Paper-17: Strategic Performance Management

Time Allowed: 3 Hours **Full Marks:** 100

Whenever necessary, suitable assumptions should be made and indicate in answer by the candidates.
Working Notes should be form part of your answer

Section –A
[Question 1 and 2 are compulsory and answer any 3 from the rest]

1. Xerox Benchmarking

Possibly the best-known pioneer of benchmarking in Europe is Rank Xerox, the document and imaging company, which created the original market for copiers. The virtual monopoly the company had in its sector almost became its undoing. However, spurred by the threat from the emerging Japanese copier companies, an in-depth study within the company recognized that fundamental changes were needed. To understand how it should change, the company decided to evaluate itself externally – a process which became known as competitive benchmarking. The results of this study shocked the company. Its Japanese rivals were selling machines for about what it cost Xerox to make them. Nor could this be explained by differences in quality. The study found that, when compared with its Japanese rivals, the company had nine times more suppliers, was rejecting 10 times as many machines on the production line and taking twice as long to get products to market. Benchmarking also showed that productivity would need to grow 18 per cent per year over five years if it was to catch up with its rivals.

Rank Xerox sees benchmarking as helping it achieve two objectives. At a strategic level it helps set standards of performance, while at an operational level it helps the company understand the best practices and operations methods which can help it achieve its performance objectives.

Its experience of using this approach has led Xerox to a number of conclusions:

- The first phase, planning, is crucial to the success of the whole process. A good plan will identify a realistic objective for the benchmarking study, which is achievable and clearly aligned with business priorities.
- A prerequisite for benchmarking success is to understand thoroughly your own processes. Without this it is difficult to compare your processes against those of other companies.
- Look at what is already available. A lot of information is already in the public domain. Published accounts, journals, conferences and professional associations can all provide information which is useful for benchmarking purposes.
- Be sensitive in asking for information from other companies. The golden rule is: 'Don't ask any questions that we would not like to be asked ourselves.'

Required:

(a) Discuss about the Competitive Benchmarking.
(b) Mentioning the steps in Benchmarking.
(c) What kind of information did Rank Xerox discover in its Benchmarking study?
(d) What did Rank Xerox get in its Benchmarking application?

[5+5+3+2]

Solution:

(a) **Competitive Benchmarking**

"A Measure of organizational performance compared against competing organization; studies the target specific product designs, process capabilities or administrative methods used by a company's direct competitors".

Competitive Benchmarking moved beyond product oriented comparisons to include comparisons of process with those of competitors. In this benchmarking, the process studied may include marketing, finance, human resource, R & D etc. A typical example would be the classical study the Rank Xerox performed with those of Canon and other photo copier manufacturers when it faced heightened competition from US and Japanese companies. By benchmarking Rank Xerox achieved significant performance improvements as given below:

- Unit manufacturing cost reduced to half; comparable to 1980 product costs
- Machine defects have improved by over 90%
- Incoming parts acceptance has improved to 99.5%
- Inventory methods of supply reduced by at least two thirds.
- Engineering drawings per person year more than doubled
- Marketing Productivity improved by one third.
- Service labour cost reduced by 30%
- Distribution productivity increased from 5% to 10%

Management Accountants are familiar with the technique of Inter Firm Comparison of financial performance of companies through ratios to draw meaningful inferences. For instance Hindalco's power cost is lowest in the world, due to the captive power plant set up by them long back. Other aluminum producers while endeavoring to move closer to this standard must improve in other areas to have competitive parity.

(b) **Steps of Benchmarking:**

Rank Xerox has given the following ten steps for Benchmarking

(a) Identify the benchmark Outputs
(b) Identify the best competitors
(c) Determine the data collection method,
(d) Determine the current competitive "gap".
(e) Project future performance level
(f) Establish functional goals; communication of data/ acceptance of Analysis
(g) Develop functional action plan
(h) Implement specific action plans
(i) Monitors results/ Report progress
(j) Recalibrate benchmarking

(c) The company adopt a process which known as Competitive Benchmarking. The study found that, when compared with its Japanese rivals, the company had nine times more suppliers, was rejecting 10 times as many machines on the production line and taking twice as long to get products to market. Benchmarking also showed that productivity would need to grow 18 per cent per year over five years if it was to catch up with its rivals.

(d) Rank Xerox sees benchmarking as helping it achieve two objectives. At a strategic level it helps set standards of performance, while at an operational level it helps the company understand the best practices and operations methods which can help it achieve its performance objectives.

2. Walmart: Keys To Successful Supply Chain Management

Over the past ten years, Walmart has become the world's largest and arguably most powerful retailer with the highest sales per square foot, inventory turnover, and operating profit of any discount retailer. Walmart owes its transition from regional retailer to global powerhouse largely to changes in and effective management of its supply chain.

Walmart began with the goal to provide customers with the goods they wanted when and where they wanted them. Walmart then focused on developing cost structures that allowed

it to offer low everyday pricing. The key to achieving this goal was to make the way the company replenishes inventory the centerpiece of its strategy, which relied on a logistics technique known as cross docking. Using cross docking, products are routed from suppliers to Walmart's warehouses, where they are then shipped to stores without sitting for long periods of time in inventory. This strategy reduced Walmart's costs significantly and they passed those savings on to their customers with highly competitive pricing. Walmart then concentrated on developing a more highly structured and advanced supply chain management strategy to exploit and enhance this competitive advantage.

The main elements of a supply chain include purchasing, operations, distribution, and integration. The supply chain begins with purchasing. Purchasing managers or buyers are typically responsible for determining which products their company will sell, sourcing product suppliers and vendors, and procuring products from vendors at prices and terms that meets profitability goals.
Supply chain operations focus on demand planning, forecasting, and inventory management. Forecasts estimate customer demand for a particular product during a specific period of time based on historical data, external drivers such as upcoming sales and promotions, and any changes in trends or competition. Using demand planning to develop accurate forecasts is critical to effective inventory management. Forecasts are compared to inventory levels to ensure that distribution centers have enough, but not too much, inventory to supply stores with a sufficient amount of product to meet demand. This allows companies to reduce inventory carrying costs while still meeting customer needs.
Moving the product from warehouses or manufacturing plants to stores and ultimately to customers is the distribution function of the supply chain.
Supply chain integration refers to the practice of developing a collaborative workflow among all departments and components involved in the supply chain to maximize efficiencies and build a lean supply chain.

