Paper 9 – Operations Management & Strategic Management

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Full Marks : 100 **Time allowed: 3 hours**

The figures in the margin on the right side indicate full marks.
This question paper has two sections.
Both the sections are to be answered subject to instructions given against each.

Section – I : (Operations Management)

1. (a) Choose the most correct alternatives: [1×10=10]

(i) The activity of specifying when to start the job and when to end the job is known as:
(A) Planning,
(B) Scheduling,
(C) Timing,
(D) Follow-up.

(ii) In an organization, the Production Planning and Control department comes under
(A) Planning department,
(B) Manufacturing department,
(C) personnel department,
(D) R&D department

(iii) In Production by service, the product undergoes the changes in:
(a) Shape and size of the surface,
(b) Shape of the surface only,
(c) Size of the surface only,
(d) Chemical and Mechanical properties.

(iv) Which of the following stages of Product Life cycle does attribute beginning of substantial increase in Sales and Profits?
(A) Introduction
(B) Growth
(C) Maturity
(D) Decline

(v) In an organisation the production planning and control department comes under:
(a) Planning department,
(b) Manufacturing department,
(c) Personal department,
(d) R & D department.

(vi) Reliability and per unit cost of which of the following spares are less?
(a) Regular spares
(b) Insurance spares
(c) Capital spares
(d) Rotable spares

(vii) Issuing necessary orders, and taking necessary steps to ensure that the time targets set in the schedules are effectively achieved is known as:
(a) Routing,
(b) Dispatching,
(c) Scheduling,
(d) Inspection.

(viii)Preventive maintenance is useful in reducing:

(a) Inspection Cost,
(b) Shutdown Cost,
(c) Cost of pre-mature replacement,
(d) Set-up cost of machine

(ix) Which one is NOT an index of productivity?

(a) Man-hour output
(b) Productivity ratio
(c) TQM
(d) Use of Financial Ratios

(x) Which of the following stages of Product Life Cycle does attribute beginning of substantial increase in Sales and Profits?

(a) Introduction.
(b) Growth.
(c) Maturity.
(d) Decline.

(b) Match the terms in Column I with the relevant terms in Column II [1×5=5]

Column I	Column II
(A) Inventory Control	(i) Turbo-Alternator
(B) Network Analysis	(ii) Crashing
(C) Aviation Fuel	(iii) Value Analysis
(D) Hydro-electricity	(iv) Stock Level
(E) Improvement in productivity	(v) Refinery

(c) State whether the following statements are True or False? [1×6=6]

(i) A Productivity Index is a device of expressing the ratio between outputs and the inputs of the resources numerically. ( )
(ii) It is desirable to conduct work measurement after method study. ( )
(iii) Increase in productivity leads to retrenchment of work force. ( )
(iv) The term "aesthetics" which appeals to the human sense does not add value to the product. ( )
(v) In general short term forecasting will be more useful in production planning. ( )
(vi) Production planning and control is essentially concerned with the control of finished goods. ( )

Answer:

1. (a) (i) (b)
(ii) (b)
(iii) (d)
(iv) (b)
(v) (b)
(vi) (a)
(vii) (b)
(viii) (b)
(ix) (c)
(x) (b)

(b)

Column I	Column II
(A) Inventory Control	(iv) Stock Level
(B) Network Analysis	(ii) Crashing
(C) Aviation Fuel	(v) Refinery
(D) Hydro-electricity	(i) Turbo-Alternator
(E) Improvement in productivity	(iii) Value Analysis

(c) (i) (True)
(ii) (True)
(iii) (False)
(iv) (False)
(v) (True)
(vi) (False)

2. (a) What are the characteristics of modern operation function? [6]

(b) (i) A workshop operates on 2 shifts of 8 hours per day. It has 10 machines. It works for 5 days in a week. Machine utilization is 90% and the efficiency of the machines is 85%. Calculate the designed/rated capacity of the workshop in standard hours.

