Paper 9 – OPERATIONS MANAGEMENT

&

STRATEGIC MANAGEMENT

Paper 9- OPERATIONS MANAGEMENT & 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 – A

1. (a) Choose the correct answer: **[1x10=10]**

(i) The lead-time is the time :
- **(a) To place holders for materials**
- **(b) Time of receiving materials**
- **(c) Time between receipt of material and using materials,**
- **(d) Time between placing the order and receiving the materials**

(ii) Variety reduction is generally known as :
- **(a) Less varieties**
- **(b) Simplification**
- **(c) Reduced varieties**
- **(d) None of the above**

(iii) To 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) Routine and Scheduling becomes relatively complicated in
- **(a) Job production**
- **(b) Batch production**
- **(c) Flow production**
- **(d) Mass production**

(v) The scope of production planning and control is :
- **(a) Limited to production of products only**
- **(b) Limited to production of services only**
- **(c) Limited to production of services and products only**
- **(d) Unlimited, can be applied to any type of activity**

(vi) The first stage in production planning is :
- **(a) Process Planning**
- **(b) Factory planning**
- **(c) Operating planning**
- **(d) Layout planning**

(vii) One of the product examples for Line Layout is :
- **(a) Repair Workshop**
- **(b) Welding Shop**
- **(c) Engineering College**
- **(d) Cement**

(viii) Cost reduction can be achieved through :
- **(a) Work sampling**
- **(b) Value analysis**
- **(c) Quality assurance**
- **(d) Supply chain management**

(ix) 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**

(x) 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**

(b) Match the products in column-I with production centers in column –II: [1x6=6]

I	II
(A) Furniture	**(a) Assembly line**
(B) Hydro-electricity	**(b) Refinery**
(C) Television set	**(c) Carpentry**
(D) Cement	**(d) Turbo-Alternator**
(E) Aviation Fuel	**(e) Rotary Kiln**
(F) Tools	**(f) Machine shop**

(c) State whether the following statements are True or False: [1x6=6]
- **(i) A good materials handling system always consists of conveyors ( )**
- **(ii) Increase in productivity leads to retrenchment of work force ( )**
- **(iii) Project costs increase as the duration of the project increases ( )**
- **(iv) Break-even analysis a management tool ( )**
- **(v) There is a limit beyond which labour productivity cannot be improved ( )**
- **(vi) Breakdown maintenance doesn't require use of standby machines ( )**

Answer:

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

(b)

I	II
(A) Furniture	(c) Carpentry
(B) Hydro-electricity	(d) Turbo-Alternator
(C) Television set	(a) Assembly line
(D) Cement	(e) Rotary Kiln
(E) Aviation Fuel	(b) Refinery
(F) Tools	(f) Machine shop

(c) (i) (F)
(ii) (T)
(iii) (T)
(iv) (T)
(v) (T)
(vi) (F)

Answer any three questions from the following: [3x16=48]

2. (a) What is forecasting? What are its advantages? [8]

(b) M/s Kobo Bearings Ltd., is committed to supply 24,000 bearings per annum to M/s. Deluxe Fans on a steady daily basis. It is estimated that it costs 10 paisa as inventory holding cost per bearing per month and that the setup cost per run of bearing manufacture is ₹ 324.
(i) What is the optimum run size for bearing manufacture?
(ii) What should be the interval between the consecutive Optimum runs?
(iii) Find out the minimum inventory holding cost. [8]

Answer:

2. (a) Forecasting is the process of making statements about events whose actual outcomes (typically) have not yet been observed.

A Forecast is a prediction of future events and their quantification for planning purposes. Forecasting involves the estimation of the trend in future variables sales, tastes or profit using both quantitative and judgment techniques whereas extrapolation is a purely statistical exercise. Forecasting includes the assessment of environmental changes and in this respect, forecasting assist in obtaining strategic fit.

The strategic environment of the firm consists of economic, political, legal, social and technological factors, which influence the ability of the organization to survive and make profits, examples of environmental variables with which a fit must be achieved include the following:
(a) The changing tastes of the customers
(b) Developments in the market demand for a product
(c) The likely trend of interest and exchange rates.