Walmart has been able to assume market leadership position primarily due to its efficient integration of suppliers, manufacturing, warehousing, and distribution to stores. Its supply chain strategy has four key components: vendor partnerships, cross docking and distribution management, technology, and integration.
Walmart's supply chain begins with strategic sourcing to find products at the best price from suppliers who are in a position to ensure they can meet demand. Walmart establishes strategic partnerships with most of their vendors, offering them the potential for long-term and high volume purchases in exchange for the lowest possible prices.
Suppliers then ship product to Walmart's distribution centers where the product is cross docked and then delivered to Walmart stores. Cross docking, distribution management, and transportation management keep inventory and transportation costs down, reducing transportation time and eliminating inefficiencies.
Technology plays a key role in Walmart's supply chain, serving as the foundation of their supply chain. Walmart has the largest information technology infrastructure of any private company in the world. Its state-of-the-art technology and network design allow Walmart to accurately forecast demand, track and predict inventory levels, create highly efficient transportation routes, and manage customer relationships and service response logistics.

Required:
(a) Mention the objectives of supply chain Management.
(b) Explain the importance of Supply Chain Management.
(c) What are the benefits getting after the adoption of Supply Chain Management by Wal Mart.
(d) How did Walmart's manage the Supply Chain Management? [3+3+4+5]

Solution:
(a) **Objective of Supply Chain Management:**

(i) Supply chain Management takes into consideration every facility that has an impact on cost and plays a role in making the product conform to customer requirements: from supplier and manufacturing facilities through warehouses and distribution centers to retailers and stores.

(ii) The supply chain management is to be efficient and cost –effective across the entire system; total system wide costs from transportation and distribution to inventories of raw materials, work – in-process and finished goods are to be minimized.

(iii) Finally, supply chain management revolves around efficient integration of suppliers, manufacturers, warehouses and stores; it encompasses the firm's activities at many levels, from the strategic level through the tactical to the operational level.

(b) In the ancient Greek fable about the tortoise and the hare, the speedy and overconfident rabbit fell asleep on the job, while the "slow and steady" turtle won the race. That may have been true in Aesop's time, but in today's demanding business environment, "slow and steady" won't get you out of the starting gate, let alone win any races. Managers these days recognize that getting products to customers faster than the competitors and try to improve a company's competitive position. To remain competitive, companies must seek new solutions to important Supply Chain Management issues such as modal analysis, supply chain management, load planning, and route planning and distribution network design. Companies must face corporate challenges that impact Supply Chain Management such as reengineering globalization and outsourcing.
Why is it so important for companies to get products to their customers quickly? Faster product availability is key to increasing sales, says R. Michael Donovan of Natick, Mass., a management consultant specializing in manufacturing and information systems. "There's a substantial profit advantage for the extra time that you are in the market and your competitor is not," he says. "If you can be there first, you are likely to get more orders and more market share." The ability to deliver a product faster also can make or break a sale. "If two alternatives [products] appear to be equal and one is immediately available and the other will be available in a week, which would you choose? Clearly, Supply Chain Management has an important role to play in moving goods more quickly to their destination.

(c) Wal-Mart's supply chain management strategy has provided the company with several sustainable competitive advantages, including lower product costs, reduced inventory carrying costs, improved in-store variety and selection, and highly competitive pricing for the consumer. This strategy has helped Walmart become a dominant force in a competitive global market. As technology evolves, Walmart continues to focus on innovative processes and systems to improve its supply chain and achieve greater efficiency.

(d) Walmart has been able to assume market leadership position primarily due to its efficient integration of suppliers, manufacturing, warehousing, and distribution to stores. Its supply chain strategy has four key components: vendor partnerships, cross docking and distribution management, technology, and integration.
Walmart's supply chain begins with strategic sourcing to find products at the best price from suppliers who are in a position to ensure they can meet demand. Walmart establishes strategic partnerships with most of their vendors, offering them the potential for long-term and high volume purchases in exchange for the lowest possible prices.
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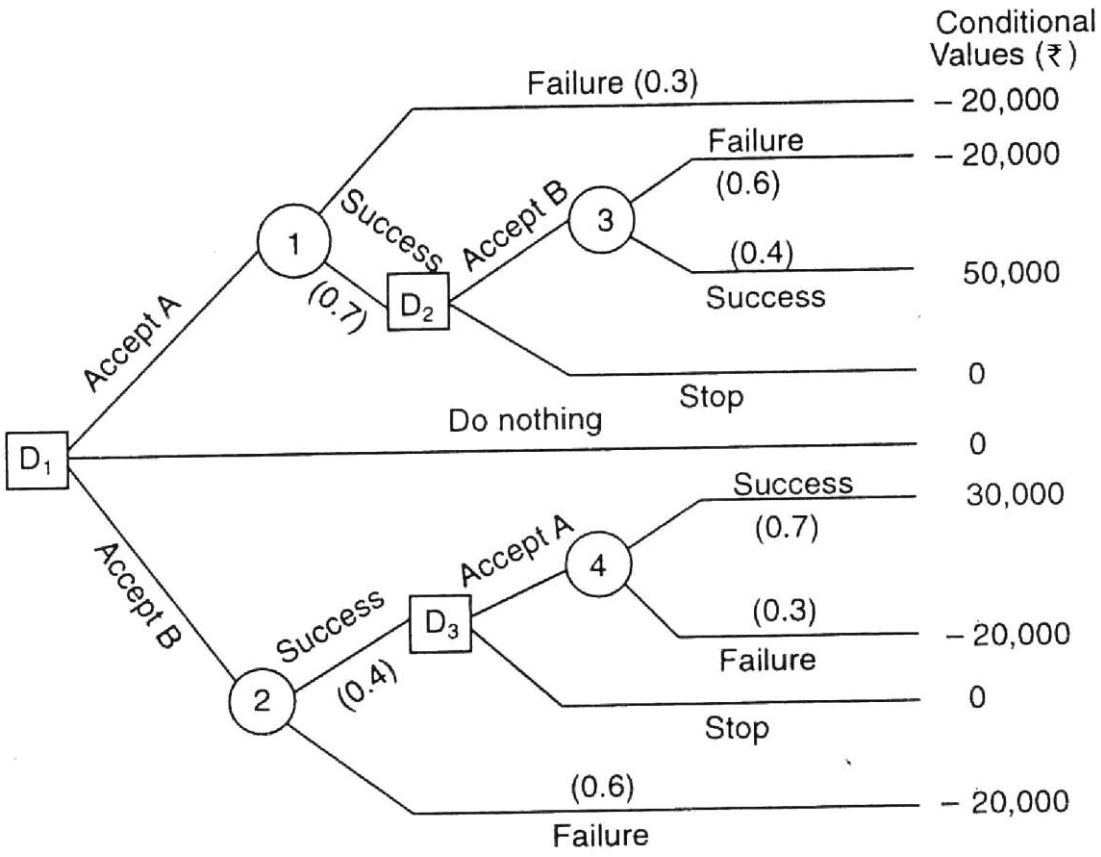
company in the world. Its state-of-the-art technology and network design allow Walmart to accurately forecast demand, track and predict inventory levels, create highly efficient transportation routes, and manage customer relationships and service response logistics.