(ii) An assembly line of an item A has the following output in a 10 week period:

Week No	Standard hours produced
1	350
2	375
3	380
4	400
5	300
6	325
7	340
8	370
9	390
10	350

Calculate the demonstrated capacity of the assembly line per week. [10]

Answer:

2. (a) Characteristics of Modern Operation Function:

The production management of today presents certain characteristics which make it look totally different from what it was during the past. Specifically, today's production system is characterised by at least four features.

1. Manufacturing as Competitive Advantage
In the past production was considered to be like any other function in the organisation. Where demand was high and production capacities were inadequate, the concern was to somehow muster all inputs and use them to produce goods which would be grabbed by market. But today's scenario is contrasting. Plants have excess capacities, competition is mounting and firms look and gain competitive advantage to survive and succeed. Interestingly, production system offers vast scope to gain competitive edge and firms intend to exploit the potential. Total Quality Management (TQM), Time-Based Competition, Business Process Re-engineering (BPRE), Just-in-Time (JIT), Focused Factory, Flexible Manufacturing Systems (FMS), Computer Integrated Manufacturing (CIM), and The Virtual Corporation are but only some techniques which the companies are employing to gain competitive advantage.

2. Services Orientation
   As was stated earlier, service sector is gaining greater relevance these days. The production system, therefore, needs to be organised keeping in mind the peculiar requirements of the service component. The entire manufacturing needs to be geared to serve (i) intangible and perishable nature of the services, (ii) constant interaction with clients or customers, (iii) small volumes of production to serve local markets, and (iv)need to locate facilities to serve local markets. There is increased presence of professionals on the production, instead of technicians and engineers.

3. Disappearance of Smokestacks Protective labour legislation, environmental movement and gradual emergence of knowledge based organisations have brought total transformation in the production system. Today's factories are aesthetically designed and built, environment friendly - in fact, they are homes away from homes. Going to factory everyday is no more excruciating experience, it is like holidaying at a scenic spot. A visit to ABB, L & T or Smith Kline and Beecham should convince the reader about the transformation that has taken place in the wealth creation system.

4. Small has Become Beautiful It was E.F. Schumacher who, in his famous book Small is Beautiful, opposed giant organisations and increased specialisation. He advocated, instead, intermediate technology based on smaller working units, community ownership, and regional workplaces utilising local labour and resources. For him, small was beautiful. Businessmen, all over the world, did not believe in Schumacher's philosophy. Inspired by economies of scale, industrialists went In for huge organisations and mass production systems.

(b) (i) Rated capacity of the workshop = No. of shifts × No. of hour's in each shift × No. of days / Week × No. of Machines × Utilization factor × Efficiency
= 2 × 8 × 5 × 10 × 0.90 × 0.85
= 612 standards hour per week.

(ii) Demonstrated capacity is the average of the total standard hours produced over a number of periods.
Total number of weeks = 10
Total standard hours produced = 3,580 standard hours.
Average per week = 3,580/10 = 358 standard hours.

3. (a) Linear Programming tools can be used in Management Application - Explain. [6]

(b) Solve the following assignment problem and obtain the minimum cost at which all the jobs can be performed.

Machinist	Job (Cost in '00 ₹)				
	1	2	3	4	5
A	25	18	32	20	21
B	34	25	21	12	17
C	20	17	20	32	16
D	20	28	20	16	27

[10]

Answer:

3. (a) Management Application of Linear Programming Tools
   (a) Portfolio Selection.
   (b) Financial Mix Strategy.
   (c) Profit Planning.
   (d) Media Selection.
   (e) Travelling Salesmen Problem.
   (f) Determination of equitable salaries.
   (g) Staffing problem.

