,000	0.2	5,000
$ $		0.6	7,000
		1.1	8,000

The expected value (EV) of profit will be:

A. ₹ 6,000

B. ₹ 4,500

C. ₹ 5,800

D. None of the above

4. ABC stocks a weekly lifestyle magazine. The owner buys the magazines for ₹0.30 each and sells them at the retail price of ₹0.50 each.

At the end of the week unsold magazines are obsolete and have no value. The estimated probability distribution for weekly demand is shown below.

Weekly demand in units	Probability
20	0.20
30	0.55
40	0.25
	1.00

What is the expected value of demand?

A. 30

B. 20

C. 25

D. None of the above

5. A manager has to choose between mutually exclusive options C and D and the probable outcomes of each option are as follows.

Options C		Options D	
Probability	Cost	Probability	Cost
	₹		₹
0.29	15,000	0.03	14,000
0.54	20,000	0.30	17,000
0.17	30,000	0.35	21,000
		0.32	24,000

Both options will produce an income of ₹30,000. Which should be chosen?

A. Option C

B. Option D

C. No Option

D. Both the Options

6. Suppose a businessman is trying to decide which of three mutually exclusive projects to undertake. Each of the projects could lead to varying net profit under three possible scenarios.

	Profits Project		
	D	E	F
Scenarios			
I	100	80	60
II	90	120	85
III	(20)	10	85

Which Project is to be selected?

A. D

B. E

C. F

D. Insufficient data

7. A company is considering which one of three alternative courses of action, A, B and C to take. The profit or loss from each choice depends on which one of four economic circumstances, I, II, III or IV will apply. The possible profits and losses, in thousands of pounds, are given in the following payoff table. Losses are shown as negative figures.

		Action		
		A	B	C
Circumstance	I	70	60	70
	II	–10	20	–5
	III	80	0	50
	IV	60	100	115

Required:

State which action would be selected using each of the maximax and maximin criteria?

A. A

B. B

C. C

D. All of the above

8. Suppose that a manager is trying to decide which of three mutually exclusive projects to undertake. Each of the projects could lead to varying net profits which are classified as outcomes I, II and III. The manager has constructed the following payoff table or matrix (a conditional profit table):

	Net profit if outcome turns out to be		
Project	I	II	III
A	₹50,000	₹65,000	₹80,000
B	₹70,000	₹60,000	₹75,000
C	₹90,000	₹80,000	₹55,000
Probability	0.2	0.6	0.2

Required:

Which project would be chosen using EV?

A. A

B. B

C. C

D. None of the above

9. A manager is trying to decide which of three mutually exclusive projects to undertake. Each of the projects could lead to varying net costs which the manager calls outcomes I, II and III. The following payoff table or matrix has been constructed:

		Outcomes (not profit)		
		I (Worst)	II (Most likely)	III (Best)
Project	A	50	85	130
	B	70	75	140
	C	90	100	110

Which project should be undertaken under minimax regret rules?

A. A

B. B

C. C

D. Insufficient data

10. The management of LT Company must choose whether to go ahead with either of two mutually exclusive projects: A or B. The expected profits are as follows:

	Profit if there is strong demand	Profit/(loss) if there is weak demand
Option A	₹4,000	₹(1,000)
Option B	₹1,500	₹ 500
Probability of demand	0.3	0.7

Ascertain what the decision would be, based on expected values, if no information about demand were available.

A. A

B. B

C. A and B

D. None

Answer:

1- C, 2-A, 3-C, 4-A, 5-A, 6- C, 7- B, 8- C, 9- B, 10- B.

⊙ Comprehensive Numerical Questions

1. ABC Corporation is introducing a new product and must decide on a selling price. The variable cost per unit is ₹5.60. Senior management has narrowed the pricing alternatives to two choices:

   ₹14.50 or ₹ 8.20 per unit. Management estimates sales levels and the probability of attaining these levels as:

   Selling price of ₹ 8.20:

Units	Probability
15,000	5%
10,000	85%
8,000	10%

   Selling price of ₹ 14.50:

Units	Probability
4,700	5%
3,800	65%
2,600	30%

As the volume levels noted above are in the relevant range, fixed costs remain constant regardless of the selling price chosen.

Required:

1. Using a payoff table, calculate the optimal price ABC Corporation should charge.
2. Restate Part 1 using a decision tree.

2. 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 maximize his profit, what should be the quantity of stock that he should hold?

3. XYZ Co. is considering rearranging its plant to increase efficiency. If the rearrangement is completely successful, anticipated operating costs will be ₹ 200,000 per annum. If the rearrangement is partially successful, anticipated operating costs are expected to be ₹ 310,000. If unsuccessful, operating costs are anticipated to be ₹ 510,000. The probability of complete success is 50%, partial success 30% and failure 20%. If the company does not rearrange, operating costs will be ₹ 400,000.

Required

1. Prepare a payoff table (alternatives are rearrange or do not rearrange).
2. Restate requirement 1 in a decision tree format.
3. XYZ has an opportunity to hire a consultant who could predict the success rate with certainty. How much should XYZ Co. be willing to pay for such a report?

4. You own the rights to sell Rolls at the local park. The weather network predicts the probability of rain at 60% for the game coming up tomorrow. You have to decide today whether you will set up Roll stand inside or outside. If you set up outside and it does not rain, you expect to sell 800 hot dogs, but if it rains you will only sell 200 Rolls. If you set up inside and it does not rain, you will sell 300 hot dogs, but, if it rains, you will sell 700 Rolls. Each Roll generates a contribution margin of ₹2.