3.(a) A business man has two independent investments A and B available to him; but he lacks the capital to undertake both of them simultaneously. He can choose to take a first and then stop, or if A is successful then take B, or vice versa. The probability of success on A is 0.7 while for B it is 0.4. Both the investments require an initial capital outlay of ₹20,000 and both return nothing if the venture is unsuccessful. Successful completion of A will return ₹30,000 (overcost). And successful completion of B will return ₹50,000 (overcost). Draw the decision tree and determine the best strategy.

(b) Mention the benefits of adopting a Balanced Scorecard approach to performance Management. [(3+4)+3]

Solution

(a)The appropriate decision tree corresponding to the given information is depicted in the following



Evaluation of decision and chance nodes

Decision Point	Outcome	Probability	Conditional value (₹)	Expected value (₹)

D_3	(i)	Accept A	Success	0.7	30,000	21,000
			Failure	0.3	-20,000	-6,000
						15,000
	(ii)	Stop	—	—	—	0
D_2	(i)	Accept B	Success	0.4	50,000	20,000
			Failure	0.6	-20,000	-12,000
						8,000
	(ii)	Stop	—	—	—	0
D_1	(i)	Accept A	Success	0.7	30,000 + 8,000	26,600
			Failure	0.3	-20,000	-6,000
						20,600
	(ii)	Accept B	Success	0.4	50,000 + 15,000	26,000
			Failure	0.6	-20,000	-12,000
						14,000
	(iii)	Do nothing	—	—	—	0

Since the EMV at node 2 is highest, the best strategy at node D_1 is to accept course of action A first and if A is successful, then accept B.

(b) **The benefits of adopting a Balanced Scorecard approach to performance management may include:**

(i) Wholistic approach: It brings strategy and vision as the centre of Management focus. It helps firms to assess overall performance, improve operational processes and enable Management to develop better plans for improvements. It provides Management with a comprehensive picture of business operations.

(ii) Overall Agenda: It brings together in a single Management Report, various aspects like customer orientation, shortening the response time, improving quality, etc. of a competitive agenda.

(iii) Objectivity: It emphasizes the need to provide the user with a set of information, which addresses all relevant areas of performance in an objective and unbiased manner.

(iv) Management by Objectives: The methodology of BSC facilitates communication and understanding of business goals and strategies at all levels of the Firm. Thus it enables Management by Objective.

(v) Feedback and Learning: It provides strategic feedback and learning. BSC guards against sub-ordination. It emphasizes an integrated combination of traditional and non-traditional performance measures.

(vi) System Approach: It helps Senior Managers to consider all the important performance measures together, and allows them to see whether an improvement in one area has been achieved at the expense of another.

4. (a) Wipro is examining the profitability and pricing policies of its Software Division. The Software Division develops Software Packages for Engineers. It has collected data on three of its more recent packages - (a) ECE Package for Electronics and Communication Engineers, (b) CE Package for Computer Engineers, and (c) IE Package for Industrial Engineers.

Summary details on each package over their two year cradle to grave product lives are -

Package	Selling Price	Number of units sold	
		Year 1	Year 2

ECE	₹250	2,000	8,000
CE	₹300	2,000	3,000
IE	₹200	5,000	3,000

Assume that no inventory remains on hand at the end of year 2. Wipro is deciding which product lines to emphasize in its software division. In the past two years, the profitability of this division has been mediocre.

Wipro is particularly concerned with the increase in R & D costs in several of its divisions. An analyst at the Software Division pointed out that for one of its most recent packages (IE) major efforts had been made to reduce R&D costs.

Last week, Amit, the Software Division Manager, decides to use Life Cycle Costing in his own division. He collects the following Life Cycle Revenue and Cost information for the packages (in ₹)-

Particulars	Package ECE		Package CE		Package IE	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Revenues	5,00,000	20,00,000	6,00,000	9,00,000	10,00,000	6,00,000
Costs						
R&D	7,00,000	-	4,50,000	-	2,40,000	-
Design of Product	1,15,000	85,000	1,05,000	15,000	76,000	20,000
Manufacturing	25,000	2,75,000	1,10,000	1,00,000	1,65,000	43,000
Marketing	1,60,000	3,40,000	1,50,000	1,20,000	2,08,000	2,40,000
Distribution	15,000	60,000	24,000	36,000	60,000	36,000
Customer Service	50,000	3,25,000	45,000	1,05,000	2,20,000	3,88,000

Present a Product Life Cycle Income Statement for each Software Package. Which package is most profitable and which is the least profitable? How do the three packages differ in their cost structure (the percentage of total costs in each category)?

(b)"A company can gain competitive advantage not just by matching or surpassing its competitors, but discovering what the customers want and then profitably satisfying, and even exceeding, customer expectations" – Discuss. [4+6]

Solution:

(a) **Life cycle Income Statement (in ₹000s)**

Particulars	Package ECE				Package CE				Package IE			
	Y1	Y2	Total	%	Y1	Y2	Total	%	Y1	Y2	Total	%
Revenues	500	2,000	2,500	100%	600	900	1,500	100%	1,000	600	1,600	100%
Costs												
R&D	700	-	700	28%	450	-	450	30%	240	-	240	15%
Design	115	85	200	8%	105	15	120	8%	76	20	96	6%
Manufacturing	25	275	300	12%	110	100	210	14%	165	43	208	13%
Marketing	160	340	500	20%	150	120	270	18%	208	240	448	28%
Distribution	15	60	75	3%	24	36	60	4%	60	36	96	6%
Cust. Service	50	325	375	15%	45	105	150	10%	220	388	608	38%
Total Costs	1065	1,085	2150	86%	884	376	1260	84%	969	727	1696	106%
Profit			**350**	**14%**			**240**	**16%**			**(96)**	**-6%**

Observation: Package ECE is most profitable, while package IE is least profitable.

