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. FOOD CORPORATION OF INDIA: SUPPLY CHAIN MANAGEMENT

Food Corporation of India (FCI) was established under the Food Corporation of India Act 1964 for the purpose of trading in food grains and other foodstuffs. The Act extended to the whole of India. The Corporation acts as a body corporate. The general superintendence, direction and management of the affairs and business of the Corporation vests in a board of directors, which exercises all such powers and does all such acts and things as may be exercised or performed by the Corporation under the FCI Act.

FCI performs the major functions of procurement, storage preservation, movement, transportation, distribution and sale of food grains and meets the requirements of Public Distribution System (PDS) in the country. In other words, it handles or manages the entire supply chain in food grains distribution in India. It acts as a nodal agency of the central government based on ethical business principles having regard to the interest of the producers (farmers) and consumers.

Supply chain management of food grains by FCI is actually a joint responsibility of the Central Government, the state governments and the union territories involved in the actual implementation of PDS. Functions of the centre are to procure, store and transport. The implementation and administration of PDS is the responsibility of the state government and the UT administration. They lift these commodities from central godowns mills and distribute them to consumers through the massive network of fair price shops. Monitoring, inspection and enforcement of legal provisions is also done by the state government and the UT administration.

The network of fair price shops (FPS) has been expanding over the years, adding to the supply chain. During the last decade, the number of fair price shops had increased from 3.61 lakh (1990) to 4.59 lakh (2004) as indicated in the following:

Increase in No. of Fair Price Shops

Year	No. of FPS (in lakhs)
1985	3.19
1987	3.38
1990	3.61
2004	4.59

An efficient supply chain management requires the establishment of a close link between production, procurement, transportation, storage and distribution of selected commodities. Infrastructure needs to be strengthened, particularly in the backward, remote and inaccessible areas. The system also needs to be much improved to make it cost-effective. There is need for buffer stock in such a system. But, buffer stock can be reduced by timely procurement, transportation and storage.

This would reduce the carrying costs of the goods meant for distribution. The costs can also be reduced by increasing efficiency in the distribution network.

Leakages during the movement of food grains, etc., need to be plugged. Proper and timely checks of the fair price shops, godown, etc., can also lower the cost of PDS operations and the total supply chain management. FCI has to ultimately ensure a cost-effective supply chain and, for this, appropriate modalities have to be worked out.

Required:

(a) Explain the objectives of Supply Chain Management?

(b) Describe the Importance of Supply Chain Management?

(c) Discuss the advantages and disadvantages after implementing the supply chain management by FCI?

(d) Mention the component of Supply Chain Management. [3+4+3+5]

Answer of 1 :

(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 competition will 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, 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."**

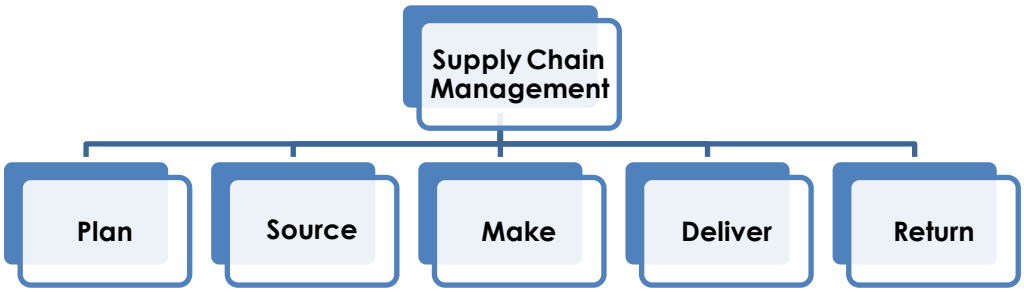
(c) This would reduce the carrying costs of the goods meant for distribution. The costs can also be reduced by increasing efficiency in the distribution network.

Leakages during the movement of food grains, etc., need to be plugged. Proper and timely checks of the fair price shops, godown, etc., can also lower the cost of PDS

operations and the total supply chain management. FCI has to ultimately ensure a cost-effective supply chain and, for this, appropriate modalities have to be worked out.

(d) Component of Supply Chain Management:

There are five basic components of Supply Chain Management. These are showing in the diagram:



(i) **Plan:** This is the strategic portion of SCM. You need a strategy for managing all the resources that go toward the meeting customer demand for your product and services.