(b) This problem is unbalanced since number of jobs in 5 while the number of workers is 4. We first balance it by introducing a dummy worker E, as shown Table in below:

Table: Balancing the Assignment Problem

Worker	Job				
	1	2	3	4	5
A	25	18	32	20	21
B	34	25	21	12	17
C	20	17	20	32	16
D	20	28	20	16	27
E	0	0	0	0	0

Obtain reduce cost values by subtracting the minimum value in each row from ever cell in the row. This Table is given in below:

Table: Reduced Cost Table 1

Worker	Job				
	1	2	3	4	5
A	~~7~~	~~0~~	~~14~~	~~2~~	~~3~~
B	22	13	9	0	5
C	~~4~~	~~1~~	~~4~~	~~16~~	~~0~~
D	4	12	4	0	11
E	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~

Since there is at least one zero in each row and column, we test it for optimality. Accordingly, lines are drawn. All zeros are covered by 4 lines, which is less than 5 (the order of the given matrix). Hence, we proceed to improve the solution. The least uncovered value is 4. Subtracting from every uncovered value and adding it to every value lying at the intersection of lines, we get the revised values as shown in Table.

Table: Reduced Cost Table 2

Worker	Job				
	1	2	3	4	5
A	7	[0]	14	~~6~~	3
B	18	~~9~~	5	[0]	1
C	~~4~~	~~1~~	~~4~~	~~20~~	[0]
D	[0]	~~8~~	~~8~~	~~8~~	~~7~~
E	~~8~~	~~8~~	[0]	~~4~~	~~8~~

The solution given in above table is optimal since the number of lines covering zeros matches with the order of the matrix. We can, therefore, proceed to make assignments. To begin with, since each of the columns has multiple zeros, we cannot stair making assignments considering columns and have, therefore, to look through rows. The first row has a single zero. Thus, we make assignment A-2 and cross out zero at E-2. Further, the second and the third rows have one zero each. We make assignments B-4 and C-5, and cross out zeros at D-4 and E-5. Now, both the rows left have two zeros each and so have both the columns. This indicates existence of multiple optimal solutions. To obtain the solutions, we select zeros arbitrarily and proceed as discussed below:

(i) Select the zero at D-1, make assignment and cross out zeros at D-3 and E-1 (as both, worker D and job, 1, are not available any more). Next, assign worker E to job 3, corresponding to the only zero left. Evidently, selecting the zero at E-3 initially would have the effect of making some assignments.

(ii) Select the zero at D = 3, make assignment and cross out zeros at D-1 and E-3. Next, make assignment of the only zero left at E-1. Obviously, selecting the zero at E-1 making assignment in the first place would lead to the same assignments.

To conclude, the problem has two optimal solutions as given below:

Solution 1		('00 ₹) Cost	Solution 2		('00 ₹) Cost
Worker	Job		Worker	Job	
A	2	18	A	2	18
B	4	12	B	4	12
C	5	16	C	5	16
D	1	20	D	3	20
Job Left	3		Job Left	1	
	Total	66		Total	66

4. (a) The following jobs have to be shipped a week from now (week has 5 working days):

Job	**A**	**B**	**C**	**D**	**E**	**F**
Number of day's work remaining	**2**	**4**	**7**	**6**	**5**	**3**

Sequence the jobs according to priority established by (a) least slack rule (b) critical ratio rule. [8]

(b) A company manufactures around 150 mopeds. The daily production varies from 146 to 154 depending upon the availability of raw materials and other working conditions.

Production per day	**Probability**
146	**0.04**
147	**0.09**
148	**0.12**
149	**0.14**
150	**0.11**
151	**0.10**
152	**0.20**
153	**0.12**
154	**0.08**

The finished mopeds are transported in a specially arranged lorry accommodating only 150 mopeds. Using following random numbers 80, 81, 76, 75, 64, 43, 18, 26, 10, 12, 65, 68, 69, 61, 57, simulate the process to find out:

(i) What will be the average number of mopeds waiting in the factory?