(b) The above statement is described about the uses of Value chain analysis to assess the competitive advantage

VCA can be used to better understand which segments, distribution channels, price points, product differentiation, selling propositions and value chain configurations will yield the Firms the greatest competitive advantage.

Use VCA to assess competitive advantage involves the following analyses –

(i) **Internal cost Analysis-** to determine the sources of differentiation (including the cost) within internal value creating processes; and

(ii) **Internal Differentiation Analysis-** to understand the sources of differentiation (including the cost) within internal value creating processes ; and

(iii) **Vertical Linkage Analysis –** to understand the relationships and associated costs among external suppliers and customers in order to maximize the value delivered to customers and minimizes cost.

The following actions and steps are involved in the above analyses

Stage	Description
1.	**Internal Cost Analysis:** • Indentify the firm's value – creating processes. • Determine portion of the total cost of the product or services attributable to each value creating process. • Identify the cost driver for each process. • Identify the links between processes. • Evaluate the opportunities for achieving relative cost advantage.
2	**Internal Differentiation Analysis:** • Identify the customers' value –creating processes • Evaluate differentiation strategies for enhancing customer value. • Determine the best sustainable differentiation strategies.
3	**Vertical Linkage Analysis:** • Identify the industry's Value chain and assign costs, revenues and assets to value creating processes. • Diagnose the cost drivers for each value creating process. • Evaluate the opportunities for sustainable competitive advantage.

Features of these Analyses

(i) Not Mutually Exclusive: Firms begin by focusing on their internal operations and gradually widening their focus to consider their competitive position within their industry.

(ii) Continuous: VCA is a continuous process of gaining competitive advantage, not a one –time affair.

(iii) Part of Strategic Planning: VCA is process of gathering, evaluating and communicating information for business – making.

5. (a) The two manufacturing divisions of Das Company are organized on profit centre basis. Division X is the only source of a component required by Division Y for their product "P". Each unit of "P" requires one unit of the said component. As the demand for the product is not steady, order for increased quantities can be obtained only by manipulating prices. The manager of Division Y has given the following forecast -

Sales Per Day (units)	5,000	10,000	15,000	20,000	25,000	30,000
Average price per unit of P (₹)	393.75	298.50	247.50	208.50	180.00	150.75

The manufacturing cost (excluding the cost of the component from Division X) of P in Division Y is ₹14,06,250 on first 5,000 units and ₹56.25 per unit in excess of 5,000 units.

Division X incurs a total cost of ₹5,62,000 per day for an output upto 5,000 components and the total costs will increase by ₹3,38,000 per day for every additional 5,000 components manufactured. The manager of Division X has set the Transfer Price for the component at ₹90 per unit to optimize the performance of his division.

Required:

(i) Prepare a schedule showing the profitability at each level of output, for Divisions X and Y

separately.

(ii) Find out the profitability of the Company as a whole at the output level where – (a) Division X's net profit is maximum ;(b) Division Y's net profit is maximum.

(iii) Find out at what level of output, the Company will earn maximum profit.

(b) Discuss about the Price Discrimination under the demand oriented pricing. [(3+1+2)+4]

Solution: (a)

Basic Data

Division	Division X	Division Y
Role	Transferring Division	Recipient division
Internal Transfer Quantity	5,000 to 30,000 units	5,000 to 30,000 units
Selling Price/ Transfer Price	Transfer Price = ₹90 p.u. (given)	Selling Price ranges from ₹150.75 to ₹393.75 based upon quantity sold
Own costs of the division: First 5,000 units Additional 5,000 units	 ₹5,62,000 ₹3,38,000	 ₹14,06,250 ₹2,81,250 (56.25 x 5,000)
Transfer In costs	Not Applicable	₹90 per unit

(i) Contribution Statement of divisions and the company as a whole

a. Quantity (units)	5,000	10,000	15,000	20,000	25,000	30,000
b. X's revenue at ₹90 p.u	4,50,000	9,00,000	13,50,000	18,00,000	22,50,000	27,00,000
c. X's costs	5,62,500	9,00,000	12,38,000	15,76,000	19,14,000	22,52,000
d. X's Profit (b – c)	**(1,12,500)**	**Nil**	**1,12,000**	**2,24,000**	**3,36,000**	**4,48,000**
e. Y's Selling Price p.u	393.75	298.50	247.50	208.50	180.00	150.75
f. Y's revenue (a x e)	19,68,750	29,85,000	37,12,500	41,70,000	45,00,000	45,22,500
g. Y's own costs	14,06,250	16,87,500	19,68,750	22,50,000	25,31,250	28,12,500
h. Y's Tfr. in costs (i.e. b)	4,50,000	9,00,000	13,50,000	18,00,000	22,50,000	27,00,000
i. Y's Total costs (g + h)	18,56,250	25,87,500	33,18,750	40,50,000	47,81,250	55,12,500
j. Y's Profit (f – i)	**1,12,500**	**3,97,500**	**3,93,750**	**1,20,000**	**(2,81,250)**	**(9,90,000)**
k. Company Profit (d + j)	Nil	3,97,500	5,05,750	3,44,000	54,750	(5,42,000)

(ii) Divisional and Company decisions

Division	Maximum Divisional Profit	Output Level	Company's profit at this level
X (Transferring)	₹4,48,000	30,000 units	(₹ 5,42,000) Loss
Y (Recipient)	₹3,97,500	10,000 units	₹3,97,500

(iii) Decisions:

- **Conflict:** Based on divisional viewpoint, there is a conflict in decision in as much that Division X will produce 30,000 units for internal transfer whereas division Y will restrict output to 10,000 units only.
- **Company Angle:** However, the Company's profits are maximized at ₹5,05,750 when the sale Quantity is 15,000 units. It should operate at 15,000 units output level.

(b) There are many bases on which the open price discrimination is practiced. These are discussed below:

(i) Time Price Differentials: It is a general practice to use the expression "the demand for a product or service", but it is important to note that demand also has a time dimension. The demand may shift in fairly short-time intervals. For example, demand for telephone facilities is more in the day time rather than at night.

(ii) Use Price differentials: Different buyers have different uses of a product or a service. For example railways can be used for long-haul or short-haul freight traffic. Railways can also be used for transporting different types of commodities. Electricity can similarly, be used for industrial or residential purposes.