(ii) **Source:** Choose the suppliers that will deliver the goods and services you need to create your product. Develop a set of pricing, delivery and payment processes with suppliers and create metrics for monitoring and improving the relationships.

(iii) **Make:** This is the manufacturing step. Schedule the activities necessary for production, testing, packaging and preparation for delivery.

(iv) **Deliver:** This is the part that many insiders refer to as logistics. Coordinate the receipt of orders from customers, develop a network of warehouses, pick carriers to get products to customers and set up an invoicing system to receive payments.

(v) **Return:** The problem part of the supply chain. Create a network for receiving defective and excess products back from customers and supporting customers who have problems with delivered products.

2. Taxmann Allied Services is a leading publisher specializing in books on Indian taxation and corporate laws, accounting and auditing, banking, finance and management. It also prints a vast array of journals, web-based products and legal databases on DVDs.
Until 2012, Taxmann did not have any solution to automate and manage sales or service processes. "Our sales, service and marketing teams managed customer information such as call and comments in a diary or at times in Excel worksheets, based on personal preferences," recalls Sumita Sharma, Head – Customer Care, Taxmann. The result was either duplication or data loss. Disorganized tracking and monitoring made the sales cycle longer than anticipated, thus resulting in a higher cost of sales and poor closure rate.
Taxmann also offers online subscription to journals and books and other content. Previously, if a customer contacted its call center, the representative did not have sufficient information to handle the calls effectively. Even simple issues such as activation, renewal and access, took time to resolve. In addition, there was no provision to log the customer and call details, or record the interaction. "Manual routing of calls, high wait time, and finding the right resources to resolve issues was a challenge. Resolution took 3-7 days, resulting in customer dissatisfaction," says Vishal Gambhir, Team Lead – Customer Care, Taxmann. Sometimes

customers would abandon the call due to the long wait time and there was no way to identify repeat callers.

The company wanted a robust and centralized Customer Relationship Management (CRM) solution that would help optimize business processes, effectively plan and track sales activities to shorten the sales cycles, increase closure rates and provide quality services to its customers, thus leading to customer satisfaction.

Taxmann evaluated several CRM solutions available in the market, including Sage, Zoho, Salesforce.Com, Microsoft Dynamics CRM and Sugar CRM.

Taxmann approached Godrej Infotech, a Microsoft Gold Certified Partner to implement the solution because of its experience, expertise and on-time delivery record.

After much analysis, the team opted for the Microsoft Dynamics CRM 2011 solution. "It was imperative that the solution proposed consolidate all of the customer data into a single system and reduces overheads, duplication and rework," says Hemant Savla, Delivery Manager, Godrej Infotech."At the same time, integration with other existing applications was a must." Out-of-the-box features of Microsoft Dynamics CRM and integration abilities met all Taxman's requirements.

The deployment started in October 2012 and the solution went live in less than five months with all the three modules, Sales, Service and Marketing for 50 concurrent users. In March 2013, Taxmann started using its CRM solution at the head office and its two customer call centers in Delhi. It purchased 50 concurrent user licenses.

Taxmann now defines marketing campaigns, and assigns employees to specific customers. All employees add updates to the CRM solution, for example, sales persons will update leads and opportunities in Dynamics CRM. This generates a 360-degree view of the customers. A salesperson can also track a customer's preferences, such as the preferred mode of communication, and the type of information and offers he/she would like to receive. This information helps the marketing team to deliver the right information via the right touch point to the customer. Taxmann develops new strategies based on the information available in Dynamics CRM to cross-sell and up-sell its products and services, thus increasing revenue.

Godrej Infotech also customized and integrated Dynamics CRM with third-party applications to fulfill unique business requirements. "Integration with SMS and email helps us to stay connected with our customers on their mobile phones," says Vishal. Computer Telephony Integration (CTI) routes calls immediately to the technical team to resolve queries. If required, agents escalate the queries from one office to another, thus giving immediate response to customers and ensuring satisfaction. Call wrap-up capability for managing post-call operations in Dynamics CRM, such as adding notes, activity and case management helps the Taxmann management to understand its customers better.