(ii) What will be the average number of empty spaces on the lorry? [8]

Answer:

4. (a) Calculation of slack:

Number of days unit clue date is 5 days for all jobs

Job	Slack	(days)
A	5 - 2	=3
B	5 – 4	=1
C	5 – 7	=(-2)
D	5 – 6	=(-1)
E	5 – 5	=0
F	5 - 3	=2

Sequence:

C	D	E	B	F	A
-2	-1	0	1	2	3

Critical ratio = (Due Date - Date Now)/ Lead Time Remaining
= (DD – DN)/LTR
= Available Time / Operation Time

Critical ratio for job A = 5/2 = 2.5
Critical ratio for job B = 5/4 = 1.25
Critical ratio for job C = 5/7 = 0.71
Critical ratio for job D = 5/6 = 0.83
Critical ratio for job E = 5/5 = 1.0
Critical ratio for job A = 5/3 = 1.67

Job having least critical ratio is given the first priority and so on.

Sequence:	C	D	E	B	F	A
Critical Ratio:	0.71	0.83	1.0	1.25	1.67	2.5

(b) (i) As a first step, we allocate random numbers 00-99 in proportion to the probabilities associated with the production of scooters per day, as shown in table

Table: Allocation of Random Numbers

Production per day	Probability	Cumulative Probability	Random Number Internal
146	0.04	0.04	00-03
147	0.09	0.13	04-12
148	0.12	0.25	13-24
149	0.14	0.39	25-38
150	0.11	0.50	39-49
151	0.10	0.60	50-59
152	0.20	0.80	60-79
153	0.12	0.92	80-91
154	0.08	1.00	92-99

Based on the given random numbers, we may simulate the production per day as shown in Table. Along with, the number of scooters waiting or number of empty spaces in the lorry for each day are indicated.

Table: Simulation Worksheet

Sl. No.	Random Number	Production	No. of Scooters waiting for space	No. of empty spaces in lorry
1	80	153	3	0
2	81	153	3	0
3	76	152	2	0
4	75	152	2	0
5	64	152	2	0
6	43	150	0	0
7	18	148	0	2
8	26	149	0	1
9	10	147	0	3
10	12	147	0	3
11	65	152	2	0
12	68	152	2	0
13	69	152	2	0
14	61	152	2	0
15	57	151	1	0
		Total	21	9

Average number of scooters waiting for space in the lorry = Total No. of scooters waiting for Space / Total number of days = 21/15 = 1.4

(ii) Average Number of empty spaces in the lorry = 9/15 = 0.6.

5. (a) Project with the following data is to be implemented. Draw the network and find the critical path.

Activity	Predecessor	Duration (days)	Cost (day)(₹)
A	--	2	50
B	--	4	50
C	A	1	40
D	B	2	100
E	A, B	3	100
F	E	2	60

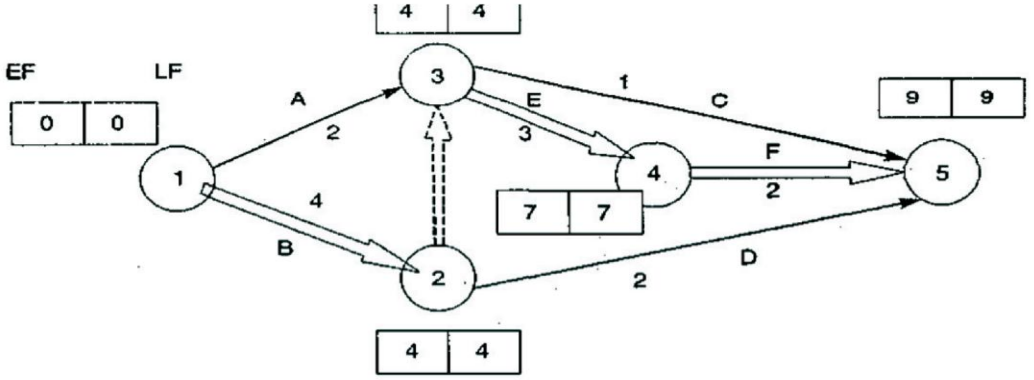
[8]

(i) What is the minimum duration of the project?
(ii) Draw a Gantt chart for early start schedule.
(iii) Determine the peak requirement money and day on which it occurs above schedule.