(iii) Quality price Differentials: If the product caters to that group of consumers who are concerned about its quality, then the quality becomes a significant determinant of demand elasticity. The seller has, therefore, to crate differences in quality to sell his product. It must be emphasized here that the differences in quality basically depend upon the buyers' understanding of the quality. Sellers use many devices to create quality differences.

(iv) Quantity Differentials: When the seller discriminates on the basis of the quantity of purchase, it is known as quantity differentials. Quantity discounts are price concessions based on the size of the lot purchased at one time and delivered at one location. These discounts are thus related to size of a single purchase. The size of the lot purchased is measured in terms of either physical units or monetary units. Sometimes, discounts are according to the trade status, i.e., wholesaler, retailer, jobber, etc.

6.(a) K Ltd. sells output in a perfectly competive market. The average variable cost function K Ltd. is AVC = 300 – 40Q + 2Q². K Ltd has an obligation to pay ₹ 500 irrespective of the output produced. What is the price below which K Ltd. has to shut down its operation in the short run?

(b) The total cost function for a monopolist is given by
TC = 900 + 40 Q²
The demand function for the good produced by the monopolist is given by
2Q = 48 – 0.08 P
What will be the profit maximizing price?

(c) Discuss the objectives of Process Analysis. [3+4+3]

Solution:

(a) A firm has to shut down its operation, if the price is less than average variable cost. Under perfect competition
P = MR i.e. Price is equal to Marginal Revenue.
The firm will continue its operation under the short run so long as price is atleast equal to average variable cost.
Thus the equilibrium price which the firm will shut down is the minimum AVC i.e. the Average Variable Cost.

$AVC = 300 – 40Q + 2Q^2$

AVC is minimum where $\frac{d(AVC)}{dQ} = 0$

i.e. $\frac{d(AVC)}{dQ} = -40 + 4q = 0$

i.e. Q = 10 units.

When the firm is producing 10 units,
$AVC = 300 – 40Q + 2Q^2$
$= 300 – 40(10) + 2 (10)^2$
$= 300 – 400 + 200 = 100$
If the price falls before ₹ 100 the firm has to shut down its operation under short run.

(b) Demand function is given by
2Q = 48 – 0.08 P

or , 2Q – 48 = – 0.08 P
or, 48 – 2Q = 0.08 P
or, P = 600 – 25Q
TR = PQ
= $600Q – 25Q^2$
TC is given by,
TC = $900 + 40 Q^2$
The first order condition for profit maximization is MR = MC
TR = $600Q – 25Q^2$

$MR = \frac{dTR}{dQ} = 600 - 50Q$

$MC = \frac{d(TC)}{dQ} = 80Q$

For maximizing profit
MR = MC
i.e. 600 – 50Q = 80Q
Q = 4.6units
Equilibrium Price
P = 600 – 25 Q = 600 – 25(4.6)
= 600 – 115
= ₹ 485
i.e. profit maximizing price is ₹ 485

(c) **The objectives of analyzing the process include:**
(i) Identify what makes maps difficult to understand and use
(ii) Evaluate completeness
(iii) Isolate bottlenecks
(iv) Find redundancies
(v) Examine resources allocation
(vi) Measure process times

Section –B
[Answer any one]

7.(a) Discuss the role of government in examining, promoting, understanding and application of e-commerce technologies throughout Indian Industries and communities.
(b) Explain the Data Quality Dimensions.

(c) "Artificial neuron is a basic building block of every artificial neural network. Its design and functionalities are derived from observation of a biological neuron" –Explain the Statement. [6+8+6]

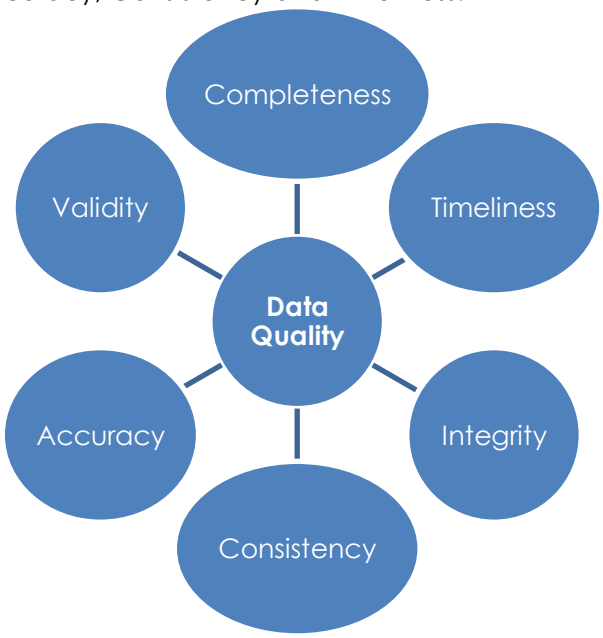
Solution:

(a) **Role of Government:**
Government can play an important role in examining the economic and social impact of ecommerce technologies and in promoting understanding and application of these technologies throughout Indian industries and communities.
(i) Facilitating market access and business opportunities, especially for small, medium, and micro enterprises (SMMEs), on a national and global scale.

(ii) Providing educational and skills development resources.
(iii) Supporting the rapid deployment of necessary infrastructure.
(iv) Facilitating the development of MPCCs as vibrant seeding points for community knowledge and wealth creation, above and beyond the provision of the latest ICTs.
(v) Developing "model use" programmes for the dissemination of government information and services using e-commerce platforms, e.g., for electronic tender processes.
(vi) Ensuring equity in the availability of opportunities and benefits, in the context of the overall development of Indian rural community

(b) **Data Quality Dimensions**

Using five core dimensions to assess the Data Quality. These are Completeness, Validity, Accuracy, Consistency and Timeliness.



Completeness

Data quality completeness is the degree to which required data elements are populated. But whether a data element is "required" depends on the use of the data. For instance, to send an email newsletter to your customers, you need at least the customer's name and a valid email address, but their phone number is not necessary. If you only have email addresses for 45% of your customers, an email newsletter may not be the most effective method to reach them. A typical database query to obtain your email address list provides you with no indication as to the completeness of that data element. Without at some point assessing the completeness of the email data element in your entire customer database, you may not realize that you are communicating to only a small subset of your intended customer base.