Godrej Infotech configured the master data management, that set the policies, governance and management of the master data. In addition, it integrated Microsoft Dynamics NAV, the ERP solution at Taxmann with Dynamics CRM.

"All the requisition orders and sales orders from Dynamics CRM automatically flow into Dynamics NAV and are added to the master data," states Sunita Singh, ERP Head, Taxmann. For example, an employee can use the customer information that is in Microsoft Dynamics NAV, which is synchronized with Dynamics CRM, to fill in an order form that a salesperson creates in Microsoft Dynamics CRM. "It automatically synchronizes a customer's account, contact, product, sales order and invoice information in both the applications, thus eliminating duplication of data."

The solution also provides meaningful charts and dashboards, culling out useful reports using tools such as SQL Server Reporting Services (SSRS) and SQL Server Integration Services (SSIS – for CTI reports) and creating customized forms for individual customers. Additionally, it offers tools to improve its ability to predict market trends and requirements.

Taxmann plans to integrate its website with the solution in the near future. This will assist in capturing leads and opportunities from the website as well as service requests.

Benefits

Microsoft Dynamics CRM consolidated information in a centralized system giving a precise 360-degree view of every customer. It has effectively mitigated business challenges faced earlier. "We have improved the visibility of information and processes for more predictable and manageable business operations," says Sumita.

(i) Improves Collaboration
(ii) Enhances Customer Service
(iii) Increase in Revenue
(iv) Increases Efficiency

Required:

(a) Define the Customer Relationship Management.
(b) Describe the objectives of the using of CRM applications.
(c) What are problem faces by the Taxmann before implementing the Customer Relationship?
(d) What are the steps are taken by the Taxmann to solve the problem?
(e) What are the facilities getting from implementation of Customer Relationship Management? **[3x5 =15]**

Answer of 2:

(a) There are as many definitions for CRM as there are opinions as to what is going to happen in the stock market on the next day. At its basic core, CRM entails initiatives that surround the customer side of the business. An example is initiatives wrapped around the customers in an effort to increase sales, improve customer service, add market share, enhance customer loyalty and reduce operating costs of sales and service. At its more formal definition, CRM is a business strategy comprised of process, organizational and technical change whereby a company seeks to better manage its enterprise around its customer behaviors. It entails acquiring and deploying knowledge about customers and using this information across the various customers touch points to increase revenue and achieve cost reduction through operational efficiencies.

(b) **Objectives for using CRM applications**

Objectives of using CRM applications, defined in the following line:

(i) To support the customer services
(ii) To increase the effectiveness of direct sales force.
(iii) To support of business to business activities.

(c) Until 2012, Taxmann did not have any solution to automate and manage sales or service processes. They managed customer information such as call and comments in a diary or at times in Excel worksheets, based on personal preferences. The result was either duplication or data loss. Disorganized tracking and monitoring made the sales cycle longer than anticipated, thus resulting in a higher cost of sales and poor closure rate.

Taxmann also offers online subscription to journals, books and other content. Previously, if a customer contacted its call center, the representative did not have sufficient information to handle the calls effectively. Even simple issues such as activation, renewal and access, took time to resolve. In addition, there was no provision to log the customer and call details, or record the interaction. Manual routing of calls, high wait time, and finding the right resources to resolve issues was a challenge. Resolution took 3-7 days, resulting in customer dissatisfaction. Sometimes customers would abandon the call due to the long wait time and there was no way to identify repeat callers.

(d) The company wanted a robust and centralized Customer Relationship Management (CRM) solution that would help optimize business processes, effectively plan and track sales activities to shorten the sales cycles, increase closure rates and provide quality services to its customers, thus leading to customer satisfaction.

Taxmann evaluated several CRM solutions available in the market, including Sage, Zoho, Salesforce.Com, Microsoft Dynamics CRM and Sugar CRM.
Taxmann approached Godrej Infotech, a Microsoft Gold Certified Partner to implement the solution because of its experience, expertise and on-time delivery record.
After much analysis, the team opted for the Microsoft Dynamics CRM 2011 solution. "It was imperative that the solution proposed consolidate all of the customer data into a single system and reduces overheads, duplication and rework. Out-of-the-box features of Microsoft Dynamics CRM and integration abilities met all Taxman's requirements.