Required

a. Where should you set up, inside or outside?

b. What is the most you would pay someone to predict (with 100% accuracy) tomorrow's weather?

c. At what rain probability would you be indifferent between setting up inside or outside?

5. Bajaj Company is considering three alternative machines to produce a new product. The cost structures (unit variable costs plus avoidable fixed costs) for the three machines are shown below. The selling price is unaffected by the machine used.

   Single purpose machine ₹ 0.60 + ₹ 20,000

   Semi-automatic machine ₹ 0.40 + ₹ 50,000

   Automatic machine ₹ 0.20 + ₹ 120,000

   The demand for units of the new product is described by the following probability distribution:

Demand	Probability
200,000	0.4
300,000	0.3
400,000	0.2
500,000	0.1

   Required

   Calculate expected demand. Calculate the expected costs of using the semi-automatic machine.

   Which machine should be selected?

6. Your client, Alpha Ltd., wants your advice on which of two alternatives he should choose. One alternative is to sell an investment now for ₹ 10,000. Another alternative is to hold the investment three days; after which he can sell it for a certain selling price based on the following probabilities:

Selling Price (₹)	Probability
5,000	0.4
8,000	0.2
12,000	0.3
30,000	0.1

   Required

   Would you recommend selling the investment now or hold the investment for three days?

7. The TTC Company is considering hiring several new employees to handle an overload from a new contract. If the new people are not hired, there will be delays in the contract work. The following payoff matrix has been prepared for analysing whether new people are needed:

	Hire New New People	Do Not Hire People
Retain new customers	₹100,000	₹75,000
Lose new customers	₹25,000	₹50,000

   Based on past experience, the company expects to retain 75% of the new customers with no new hires.

Required

Calculate the expected profit for the "no hire" decision.

8. Cement Co is a company specialising in the manufacture of cement, a product used in the building industry. The company has found that when weather conditions are good, the demand for cement increases since more building work is able to take place. Cement Co is now trying to work out the level of cement production for the coming year in order to maximise profits. The company has received the following estimates about the probable weather conditions and corresponding demand levels for the coming year:

Weather	Probability	Demand
Good	25%	350,000 bags
Average	45%	280,000 bags
Poor	30%	200,000 bags

Each bag of cement sells for ₹ 9 and costs ₹ 4 to make. If cement is unsold at the end of the year, it has to be disposed of at a cost of ₹ 0·50 per bag. Cement Co has decided to produce at one of the three levels of production to match forecast demand. It now has to decide which level of cement production to select.

Required

Construct a pay-off table to show all the possible profit outcomes.

⊙ Unsolved Case

1. Suppose you are the Manager Cost of your company and you have to choose between mutually exclusive options A and B. The probable outcomes of each option are as follows.

Option A		Option B	
Probability	Profit	Probability	Profit
0.8	5,000	0.1	(2,000)
0.2	6,000	0.2	5,000

Explain how you can arrive at a decision, for selecting either Option A or Option B?

Key Terms

Conservatism : Conservatism is associated with risk aversion and prudence.

Coefficient of variation: A ratio measure of dispersion derived by dividing the standard deviation by the expected value.

Decision tree: A diagram showing several possible courses of action and possible events and the potential outcomes for each of them.

Decision rule: A decision rule is a function which maps an observation to an appropriate action.

Decision Maker : A decision maker is risk neutral if he is concerned with what will be the most likely outcome.

Events: In the context of risk and uncertainty, factors that are outside the decision-maker's control, also known as states of nature.

Expected value: A figure calculated by weighting each of the possible outcomes by its associated probability.

Expected value of perfect information: The maximum amount it is worth paying for additional information in an uncertain situation, calculated by comparing the expected value of a decision if the information is acquired against the expected value in the absence of the information.

Independent Events : If the occurrence or non-occurrence of one event does not change the probability of the occurrence of the other event, the two events are said to be independent.

Joint Probability: A joint probability, in probability theory, refers to the probability that two events will both occur. In other words, joint probability is the likelihood of two events occurring together.

Maximax criterion : A decision rule based on the assumption that the best possible outcome will always occur and the decision-maker should therefore select the largest payoff.

Maximin criterion: A decision rule based on the assumption that the worst possible outcome will always occur and the decision-maker should therefore select the largest payoff under this assumption.

Mutually Exclusive Events : Mutually exclusive events are things that can't happen at the same time.

Objective probabilities: Probabilities that can be established mathematically or compiled from historical data.

Pay-off : A Payoff Table is a listing of all possible combinations of decision alternatives and states of nature.

Probability: Probability gives us a numerical measurement of the likelihood that an event will occur.

Regret criterion: A decision rule based on the fact that if a decision-maker selects an alternative that does not turn out to be the best, he or she will experience regret and therefore decisions should be made that will minimize the maximum possible regret.

Risk: A term applied to a situation where there are several possible outcomes and there is relevant past experience to enable statistical evidence to be produced for predicting the possible outcomes.

Risk Seeker : A risk seeker is a decision maker who is interested in the best outcomes no matter how small the chance that they may occur.

Risk averse decision maker: A risk averse decision maker acts on the assumption that the worst outcome might occur.

Risk management: It is a systematic process of identifying and assessing company risks and taking actions to protect a company against them.

Standard deviation: The square root of the mean of the squared deviations from the expected value.

States of nature: In the context of risk and uncertainty, factors that are outside the decision maker's control, also known as events.

Subjective probabilities: Probabilities that are based on an individual's expert knowledge, past experience, and on observations of current variables which are likely to affect future events.

Uncertainty: A term applied to a situation where there are several possible outcomes and but there is little previous statistical evidence to enable probabilities to be attached to possible outcomes.

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