Forecasting can be more than just a numerical exercise on estimated trends. Whilst trends in price, interest rates, market growth rates and margins will involve numbers, other forecast does not;
(i) Value profiles are long range forecasts of consumers and social attitudes.
(ii) Geopolitical forecasts consider changes in national economic power and can alert the firm to new markets or potential competitive threats.

After all, the forecast that 'the political situation is unstable' is not quantitative but it would be relevant.

The important role which Forecasting plays in strategic planning is therefore to forewarn managers of possible changes in environmental factors. The long-term nature of strategic change means that effective forecasting is necessary to given the organization time to adopt and obtain a good fit with its environment.

(b) (a) Optimum run size or Economic Batch Quantity (EBQ)

$$= \sqrt{\frac{2 \times \text{Annual Output} \times \text{Setup Cost}}{\text{Annual Cost of Carrying one unit}}} = \sqrt{\frac{2 \times 24000 \times 324}{0.10 \times 12}} = 3600 \text{ units}$$

(b) Interval between two consecutive optimum runs = $\frac{\text{EBQ}}{\text{Monthly Output}} \times 3$

$= \frac{3600}{24000 \div 12} \times 30 = 54$ Calendar days

(c) Minimum inventory holding cost = Average inventory × Annual carrying cost of one unit of inventory
= (3600 ÷ 2) × 0.10×12 = ₹ 2,160.

3. (a) What does Product Design do? Discuss – Process design and selection. [6]

(b) A department works on 8 hours shift, 288 days a year and has the usage data of a machine, as given below:

Product	Annual Demand (units)	Processing time (standard time in hours)
A	325	5.0
B	450	4.0
C	550	6.0

Calculate:
(a) Processing time needed in hours to produce product A, B and C,
(b) Annual production capacity of one machine in standard hours, and
(c) Number of machines required. [10]

Answer:

3. (a) The activities and responsibilities of product design include the following:
(i) Translating customer needs and wants into product and service requirements (marketing).
(ii) Refining existing products (marketing).
(iii) Developing new products (marketing, product design and production).
(iv) Formulating quality goals (quality assurance, production).
(v) Formulating cost targets (accounting).
(vi) Constructing and testing prototype (marketing, production).
(vii) Documenting specifications (product design).

Process Design is concerned with the overall sequences of operations required to achieve the product specifications. It specifies the type of work stations to be used, the machines and equipments necessary to carry out the operations. The sequence of operations are determined by (a) the nature of the product, (b) the materials used, (c) the quantities to be produced and (d) the existing physical layout of the plant.

The process design is concerned with the following:
(i) Characteristics of the product or service offered to the customers.
(ii) Expected volume of output.
(iii) Kinds of equipments and machines available in the firm.
(iv) Whether equipments and machines should be of special purpose or general purpose.
(v) Cost of equipments and machines needed.
(vi) Kind of labour skills available, amount of labour available and their wage rates.
(vii) Expenditure to be incurred for manufacturing processes.
(viii) Whether the process should be capital-intensive or labour-intensive.
(ix) Make or buy decision.
(x) Method of handling materials economically.

(b) Step 1: Calculate the processing time needed in hours to produce product x, y and z in the quantities demanded using the standard time data.

Product	Annual demand (units)	Standard processing per unit (Hrs.)	Processing needed (Hrs.)
X	300	4.0	300 x 4 = 1200 Hrs.
Y	400	6.0	400 x 6 = 2400 Hrs.
Z	500	3.0	500 x 3 = 1500 Hrs.
			Total = 5100 Hrs

Step 2 : Annual production capacity of one machine in standard hours = 8 × 250 = 2000 hours per year

Step 3 : Number of machines required = $\frac{\text{Work load per year}}{\text{Production capacity per machine}} = \frac{5100}{2000}$ = 2.55 machines = 3 machines.