Validity

Data quality validity is the degree to which data elements satisfy their semantic constraints. Semantic constraints may be syntactic, format or valid values constraints on a data element. For example, an email address without the "at" ("@") symbol doesn't meet the syntax constraint for a valid email address. A date field, to use another example, may be required to be in the MM/DD/YYYY format, such as 01/23/1965 to be considered valid. Finally, a gender data element may be constrained to a valid value list: {Male, Female, Unknown}. Continuing the newsletter example; if you simply email the newsletter to all of the values found in the email data element in your customer database, there are bound to be many newsletters that are not deliverable due to their invalid email addresses. A variety of problems contribute to invalid

data—from the lack of semantic constraints in the data entry system, to legacy data migration problems, to simple human error. Data validity doesn't mean that the value is correct (for example, that the customer's email address listed is current and correctly spelled); it only means that it's properly formatted. If the newsletter is intended only for your female customers, and you correctly query the database for all "Female" gender customers, you may miss other female customers whose gender has been invalidly stored as "F" or "Woman." If the newsletter is targeting customers born in a specific month ("Happy Birthday" specials), and there are invalidly formatted birth dates in your data such as 23/01/1965 (DD/ MM/YYYY instead of MM/DD/YYYY), those customers would also be missed by your mailing.

Accuracy

Data quality accuracy is the degree to which data elements contain correct values. Does the valid gender data element in your customer data reflect the customer's true gender? If the customer's gender is inaccurate, you may be communicating ineffectively with them or even offending them, perhaps sending your female-oriented newsletter to men inaccurately indicated as female in your data.

One common data quality accuracy problem comes from duplicate data records. Duplicate records can arise for a variety of reasons, most commonly through combining records from multiple legacy systems into one new central data warehouse. This is also a common problem that can occur when two companies merge operations. Both companies may have served an overlapping set of customers prior to the merger. Are M. Smith and Mark Smyth at 100 North Main Street the same customer? Possibly, but depending how the data integration was handled, the same customer might now be listed twice in your database.

Consistency

Data quality consistency is the degree of variability or contradiction of data element values. Inconsistent data can be an artifact of data capture system problems or policy/procedure adherence issues. For instance, your company policy might be that all travel reservations should be processed through a single travel agency so that proper supplier discounts are applied. Your accounting data should show consistent travel expenses paid via the approved travel agency. Any inconsistency in the values of the accounting data showing expenses paid to another travel agency would indicate a potential policy violation that could be costing your company the value of the negotiated travel discounts.

Contradictory values in your data could also point to system or procedural issues. Suppose the correct description of part number 1234B in your parts database is "spare tire." Through your data quality monitoring program, you discover that your orders system has order entries for part number 1234B with the description, "lug nut." Investigating the source of that data consistency contradiction could lead you to uncover a programming issue in your new order entry system.

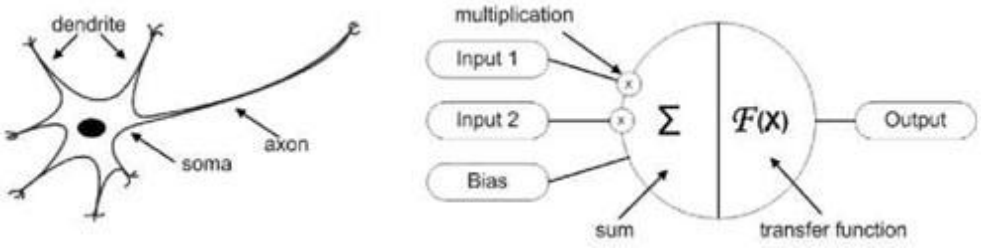
Timeliness

Data quality timeliness is the degree to which data elements are current. Any type of accurate forecasting is only going to be as good as the timeliness of the data on which the forecast is based.

Forecasting sales of mailboxes is dependent upon data about new home construction. For example, if you were trying to plan how many mailboxes to manufacture next week and your new home construction data was two months old, your forecast would be much less accurate than if you had more timely construction data.

In addition, a company attempting to implement a just-in-time inventory system would run into trouble if its sales staff only entered customer orders into the order entry system on a weekly basis. If the company normally sold 500 widgets a week and a new order for 7,000 widgets came in on a Monday, but the order data isn't available until Friday, the components required to manufacture those 7,000 widgets would not be available when needed.

(c) These statement describe about the Artificial Neuron. Artificial neuron is a basic building block of every artificial neural network. Its design and functionalities are derived from observation of a biological neuron that is basic building block of biological neural networks (systems) which includes the brain, spinal cord and peripheral ganglia. Similarities in design and functionalities can be seen in the figure below, where the left side of a figure represents a biological neuron with its soma, dendrites and axon and where the right side of a figure represents an artificial neuron with its inputs, weights, transfer function, bias and outputs.



Biological and Artificial Neuron Design

In case of biological neuron information comes into the neuron via dendrite, soma processes the information and passes it on via axon. In case of artificial neuron the information comes into the body of an artificial neuron via inputs that are weighted (each input can be individually multiplied with a weight). The body of an artificial neuron then sums the weighted inputs, bias and "processes" the sum with a transfer function. At the end an artificial neuron passes the processed information via output(s). Benefit of artificial neuron model simplicity can be seen in its mathematical description below:

$$Y(k) = F\left(\sum_{i=0}^{m} w_i(k)\, x_i\,(k) + b \right)$$

Where:

- X_i (k) is input value in discrete time k where i goes from 0 to m,
- W_i (k) is weight value in discrete time k where i goes from 0 to m,
- b is bias,
- F is a transfer function,
- y_i (k) is output value in discrete time k.

As seen from a model of an artificial neuron and its above equation the major unknown variable of our model is its transfer function. Transfer function defines the properties of artificial neuron and can be any mathematical function. We choose it on the basis of problem that artificial neuron (artificial neural network) needs to solve and in most cases we choose it from the following set of functions: Step function, Linear function and Non-linear (Sigmoid) function.

Step function is binary function that has only two possible output values (e.g. zero and one). That means if input value meets specific threshold the output value results in one value and if specific threshold is not meet that results in different output value.
When this type of transfer function is used in artificial neuron we call this artificial neuron perceptron. Perceptron is used for solving classification problems and as such it can be most commonly found in the last layer of artificial neural networks. In case of linear transfer function artificial neuron is doing simple linear transformation over the sum of weighted inputs and bias. Such an artificial neuron is in contrast to perceptron most commonly used in the input layer of artificial neural networks. When we use non-linear function the sigmoid function is the most commonly used. Sigmoid function has easily calculated derivate, which can be important when calculating weight updates in the artificial neural network.

8. (a) Discuss about the Stochastic Frontier Analysis (SFA) .

