Paper - 9 : OPERATIONS MANAGEMENT & STRATEGIC MANAGEMENT

Paper – 9 : Operation Management and Strategic Management

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 : (Operation Management)

1. (a) Choose the most correct alternative: **[1×10]**

(i) Which one is NOT an index of Productivity?
- **(A) Man-hour output**
- **(B) Productivity ratio**
- **(C) TQM**
- **(D) Use of Financial Ratios**

(ii) 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**

(iii) 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**

(iv) In an organization, the Production Planning and Control department comes under
- **(A) Planning department**
- **(B) Manufacturing department**
- **(C) Personnel department**
- **(D) R & D department**

(v) Preventive maintenance is useful in reducing
- **(A) Inspection Cost**
- **(B) Cost of premature replacement**
- **(C) Shutdown Cost**
- **(D) Set-up Cost of machine**

(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)Long range forecasting is useful in:

(A) Plan for research and development

(B) To schedule jobs in job production

(C) In purchasing the material to meet the present production demand

(D) To access man power required in the coming month

(viii) The act of releasing the production documents to production department is known as:

(A) Routine

(B) Scheduling

(C) Expediting

(D) Dispatching

(ix) The method used in scheduling a project is:

(A) A schedule of break-down of orders

(B) Outline master programme

(C) PERT & CPM

(D) Schedule for large and integrated work.

(x) Most suitable layout for continuous production is:

(A) Line layout

(B) Process layout

(C) Group technology

(D) Matrix layout

(b) Match the terms in Column I with the relevant terms in Column II-(ANY Six) [1×6]

Column I	Column II
(A) Electricity	(i) Blast Furnace
(B) Petrol	(ii) Generator
(C) Iron	(iii) Refinery
(D) Cloth	(iv) Assembly Line
(E) Car	(v) Smithy
(F) Cotton Yarn	(vi) Spinning Mill
(G) Forgings	(vii)Power Loom

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

(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) (C)
(ii) (B)
(iii) (B)
(iv) (B)
(v) (C)
(vi) (A)
(vii) (A)
(viii) (D)
(ix) (C)
(x) (A)

Answer: 1 (b)

Column I	Column II
(A) Electricity	(ii) Generator
(B) Petrol	(iii) Refinery
(C) Iron	(i) Blast Furnace
(D) Cloth	(vii) Power Loom
(E) Car	(iv) Assembly Line
(F) Cotton Yarn	(vi) Spinning Mill
(G) Forgings	(v) Smithy

Answer: 1 (c)

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

2. (a) What are the characteristics of modern operation function? [8]

(b) With the help of following data project the trend of sales for the next five years:

Year	2002	2003	2004	2005	2006	2007
Sales (in lakhs)	100	110	115	120	135	140

[8]

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.

2. (b) Computation of trend values of Sales

Year	Time deviations from the middle of 2004 and 2005 assuring 5 years = 1	Sales (in lakh `)	Squares of time deviation	Product of time deviation and sales
	X	Y	X^2	XY
2002	-5	100	25	-500
2003	-3	110	9	-330
2004	-1	115	1	-115
2005	+1	120	1	+120
2006	+3	135	9	+405
2007	+5	140	25	+700
n = 6	$\sum X = 0$	$\sum Y = 720$	$\sum X^2 = 720$	$\sum XY = 280$

Regression equation of Y on X:

$$Y = A + BX$$

To find the values of a and b

$$a = \frac{\sum Y}{n} = \frac{720}{6} = 120$$

$$b = \frac{\sum XY}{\sum X^2} = \frac{280}{70} = 4$$

Sales forecast for the next years, i.e., 2008 to 2012

Y_{2008} = 120 + 4 (+7) = 120 + 28 = ₹ 148 lakhs

Y_{2009} = 120 + 4 (+9) = 120 + 36 = ₹ 156 lakhs

Y_{2010} = 120 + 4 (+11) = 120 + 44 = ₹ 164 lakhs.

Y_{2011} = 120 + 4 (+13) = 120 + 52 = ₹ 172 lakhs.

Y_{2012} = 120 + 4 (+15) = 120 + 60 = ₹ 180 lakhs.

3. (a) Linear Programming tools can be used in Management Application – Explain. [4]

(b) A pension fund manager is considering investing in two shares A and B. It is estimated that:

(i) Share A will earn a dividend of 12% per annum and share B 4% per annum.