4. (a) Priyanshu enterprise has three factories at locations A, B and C which supply three warehouses located at E, E and F. Monthly factory capacities are 10, 80and 15 units respectively. Monthly warehouse requirements are 75, 20 and 50 units respectively. Unit shipping costs (in ₹) are given in the following table :

	To	D	E	F
	A	5	1	7
From	B	6	4	6
	C	3	2	5

The penalty costs for satisfying demand at the warehouses D, E and F are ₹ 5, ₹ 3 and ₹ 2 per unit respectively. Determine the optimum distribution for Priyanshu, using any of the known algorithms. [10]

(b) A small retailer has studied the weekly receipts and payments over the past 200 weeks and has developed the following set of information: [6]

Weekly Receipts (₹)	Probability	Weekly Payments (₹)	Probability
3,000	0.20	4,000	0.30
5,000	0.30	6,000	0.40
7,000	0.40	8,000	0.20
12,000	0.10	10,000	0.10

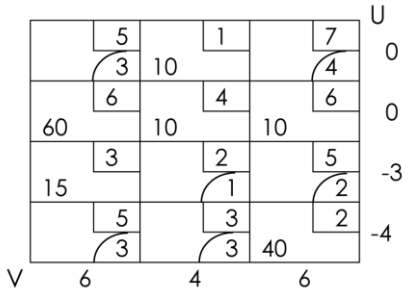
Using the following set of random numbers, simulate the weekly pattern of receipts and payments for the 12 weeks of the next quarter, assuming further that the beginning bank balance is ₹ 8,000. what is the estimated balance at the end of the 12 weekly period? What is the highest weekly balance during the quarter? What is the average weekly balance for the quarter?

Answer:

4. (a)

	D	E	F		
A	5	1 10	7 200	10/0	4*
B	6 60	4 10	6 10	80/0	2/2/2
C	3 15	2	5	15/0	1/1/1
Dummy D	5	3	2 40	40/0	1/1
	75	20	50		
	60	10	10		
	0	0	0		
	2	1	3		
	2	1	3*		
	3*	2	1		

Since there are m+n-1 allocations optimality test can be performed.
Since Δ ij ≥ 0, the solution is optimum.



		Quantity	Minimum Cost
A	E	10 x 1	10
	D	60 x 6	360
B	E	10 x 4	40
	F	10 x 6	60
C	D	15 x 3	45
Dummy	F	40 x 2	**80**
		145	**₹ 595**

(including Penalty cost of ₹ 80)

(b)

Range of random numbers							
Receipt (₹)	Probability	Cumulative probability	Range	Payments (₹)	Probability	Cumulative probability	Range
3000	0.20	0.20	0-19	4000	0.30	0.30	0-29
5000	0.30	0.50	20-49	6000	0.40	0.70	30-69
7000	0.40	0.90	50-89	8000	0.20	0.90	70-89
12000	0.10	1.00	90-99	10000	0.10	1.00	90-99

Simulation of Data for a period of 12 weeks					
Week	Random No. for receipt	Expected Receipt (₹)	Random No. for payment	Expected Payment (₹)	Week end Balance (₹)
Opening Balance					8000
1	03	3000	61	6000	5000 (8000 + 3000 – 6000)
2	91	12000	96	10000	7000
3	38	5000	30	6000	6000
4	55	7000	32	6000	7000
5	17	3000	03	4000	6000
6	46	5000	88	8000	3000
7	32	5000	48	6000	2000
8	43	5000	28	4000	3000
9	69	7000	88	8000	2000
10	72	7000	18	4000	5000
11	24	5000	71	8000	2000
12	22	5000	99	10000	(3000)

Estimated balance at the end of 12th week = ₹ (3,000)
Highest balance = ₹ 7,000
Average balance during the quarter = 45,000/12 = ₹ 3,750

5. (a) The following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1 – 2	**6**	**600**	**4**	**1,000**
1 – 3	**4**	**600**	**2**	**2,000**
2 – 4	**5**	**500**	**3**	**1,500**
2 – 5	**3**	**450**	**1**	**650**
3 – 4	**6**	**900**	**4**	**2,000**
4 – 6	**8**	**800**	**4**	**3,000**
5 – 6	**4**	**400**	**2**	**1,000**
6 – 7	**3**	**450**	**2**	**800**

The indirect cost per day is ₹100.