(b) Assume that at a bank teller window the customers arrive in their cars at the average rate of twenty per hour according to a poisson distribution. Assume also that the bank teller spends an average of two minutes per customer to complete a service, and the service time is exponentially distributed. Customers, who arrive from an infinite population, are served on a first-come-first served basis, and there is no limit to possible queue length.
(i) What is the expected waiting time in the system per customer?
(ii) What is the mean number of customers waiting in the system?
(iii) What is the probability of zero customers in the system?
(iv) What value is the utilization factor? **[8]**

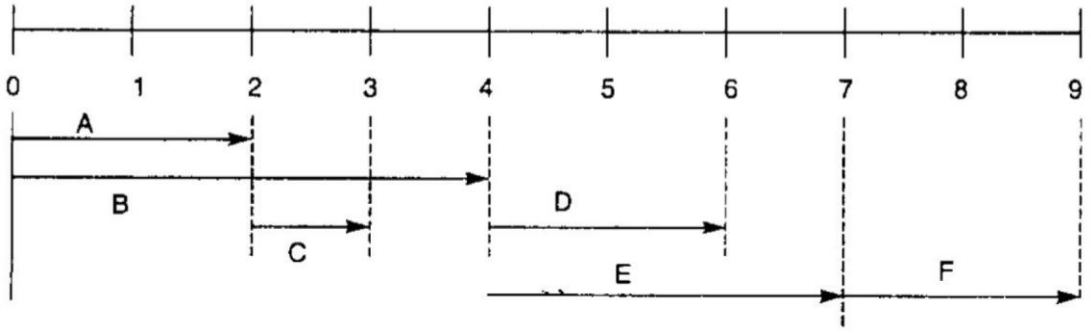
Answer:

5. (a)



Critical Path 1 – 2 – 3 – 4 – 5
Minimum time = 9

Activity	t	EX(EF – t)	EF	LS (LF – t)	LF	Event Slack (LS – ES) (LF – EF)	On Critical Path
A	2	0	2	2	4	2	No
B	4	0	4	0	4	0	Yes
C	1	4	5	8	9	4	No
D	2	4	6	7	9	3	No
E	3	4	7	4	7	0	Yes
F	2	7	9	7	9	0	Yes



(b) Here, arrival rate λ = 20 customers/hour,
Service rate μ = 30 Customers / hour
Thus, p = λ / μ = 20/30 = 2/3

(i) Expected waiting time in the system per customer,
$W_s = 1/(\lambda - \mu) = 1/(30 - 20) = 1/10$ hour or 6 minutes

(ii) Mean number of customers waiting in the system,
$L_q = p^2/(1 - p) = (2/3)^2/(1 – 2/3) = 4/3$

(iii) Probability of zero customers in the system.
$P(0) = 1 – p = 1 – 2/3 = 1/3$

(iv) Utilization factor, p = 2/3.

Section – II: (Strategic Management)

6. Choose the correct answer from the given alternatives: [1×6=6]

(i) Successful 'differential strategy' allows a company to
(A) Gain buyer loyalty to its brands
(B) Charge too high a price premium
(C) Have product quality that exceeds buyers' needs
(D) Depend only on intrinsic product attributes.

(ii) For an actor in Bollywood, his outstanding performance would be a /an
(A) Asset
(B) Strategic Asset
(C) Core competency
(D) Capability.

(iii) A Strategic Business Unit (SBU) is defined as a division of an organization:
(A) That help in the marketing operations
(B) That enable managers to have better control over the resources
(C) The help in the choice of technology
(D) That help in the allocation of scare resources
(E) That help in identifying talents and potentials of people

(iv) Intensity of competition is _____ in low return industries
(A) low.
(B) non-existent.
(C) high.
(D) not important dependent on industry nature.