(ii) Growth in the market value in one year of share A will be 10 paise per ₹1 invested and in B 40 paise per ₹1 invested.

He required investing the minimum total sum which will give:

Dividend income of at least ₹600 per annum and growth in one year of at least ₹1,000 on the initial investment.

Your are required to:

(i) State the mathematical formulation of the problem

(ii) Compute the minimum sum to be invested to meet the manager's objective. [8]

(c) What are the limitations of Linear Programming? [4]

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.

Answer: 3(b)

Share	Dividend	Growth in Rs.
A	12%	10/100 = 0.1
B	4%	40/100 = 0.4
Min-income	600	1000

Let x_1 be the amount invested on share A

Let x_2 be the amount invested on share B

Objective function: Min. $Z = x_1 + x_2$

Subject to Constraints:

$0.12\ x_1 + 0.04\ x_2 \geq 600$

$0.1\ x_1 + 0.4\ x_2 \geq 1000$

And $x_1 , x_2 \geq 0$.

Answer: 3(c)

Although linear programming is a very useful technique for solving optimization problems, there are certain important limitations in the application of linear programming. Some of these are discussed below:

1. Firstly, the linear programming models can be applied only in those situations where the constraints and the objective function can be stated in terms of linear expressions.
2. In linear programming problems, coefficients in the objective function and the constraint equations must be completely known and they should not change during the period of study.
3. Yet another important limitation of linear programming is that it may give fractional valued answers.
4. Linear programming will fail to give a solution if management have conflicting multiple goals.
5. Linear programming problem requires that the total measure of effectiveness and total resource usage resulting from the joint performance of the activities must equal the respective sums of these quantities resulting from each activity being performed individually.
6. Many real-world problems are so complex, in terms of the number of variables and relationships constrained in them, that they tax the capacity of even the largest computer.
7. Other limitations of LP includes:- - Does not take into consideration the effect of time and uncertainty. - Parameters appearing in the model are assumed to be constants but in real-life situations they are frequently neither known nor constants.

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 bakery keeps stock of a popular brand of cake. Previous experience shows the daily demand pattern for the item with associated probabilities, as given below:

Daily demand (number)	**0**	**10**	**20**	**30**	**40**	**50**
Probability	**0.01**	**0.20**	**0.15**	**0.50**	**0.12**	**0.02**

Use the following sequence of random numbers to simulate the demand for next 10 years.

Random numbers: 48, 78, 19, 51, 56, 77, 15, 14, 68, 9.

Also estimate the daily average demand for the cakes on the basis of simulated data. [8]

Answer: 4 (a)

(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

$$\text{Critical ratio} = \frac{\text{Due Date - Date Now}}{\text{Lead Time Remaining}} = \frac{\text{DD - DN}}{\text{LTR}} = \frac{\text{Available Time}}{\text{Operation Time}}$$

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

Answer: 4 (b)

According to the given distribution of demand, the random number coding for various demand levels is shown in below

Demand	Probability	Cumulative probability	Random number interval
0	0.01	0.01	00
10	0.20	0.01 + 0.20 = 0.21	01 – 20
20	0.15	0.21 + 0.15 = 0.36	21 – 35
30	0.50	0.36 + 0.50 = 0.86	36 – 85
40	0.12	0.86 + 0.12 = 0.98	86 – 97
50	0.02	0.98 + 0.02 = 1.00	98 - 99

The simulation experiment is now conducted for demand by taking a sample of 10 random numbers from a table of random numbers.

The simulated demand for the cakes for a period of 10 days is given in adjoining table

SIMULATION EXPERIMENT WORKSHEET

Day	Random number	Demand
1	48	30

2	78	30
3	19	10
4	51	30
5	56	30
6	77	30
7	15	10
8	14	10
9	68	30
10	09	10
Total	-	220

Expected demand, on the basis of simulated data. = 220/10 = 22 cakes/day.