1. **Draw the network and identify the critical path.**
2. **What are the normal project duration and associated cost?** **[8]**

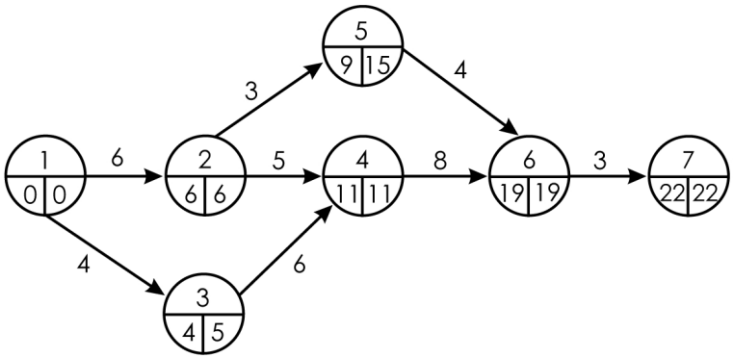
(b) A firm is using a machine whose purchase price is ₹15,000. The installation charges amount to ₹ 3,500 and the machine has a scrap value of only ₹1,500 because the firm has a monopoly of this type of work. The maintenance cost in various years is given in the following table: **[8]**

Year	1	2	3	4	5	6	7	8	9
Maintenance Cost (₹)	260	760	1100	1600	2200	3000	4100	4900	6100

The firm wants to determine after how many years should the machine be replaced on economic considerations, assuming that the machine replacement can be done only at the year end.

Answer:

5. (a) (i) The network for normal activity times indicates a project time of 22 weeks with the critical path 1-2-4-6-7.



(ii) Normal project duration is 22 weeks and the associated cost is as follows:
Total cost = Direct normal cost + Indirect cost for 22 weeks.
= 4,700 + 100 x 22 = ₹ 6,900.

(b) Cost of machine, C = ₹ 15,000 + ₹ 3,500 = ₹ 18,500
Scrap value, S = ₹ 1,500.

Year	Maintenance Cost, M_1 (₹)	Cumulative Maintenance Cost, ΣM_1 (₹)	C – S (₹)	Total Cost $T_{(n)}$ (₹)	Annual Cost $A_{(n)}$ (₹)
(i)	(ii)	(iii)	(iv)	(v)= (iii)+(iv)	(vi)=(v)/n
1	260	260	17,000	17,260	17,260
2	760	1,020	17,000	18,020	9,010
3	1,100	2,120	17,000	19,120	6,373
4	1,600	3,720	17,000	20,720	5,180
5	2,200	5,920	17,000	22,920	4,584
6	3,000	8,920	17,000	25,920	4,320
7	4,100	13,020	17,000	30,020	4,288*
8	4,900	17,920	17,000	34,920	4,365
9	6,100	24,020	17,000	41,020	4,557

Lowest average cost is ₹4,288 approx., which corresponds to n = 7 in above table. Thus machine needs to be replaced every 7th year.

Section – B

6. Choose the correct answer: **[6x1=6]**

(i) Benchmarking is :
(a) The analytical tool to identifying high cost activities based on the 'Pareto Analysis'
(b) The search for industries best practices that lead to superior performance
(c) The simulation of cost reduction schemes that help to build commitment and improvement of actions
(d) The process of marketing and redesigning the way a typical company works
(e) The framework that earmarks a linkage with suppliers and customers

(ii) Question mark in BCG Matrix is an investment, which :
- **(a) Yields low current income but has bright growth prospects**
- **(b) Yields high current income and has bright growth prospects**
- **(c) Yields high current income and has bleak growth prospects**
- **(d) Yields low current income and has bleak growth prospects**

(iii) Directional policy matrix is the same as :
- **(a) the BCG model**
- **(b) the 9 – cell GE matrix**
- **(c) the life cycle portfolio analysis**
- **(d) the PIMS matrix**
- **(e) the 3x3 competitive positioning matrix**

(iv) For an entrepreneur :
- **(a) Vision is before the mission**
- **(b) Mission is before the vision**
- **(c) Both are developed simultaneously**
- **(d) Division or mission are un-important issue**
- **(e) Profitability is most crucial**