(v) The strategy of the TATA group in India could be viewed as a good example of
(A) Conglomerate diversification
(B) Market development
(C) Cost Leadership
(D) Concentric diversification

(vi) Blue Ocean Strategy is concerned with
(A) moving into new market with new products
(B) creating a new market places where there is no competition
(C) developments of products and markets in order to ensure survival
(D) making the product unique in terms of attributes

Answer:

6. (i) (A)
(ii) (C)
(iii) (B)
(iv) (C)
(v) (A)
(vi) (B)

Answer any one question form the following:

7. (a) Discuss about "Product Development Strategy".

(b) Enlist the advantage of strategic Management. [6+6]

Answer:

7. (a) Product Development Strategy:

This involves extending the product range available to the firm's existing markets. These products may be obtained by:

(i) investment in the research and development of additional products;
(ii) acquisition of rights to produce someone else's product;
(iii) buying-in the product and 'badging' it;
(iv) joint development with owners of another product who need access to the firm's distribution channels or brands.

The critical factor to the success of this strategy is the profitability of the customer group for which the products are being developed. Also the firm's present competitive advantages in serving the market must confer on to the new good. These can include:

(i) customer information that allows accurate targeting;
(ii) established distribution channels;
(iii) a brand which can be credibly applied to the new product.

(b) The Advantages of Strategic Management

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

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

- Provides a Framework for Decision-Making
  Strategy provides a framework within which all staff can make day-to-day operational decisions and understand that those decisions are all moving the organization in a single direction.

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

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

8. (a) What are the areas to keep in mind while framing strategy to motivate employees?

(b) Discuss about "Types of Strategic Control System". [6+6]

Answer:

8. (a) While designing strategy to motivate employees, the management must bear in mind the following cardinal principles:

(a) All reasonably healthy adults have a considerable reservoir of potential energy. Differences in the total amount of potential energy are important determinants of motivation.

(b) All adults have a number of basic motives which can be thought of as values or outlet that channel and regulate the flow of potential energy from this reservoir.

(c) Most adults within a given socio-cultural system may have the same set of motives or energy outlets that channel and regulate the flow of potential energy from this reservoir.

(d) Actualisation of motive depends on specific situation in which a person finds himself.

(e) Certain characteristics of a situation arouse or trigger different motives, opening different values or outlets. Each motive or energy outlet is responsive to a different set of situational characteristics.

(f) Each motive leads to a different pattern of behaviour.

(g) By changing the nature of the situational characteristics or stimuli, different motives are aroused or actualised resulting in the emerging of distinct different patterns of behaviour.

(b) Types of Strategic Control Systems:

- **Personal Control**
  It is the desire to shape and influence the behaviour of a person in a face to face interaction in order to achieve the organisation's goals. Direct supervision is the most common form of personal control as it helps in identifying the problems faced by subordinates and better man management. Personal control may also come from group of peers when people work in teams. Here personal control is all about possibility of learning to occur and competencies to develop.

- **Output control**
  This system involves the estimation and forecasting of appropriate performance goals for each unit/division, department and employees and then measure the actual performance relative to these goals. It is often observed that the organisation's reward system is linked to performance on these goals. It can therefore be concluded that the output control system also provides an incentive structure for motivating employees at all levels of the organisation.

- **Behaviour control**
  The establishment of a comprehensive system of rules and procedures to direct the actions or behaviour of divisions, functions and individuals is called behaviour control. The main purpose of having behaviour control is not to specify goals but to standardise the way of reaching them. It is felt that if rules are standardised then outcomes are predictable. It is of utmost importance that the management reviews behaviour controls over time. The rules that have been established tend to increase over time leading to inflexibility to react to the changing environment thereby adversely affecting the organisation's competitive advantage.

9. Write short notes on any three of the following four questions: [4×3=12]

(a) Strategic Management Framework;

(b) Mc Kinsey's 7 –s Frame work;

(c) Marketing Mix;

(d) Theory X and Theory Y.