(b) Define the following term in the context of Supply Chain Management
(i) Agreement, (ii) Forecast Error , (iii) Inventory Management Systems , (iv) Performance Measurement.
(c) Mention the phases of DMADV. [3+(4x3)+5]

Solution:

(a) If someone wishes to estimate a production function or a cost function. The object is to estimate not the average production or average cost, but the maximum possible production given a set of inputs or the minimum possible cost of a set of outputs. OLS regression estimates the mean of the dependent variable conditional on the explanatory variables; Quantile regression is based on a quantile (e.g. 10th, 25th, median, 75th, 90th), not the maximum or minimum; The max or min cannot be detected directly and used to define the sample for selection bias analysis; Limited dependent variable models truncate the dependent variable into categories or limits but not the maximum or minimum.

The answer is frontier functions, stochastic frontier analysis (SFA) or linear programming data envelopment analysis (DEA). Frontier functions estimate maxima or minima of a dependent variable given explanatory variables, usually to estimate production or cost functions.

SFA has a stochastic frontier with a probability distribution. DEA has a non-stochastic frontier. SFA has one output, or a priori weighted average of multiple outputs. DEA often has more than one output, no a priori weights, but assumes input-output separability. Both can have stochastic inefficiency, SFA always does, DEA sometimes does.

(b) **(i) Agreements**

An agreement should clearly state what you are buying and its cost. Delivery terms and responsibility, Installation related issues, if applicable, an acceptance provision detailing how and when the buyer will accept the products, warranty issues, and your remedial actions should be clearly spelled out in the agreement. Arbitration and conflict resolution mechanisms should also be included in the contract because even the best written agreements are subject to misinterpretation. A well-developed agreement can provide adequate protection against economic opportunism between parties and lead to a positive relationship. Effective long-term agreements generally have specific, measurable objectives stated in them, including pricing mechanisms, delivery and quality standards and improvements, cost savings sharing, evergreen clauses, and termination of the relationship.

(ii) Forecast Error

The difference between actual demand and forecast demand, stated as an absolute value or as a percentage. E.g., average forecast error, forecast accuracy, mean absolute deviation, tracking signal. There are three ways to accommodate forecasting errors: One is to try to reduce the error through better forecasting. The second is to build more visibility and flexibility into the supply chain. And the third is to reduce the lead time over which forecasts are required.

(iii) Inventory Management Systems

Software applications that permit monitoring events across a supply chain. These systems track and trace inventory globally on a line-item level and notify the user of significant deviations from plans. Companies are provided with realistic estimates of when material will arrive. With Inventory visibility, organizations are able to make decisions that optimize supply chain performance. Information is available to reduce costs by removing inventory from the supply chain, reducing obsolescence, decreasing operational assets, lowering network

operations cost, and decreasing transportation costs. Visibility also increases competitiveness by improving customer satisfaction and market responsiveness.

(iv) Performance Measurement

Supplier performance measurement and evaluation includes the methods and techniques used to collect information that can be used to measure, rate or rank supplier performance on a continuous basis. The measurement system is a crucial part of supplier management and development.

(c) The Six sigma has two methodologies: (i) DMAIC and (ii) DMADV. The Six Sigma DMADV process (define, measure, analyze, design, verify) is an improvement system used to develop new processes or products at Six Sigma quality levels. It can also be employed if a current process requires more than just incremental improvement. It is also known as DFSS (Design for Six Sigma).

The phases of DMADV:

- **D**efine design goals that are consistent with customer demands and the enterprise strategy.
- **M**easure and identify CTQs (characteristics that are Critical To Quality), product capabilities, production process capability, and risks.
- **A**nalyze to develop and design alternatives
- **D**esign an improved alternative, best suited per analysis in the previous step
- **V**erify the design, set up pilot runs, implement the production process and hand it over to the process owner(s).

Section – C
[Answer any one]

9.(a) Describe the Stagnation Risk In the context of Corporate Risk.
(b) State about the Risk Pooling
(c) Explain about the Systematic Risk and Unsystematic Risk.
(d) Explain about the Risk affecting in Capital Influx and Market Volatility. [3+5+6+6]

Solution:

(a) Stagnation Risk

This risk is associated with the stagnation of a company caused by a sudden fall in demand due to a recession. This risk has to be faced by almost all industries in the country. The unexpected nature of such a risk has left many companies high and dry as shown by the 2008 financial meltdown. When a company is exposed to such a risk, even fixed/committed costs cannot be recovered as the level of operations is usually far below the breakeven point.

Stagnation risk, due to its suddenness, has also left many companies with high inventory holdings of raw materials and components. Some companies have even had high product inventories due to earlier commitments that were subsequently not met because of recession. The unevenness of the stagnation risk is another feature and compounds the risk of an inability to meet commitments to vendors and labour.

The impact of this risk is heightened as the time frame of a recession is not finite especially if it aggravates into a depression, compounding into a chain reaction that will necessitate layoffs, temporary suspension of production etc. For example, when an automobile company is affected by stagnation, all the components manufacturers that are supplying the products to the company also suffer because the derived demand unexpectedly comes under pressure. These components manufacturers essentially are small-medium enterprises and do not have the resilience or the staying power required to fight out a recession.

(b) **Risk Pooling**

One of the forms of risk management mostly practiced by insurance companies is Risk Pool. Under this system, insurance companies come together to form a pool, which can provide protection to insurance companies against catastrophic risks such as floods, earthquakes etc. The term is also used to describe the pooling of similar risks that underlies the concept of insurance. While risk pooling is necessary for insurance to work, not all risks can be effectively pooled. In particular, it is difficult to pool dissimilar risks in a voluntary insurance market, unless there is a subsidy available to encourage participation.

Risk pooling is an important concept in supply chain management. Risk pooling suggests that demand variability is reduced if one aggregates demand across locations because as demand is aggregated across different locations, it becomes more likely that high demand from one customer will be offset by low demand from another. This reduction in variability allows a decrease in safety stock and therefore reduces average inventory.

The three critical points to risk pooling are:

(i) Centralized inventory saves safety stock and average inventory in the system.
(ii) When demands from markets are negatively correlated, the higher the coefficient of variation, the greater the benefit obtained from centralized systems i.e., the greater the benefit from risk pooling.
(iii) The benefits from risk pooling depend directly on the relative market behaviour. If we compare two markets and when demand from both markets is more or less than the average demand, we say that the demands from the market are positively correlated. Thus the benefits derived from risk pooling decreases as the correlation between demands from the two markets becomes more positive.