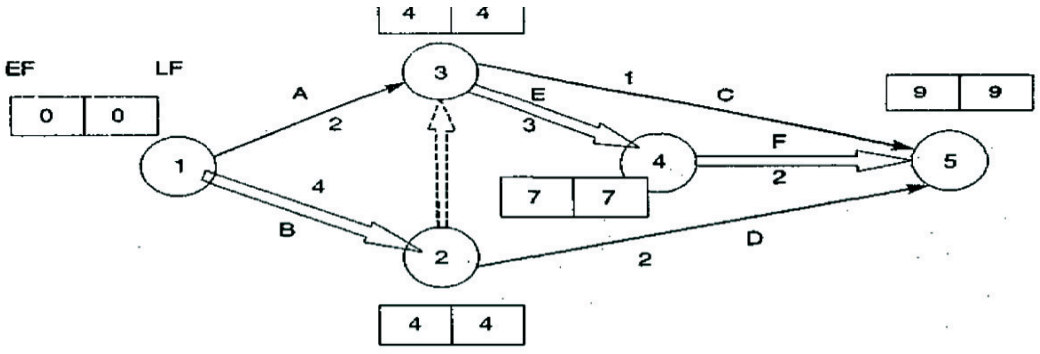
5. (a) Project with the following data is to be implemented. Draw the network and find the critical path.

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**

1. **What is the minimum duration of the project?**
2. **Draw a Gantt chart for early start schedule.**
3. **Determine the peak requirement money and day on which it occurs above schedule.** **[6]**

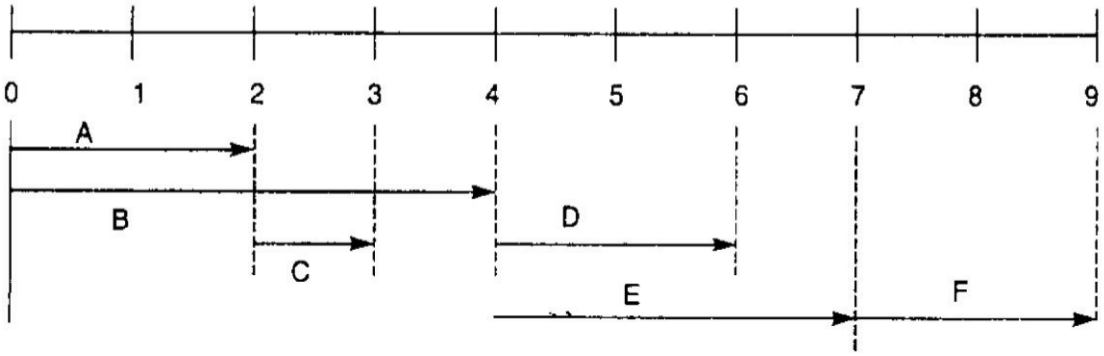
(b) Indian Electronics, manufactures TV sets and carries out the picture tube testing for 2000 hours. A sample of 100 tubes was put through this quality test during which two tubes failed. If the average usage of TV by the customer is 4 hours/day and if 10,000 TV sets were sold, then in one year how many tubes were expected to fail and what is the mean time between failures for these tubes? **[10]**

Answer: 5(a)



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

Activity	t	ES(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



Answer: 5(b)

The total test time = (100 tubes) × 2,000 hours = 200,000 tube- hours.

There are two tubes which have failed and hence the total time is to be adjusted for the number of hours lost due to the failures during the testing.

The lost hours are computed as = $2 \times \frac{2,000}{2}$ = 2,000 hours.

The assumption is made here is that each of the failed tubes have lasted average of half of the test period.

Therefore, the test shows that there are two failures during (2,00,000 – 2,000) = 1,98,000 tube hours of testing.

During 365 days a year (four hours a day) for 10,000 tubes the number of expected failures

$\frac{2}{1,98,000} \times 10,000 \times 365 \times 4 = 147.47$ tubes approximately.

Mean time between failures = $\frac{1,98,000 \text{ tubes hrs. of testing}}{2 \text{ failure}}$ = 99,000 tubes hours per failure = 99,000/4 × 365 = 67.8 tubes year per failure.

Section – B

6. Choose the correct answer: **[1*6]**

(i) McKinsey's 7-s Framework does not include

A. Skills

B. Structure

C. SBU

D. Shared Values.

(ii) Typical profits are highest in which stage of the industry life-cycle?

A. Introduction
B. Growth
C. Maturity
D. Decline

(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 scarce 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) Successful differentiation strategy allows the company to:

A. gain buyer loyalty to its brands
B. charge too high a price premium
C. depend only on intrinsic product attributes
D. have product quality that exceeds buyers needs
E. segment a market in to distinct group of buyer

(vi) What are enduring statements of purpose that distinguish one business from other similar firms?