Answer:

9. (a) Strategic Management Framework:

The basic framework of strategic management involves five stages:

Stage 1: In this stage, organisation analyse about their present situation in terms of their Strengths, Weaknesses, Opportunities and Threats.

Stage 2: In this stage, organisations setup their missions, goals and objectives by analysing where they want to go in future.

Stage 3: In this stage organisation analyses various strategic alternatives to achieve their goals and objectives. The alternatives are analysed in terms of what business portfolio/ product mix to adopt, expansion, merger, acquisition and divestment options etc are analysed to achieve the goals.

Stage 4: In this organisations select the best suitable alternatives in line with their SWOT analysis.

Stage 5: This is implementation stage in which organisation implement and execute the selected alternatives to achieve their strategic goals and objectives.

Stage 1: Where are we now? Analysis of present situation

Stage 2: Where we want to go? Setting goals and objectives for future

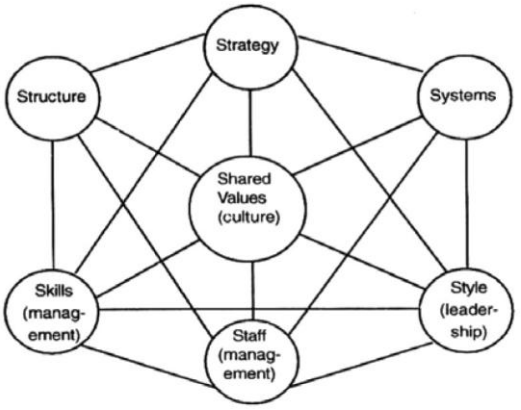
Stage 3: Analyses of various alternatives to achieve the goals and objectives

Stage 4: Selecting best alternatives in line with strengths of organisation

Stage 5: Implementing and executing the selected alternatives and monitoring of the same overtimes

(b) Mc Kinsey's 7 –s Frame work;

Strategy is dependent on many variables – Internal as well as external. All factors are interrelated.



The Mckinsey Company, a well known management consultancy firm in the United States, towards the end of 1970s was asked to find a solution to this knotty issue. The researchers Peters and Waterman found after examining America's best run companies that the problem in strategy lay in its implementation and structure was only one lever in the hands of management. The other levers were systems, staff, style, skills and super ordinate goals. A strategy is usually successful when the other S's in the 7-S framework fit into or support the strategy.

Strategy: A set of decisions and actions aimed at gaining a sustainable competitive advantage

- Structure: The organisation chart and associated information that shows who reports to whom and how tasks are both divided and integrated.
- Systems: The flow of activities involved in the daily operation of a business, including its core processes and its support systems.
- Style: How managers collectively spend their time and attention and how they use symbolic behaviour. How management acts is more important than what management says.
- Staff: How companies develop employees and shape basic values.

(c) Marketing mix is the pack of four sets of variables namely, product variables, price variables, promotion variables and place variable.

Marketing Mix refers to the appointment of effort, the combination, designing and integration of the elements of marketing into a programme or mix which, on the basis of an appraisal of the market forces will best achieve the objectives of an enterprise at a given time.

Kotler defines the marketing mix as the set of controllable variables and their levels that the firm uses to influence the target market. Such variables are:

(i) Product
(ii) Place
(iii) Price and
(iv) Promotion In addition, for service-there are three more P's

They are:

(i) People
(ii) Processes and
(iii) Physical evidence.

(d) Theory X and Theory Y: Another motivation strategy involves manager's assumptions about the nature of people. Douglas McGregor identified two sets of assumptions. According to him, Theory X involves negative assumptions that managers often use as the basis for dealing with people. Theory Y represents positive assumptions which managers strive to use. The basic rationale for using Theory Y rather than Theory X in most situations is that managerial activities reflect Theory X assumptions. As such, the activities based on Theory Y assumptions generally are more successful in motivating organisation people than those based on Theory X assumptions.