(v) Indian Airlines decreasing the airfare on the Delhi – Mumbai sector following the introduction of the no frills airlines would be an example of
- **(a) Cost leadership**
- **(b) Price leadership**
- **(c) Product differentiate**
- **(d) Focus**
- **(e) Market retention**

(vi) A product line is a group of product that
- **(a) are closely related**
- **(b) are marketed through the same channel**
- **(c) perform a similar function for being sold to the same customers**
- **(d) All of the above**

Answer:

6. (a) (i) (b)
(ii) (a)
(iii) (b)
(iv) (a)
(v) (b)
(vi) (d)

Answer any one question from the following: [1x12=12]

7. (a) What do you mean by strategy? Discuss its features. [5]

(b) Discuss Contingency Planning & its seven steps? [7]

Answer:

7. (a) STRATEGY:

Strategy is all about integrating organizational activities and utilizing and allocating the scarce resources within the organizational environment so as to meet the present objectives. While planning a strategy it is essential to consider that decisions are not taken in a vacuum and that any act taken by a firm is likely to be met by a reaction from those affected, competitors, customers, employees or suppliers.

Strategy can also be defined as knowledge of the goals, the uncertainty of events and the need to take into consideration the likely or actual behavior of others. Strategy is the outline of decisions in an organization that shows its objectives and goals, reduces the key policies, and plans for achieving these goals, and defines the business the company is to carry on, the type of economic and human organization it wants to be, and the contribution it plans to make to its shareholders, customers and society at large.

Features of Strategy:

(i) Strategy is important to foresight, the uncertain events of firms/industries .
(ii) Strategy deals with long term developments rather than routine operations. For example innovations or new products, new methods of productions, or new markets to be developed in future.
(iii) Strategy is created to deal behavior of customers and competitors.
(iv) Strategy is a well defined roadmap of an organization. It defines the overall mission, vision and direction of an organization. The objective of a strategy is to maximize an organization's strengths and to minimize the strengths of the competitors.

(b) Contingency plans can be defined as alternative plans that can be put into effect if certain key events do not occur as expected. Only high-priority areas require the insurance of contingency plans. Strategists cannot and should not try to cover all bases by planning for all possible contingencies. But in any case, contingency plans should be as simple as possible.

Steps in Contingency Planning

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

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

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

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

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

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

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

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

8. (a) Discuss various stages in strategic planning. [6]

(b) Define SBU. What are its merits & demerits? [6]

Answer:

(8) (a) The stages in strategic planning are given below:

Stage I - Strategic Option Generations

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

(a) increase market share
(b) penetration into international market

(c) concentration on core competencies
(d) acquisition or expansion etc.

Stage II - Strategic Options Evaluation
Each option is then examined on its merits.
(a) does it increase existing strengths ?
(b) does it alleviate existing weaknesses ?
(c) is it suitable for the firm's existing position ?
(d) is it acceptable to stakeholders ?

Stage III - Strategic Selection
It involves choosing between the alternative strategies. This process is strongly influenced by the values of the managers in selecting the strategies.

(b) SBU groups similar divisions into "Strategic Business Units" and then delegate's authority and responsibility of each unit to a senior executive who is normally identified as CEO or MD of that SBU. It is an extension of Divisional structure.

SBU Structure
Big organisation like Unilever, etc have many SBUs for their different categories of products like Cosmetics, Food products and Beverages, etc, and each is managed through separate unit head.

Advantages:
(i) Promotes accountability since units' heads are responsible for individual SBU profitability
(ii) Career development opportunities are further higher in this structure
(iii) Allow better control of categories of products manufacturing, marketing and distributions
(iv) Helps to expand in different related and unrelated businesses

Disadvantages:
(i) May provide inconsistent approach to tackle customers, etc, because each unit may work in it's own way to handle situations
(ii) High cost approach

9. Write a short note on any of the following three questions: [3x4=12]
(a) SWOT Analysis;
(b) BCG Matrix;
(c) Strategic Planning;
(d) Market Penetration Strategy.