A. Policies
B. Mission statements
C. Objectives
D. Rules
A. Nature of ownership

Answer: 6

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

Answer any one question from the following:

7. (a) Discuss the different types of organizational structures. [6]

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

Answer: 7 (a)

The different types of **Organisational Structure** are stated below.

- **Functional Structure**
  The **Functional Structure** is characterized by the simultaneous combination of similar activities and the separation of dissimilar activities on the basis of function. The functional organization form is one of the most common organizational structures found in firms pursuing strategy of concentration or very high relatedness. A **Functional Structure** is most appropriate when the organization is small to medium in terms of size and relatively stable.
- **Geographic Structure**
  Another basic form structural grouping is **Geographic Structure** in which activities and personnel are grouped in terms of specific geographic locations. Each geographic unit includes all functions required to produce and market products in that region.
- **Organization Structure**,
  According to geographic areas or territories, is rather a common structural form for the large-scale enterprises whose strategies need to be tailored keeping in mind the particular needs and features of different geographic locations.
- **Matrix Structure**
  Another way to achieve focus on multiple outcomes is to go for the **Matrix Structure**. The **Matrix Structure** creates a dual chain of command; two lines of budget authority and two sources of performance and reward. The key feature of the **Matrix Structure** is that the product (or the business) and functional lines of authority are overlaid to form a Matrix or grid between the product manager and the functional manager.
- **Hybrid Organization**
  A single type of structural design is not always sufficient to meet the requirements of the strategy. When this occurs, one opinion is to mix and blend the basic organizations forms, matching structure to strategy, requirement by requirement and unit by unit. **Hybrid Structure** is a form of departmentalization that adopts parts of both functional structure and divisional structure at the same level of management.
  The potential advantage of the **Hybrid Structure** is that the combination may allow the firm to gain the advantages offered by the primary structures while, at least, diminishing the impact of the disadvantages.

Answer: 7 (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) Distinguish between Strategic Planning and Strategic Management. [6]

(b) Discuss about 'Marketing Mix'. [6]

Answer: 8 (a)

Strategic Management and Strategic Planning : Distinction

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

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

Answer: 8 (b)

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

―Marketing Mixǁ 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.

9. Write a short note of the following three questions: [4*3]

(a) Strategic Management Framework;

(b) Mc Kinsey's 7 –s Frame work;

(c) Business Process Re-engineering;

(d) Matrix Organization Structure.

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.

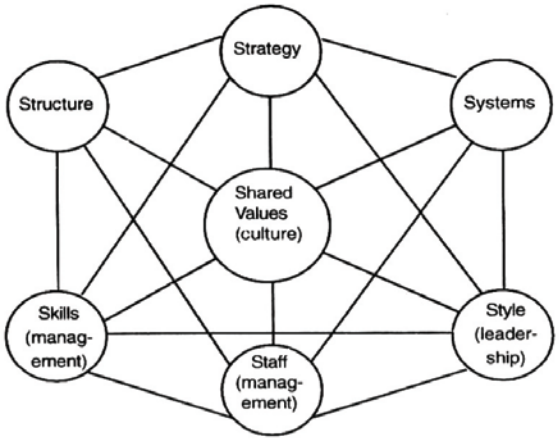
Stage 4: In this organisations select the best suitable alternatives in line with their SWOT analysis .

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 managementconsultancy 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 superordinate 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) Business Process re- engineering:

It is a business management strategy, originally pioneered in the early 1990s, focusing on the analysis and design of workflows and processes within an organisation. **Business Process Reengineering** (**BPR**) aims to help organisations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world-class competitors. **BPR** seeks to help companies radically restructure their organisations by focusing on the ground-up design of their business processes. It involves the redrawing of organisational boundaries, the reconsideration of jobs, tasks, and skills. This occurs with the creation and the use of models. Whether those are physical models or mathematical/ computer/ structural models, the engineers build and analyse models to predict the performance of designs or to understand the behaviour of devices. More specifically, **BPR** is defined as the use of scientific methods, models and tools to bring about the radical restructuring of an enterprise. That results in significant improvements in performance. Redesign, retooling and reorchestrating form the key components of **BPR** that are essential for an organisation to focus on the outcome that it needs to achieve.

(d) Matrix Organization Structure

To achieve focus on multiple outcomes is with the matrix structure. The matrix structure creates a dual chain of command; two lines of budget authority and two sources of performance and reward. The key feature of the matrix is that product (or business) and functional lines of authority are overlaid to form a matrix or grid, between the product manager and functional manager.