The basis for the concept of risk pooling is to share or reduce risks that no single member could absorb on their own. Hence, risk pooling reduces a person or fim's exposure to financial loss by spreading the risk among many members or companies. Actuarial concepts used in risk pooling include:

(i) Statistical variation.

(ii) The law of averages.

(iii) The law of large numbers.

(iv) The laws of probability.

(c) **Systematic Risk:** Systematic risk refers to that part of total risk which causes the movement in individual stock price due to changes in general stock market index. Systematic risk arises out of external and uncontrollable factors. The price of individual security reflects the fluctuations and changes of general market. Systematic risk refers to that portion of variation in return caused by factors that affect the price of all securities. The effect in systematic risk causes the prices of all individual shares/bonds to move in the same direction. This movement is generally due to the response to economic, social and political changes. The systematic risk cannot be avoided. It relates to economic trends which affect the whole market. When the stock market is bullish, prices of all stocks indicate rising trend and in the bearish market, the prices of all stocks will be falling. The systematic risk cannot be eliminated by diversification of portfolio, because every share is influenced by the general market trend.

Unsystematic Risk: Unsystematic risk is that portion of total risk which results from known and controllable factors. Unsystematic risk refers to that portion of the risk which is caused due to factors unique or related to a firm or industry. The unsystematic risk is the change in the price

of stocks due to the factors which are particular to the stock. For example, if excise duty or customs duty on viscose fibre increases, the price of stocks of synthetic yarn industry declines. The unsystematic risk can be eliminated or reduced by diversification of portfolio. Unsystematic risks are those that are unique to a particular company or a particular investment, resulting downward movement in the performance of one company can be offset by an uptrend movement in another and so much of this unsystematic risk can be eliminated through diversification on the part of the shareholders when they hold a portfolio of shares. The systematic risk attached to each of the security is same irrespective of any number of securities in the portfolio. The total risk of portfolio is reduced, with increase in number of stocks, as a result of decrease in the unsystematic risk distributed over number of stocks in the portfolio.

(d) **Risks affecting capital influx:** Capital formation through foreign direct investment must face the ramifications of political risk at the strategic level. Policies favouring capital influx into a country may have to toil against policies favouring nationalization or stringent governmental controls, especially due to the usually long time-frame of their eventual implementation. Influx of capital through foreign institutional investments must also face different risks caused by changes in interest rate, political, and national exigencies.
For example, the different interest rates in different countries has introduced a risk, in that FIIs pull out of a country or enter another country in a big way, leading to volatility in interest rates and their differentials. A thin margin of profit may lead to an avalanche of foreign institutional investors moving from one country to another. For instance, an increase in foreign institutional investment in some Asian economies, such as India, towards the end of the 20th century occurred when the Asian tigers suffered a jolt in their economy.
Another important risk in this arena is the camouflage of investments through participatory notes and the like. This may obscure the likely participation, in the secondary market, of groups that may have links with terrorism and the mafia.

Market Volatility: This has always rendered a long-term strategy susceptible to deviation from the desired course. Markets are no longer protected and the whole world has shrunk due to new vistas in communication. The winds of change that have been blowing across the globe during the last few decades have brought in many abrupt changes resulting in the diverse business risks of demand-supply imbalances, divergence, unexpected technological obsolescence, and new exigencies in corporate governance. The price mechanism has also changed. The belief that price takes care of all the factors of production such as land, labour, capital, technology, and enterprise, is not too correct because inefficiencies in any of the factors cannot be passed on to the customer. Customer behaviour, an important component of the value chain, needs to be carefully coordinated. However, the parameter is itself unpredictable, since customer perceptions across segments and sectors are known to vary and thus add to the risk component.

10. (a) Discuss the Linear Probability Model.
(b) "The key to preventing corporate failure is to spot the warning signs early, and take corrective action quickly." – Explain the above statement.
(c) Mention the objectives of GACAP. [5+10+5]

Solution:

(a) To fix the idea, let us start by considering the following model:
$Y_i = \beta_1 + \beta_2 X_i + \mu_i$ ..... [B]
Where,
X_i = the explanatory variable (s)
Y_i = 1 if the event occurs (say firm fails)
Y_i = 0 if the event does not occur (say the firm does not fail)
Models like [B], which express the dichotomous Y_i as a linear function of the explanatory variable (s) X_i , are called LPM because the conditional expectation of Y_i given X_i , can be

interpreted as the conditional probability that the event will occur given X_i ; that is, P ($Y_i = 1$ | X_i). Such a model can be estimated by using OLS(Ordinary Least Square) technique, whereas variable Y_i follows a probability distribution in which probability must lie between 0 (when event does not occurs) and 1 (when event occurs). So, LPM models require that the conditional probability must lie between 0 and 1.

In application of LPM to bankruptcy prediction, a boundary value has to be found that will distinguish between those failing and non-failing firms in the population. Minimizing the classification errors does this. LPM coefficients are used to construct performance scores for firms. Alternatively, the LPM scores may be interpreted as probabilities of failure.

(b) This question asked how company is preventing the corporate failure and taking actions. The actions needed will depend on the particular situation.

- Once the signs of impending failure are seen, it is important to investigate and identify the causes.
- These may be related to a range of different functions within the business, such as financial management, marketing or production.
- It may sometimes be necessary to seek external advice to help to identify the problem.
- It is important that the managers of the business accept that there is a problem and that mistakes have been made and to move on to a solution, rather than apportioning blame.
- Actions may involve major strategic change, such as getting out of a loss-making business, or making changes to the way operations are managed, such as changes to production management.
- The action needed may include putting in controls to prevent further loss.
- The best strategy to prevent failure is to have effective management systems in place to begin with.

The performance management system will need to reflect the performance improvement strategies:

- A link should be established between the new strategic goals and CSFs (Critical success factors)
- Performance targets should be set at all levels and these should relate to the achievement of strategic objectives
- Continuous review of actual performance against targets will be required
- Additional training and development needs must be met.

(c) The objectives of this document are;

(i) to codify the GACAP as applied in the Indian industry;

(ii) to narrow down diversities in cost accounting practices facilitating the process of development of cost accounting standards;

(iii) to provide a reference source to industry and practitioners in preparation and attestation of Cost Statements, where specific cost accounting standards are yet to be issued;

(iv) to provide a reference source to all the stakeholders in the understanding and interpreting the cost statement;

(v) to provide a base for monitoring the evolution of new concepts and practices in cost accounting and to codify them as and when they become generally accepted;