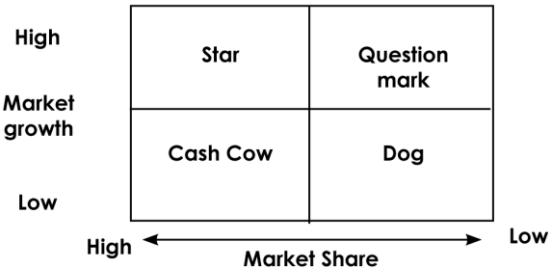
Answer:

9. (a) Swot Analysis:
Gathering data about the general, operating, and internal environments provides the raw material from which to develop a picture of the organisational environment.

SWOT analysis refines this body of information by applying a general framework for understanding and managing the environment in which an organisation operates. (The acronym SWOT stands for Strengths, Weaknesses, Opportunities, and Threats.) In many respects, the sophisticated ana-lytical techniques discussed throughout the text are further refinements of basic SWOT analysis. In addition, students have repeatedly told us that SWOT is an excellent way to begin a case analysis. SWOT analysis attempts to assess the internal strengths and weaknesses of an organisation and the opportunities and threats that it's external environment presents. SWOT seeks to isolate the major issues facing an organisation through careful analysis of each of these four elements. Managers can then formulate strategies to address key issues.

(b) Boston Matrix:

The Boston Consulting Group (BCG)'s matrix analyses 'products and businesses by market share and market growth.'



This growth/share matrix for the classification of products into cash cows, dogs, rising stars and question marks is known as the Boston classification for product-market strategy.

(i) Stars are products with a high share of a high growth market. In the short term, these require capital expenditure, in excess of the cash they generate, in order to maintain their market position, but promise high returns in the future.

(ii) In due course, however, stars will become cash cows, with a high share of a low-growth market. Cash cows need very little capital expenditure and generate high levels of cash income. The important strategic feature of cash cows is that they are already generating high cash returns, which can be used to finance the stars.

(iii) Question marks are products in a high-growth market, but where they have a low market share. A decision needs to be taken about whether the products justify considerable capital expenditure in the hope of increasing their market share, or whether they should be allowed to 'die' quietly as they are squeezed out of the expanding market by rival products. Because considerable expenditure would be needed to turn a question mark into a star by building up market share, question marks will usually be poor cash generators and show a negative cash flow.

(iv) Dogs are products with a low share of a low growth market. They may be ex-cash cows that have now fallen on hard times. Dogs should be allowed to die, or should be killed off. Although they will show only a modest net cash outflow, or even a modest net cash inflow, they are 'cash traps' which tie up funds and provide a poor return, on investment, and not enough to achieve the organisation's target rate of return.

(c) Strategic Planning

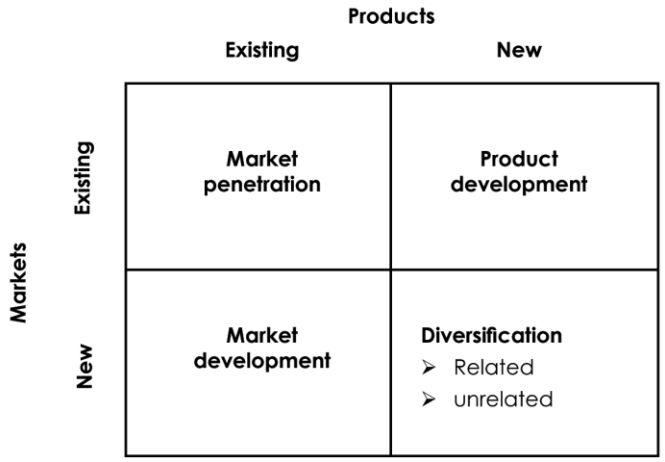
It is important to operate a planning process which will not only produce realistic and potentially rewarding plans but will also secure the support of all those involved in implementing them. There are three approaches that can be adopted to strategic planning:

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

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

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

(d) Market Penetration Strategy:



Firm increases its sales in its present line of business. This can be accomplished by:

(i) price reductions;
(ii) increases in promotional and distribution support;
(iii) acquisition of a rival in the same market;
(iv) modest product refinements.

These strategies involve increasing the firm's investment in a product/market and so are generally only used in markets which are growing, and hence the investment may be recouped. In this respect the strategy is similar to invest to build and holding strategy as described by the Boston Consulting Group.