(e) Microsoft Dynamics CRM consolidated information in a centralized system giving a precise 360-degree view of every customer. It has effectively mitigated business challenges faced earlier.
(i) Improves Collaboration
(ii) Enhances Customer Service
(iii)Increase in Revenue
(iv) Increases Efficiency

3. (a) Explain the role of Cost Accountant Role in Target Costing Environment.
(b) Describe the advantages and disadvantages of Return on investment. [6+4]

Answer of 3 (a) :
The role of a Cost Accountant in a Target Costing Team consists of the following activities

(i) **Cost Estimation**: To provide other members of the design team a running series of cost estimates based on initial designs sketch, activities based costing reviews of production processes, and "best guess" costing information from suppliers based on estimated production volumes.

(ii) **Permissible Cost Ranges**: To provide estimates within a high-low range cost, since preliminary data may be vague. But, the estimated cost range should be modified as more information becomes available.

(iii) **Capital Budgeting Analysis**: To cater to capital budgeting requests generated by the design team based on types of equipment needed for the anticipated product design, product revenues and costs, rates of return etc, and to answer questions regarding uncertainties and risk analysis.

(iv) **Cost Principles Explanation**: To work with the design team to help it understand the nature of various cost (such as cost allocations based on an Activity- Based Costing system), as well as the cost-benefit trade-offs of using different design or cost pertains in the new product.

(v) **Review of Cost reduction Targets**: To track the gap between the current cost and the target cost that is the design team's goal, providing an itemization of where cost savings have already been achieved and where there has not been a sufficient degree of progress.

(vi) **Final Review and Feed back**: To compare a product' actual cost to the target cost after the design is completed, and for as long as the Company sells the product. This is necessary since Management must know immediately if costs are increasing beyond budgeted levels and why these increases are occurring.

Answer of 3 (b) :

Advantages of Return on Investment:

ROI has the following advantages

(i) It relates net income to investments made in a division giving a better measure of divisional Profitability.

(ii) It can be used as a basis for other ratios which are useful for analytical purposes.

(iii) It is easy to understand as it is based on financial accounting measurements.

(iv) It may be used for inter firm comparisons, provided that the firms whose results are being compared are comparable size and the same industry.

4. Reduce the following two-person zero-sum game to 2 x 2 order, and obtain the optimal strategies for each player and the value of the game

		Player B			
		B_1	**B_2**	**B_3**	**B_4**
	A_1	**3**	**2**	**4**	**0**
	A_2	**3**	**4**	**2**	**4**
Player A	**A_3**	**4**	**2**	**4**	**0**
	A_4	**0**	**4**	**0**	**8**

[7+3]

Answer 4:

We observe that all entries in the third row of the given matrix are greater than, or equal to, the corresponding entries in the first row. Thus the first row is dominated by the third row and as such can be deleted. The deletion of the first row leads to the following matrix.

	B_1	B_2	B_3	B_4
A_2	3	4	2	4
A_3	4	2	4	0
A_4	0	4	0	8

Next, all elements of the first column are at least equal to their counterparts in the third column. We can, thus, delete the first column to get the following matrix:

	B_2	B_3	B_4
A_2	4	2	4
A_3	2	4	0
A_4	4	0	8

We notice now that the first column is dominated by a convex linear combination of the second and the third columns because

$$4 > \frac{1}{2}(2)+\frac{1}{2}(4);\ \ 2 = \frac{1}{2}(4)+\frac{1}{2}(0);\ \text{and}\ \ 4 = \frac{1}{2}(0)+\frac{1}{2}(8)$$

Its deletion results in the following:

	B_3	B_4
A_2	2	4
A_3	4	0
A_4	0	8

Similarly, the first row is equated to the convex linear combination of the other two rows as shown.

$$2 = \frac{1}{2}(4) + \frac{1}{2}(o); \text{ and } 4 = \frac{1}{2}(0) + \frac{1}{2}(8)$$

Hence, we deleted the first row to get the following 2 x 2 matrix which can be solved analytically.

	B_3	B_4
A_3	4	0
A_4	0	8

For this game,

$$x = \frac{8-0}{(4+8)-(0+0)} = \frac{8}{12} = \frac{2}{3}; \quad y = \frac{8-0}{(4+8)-(0+0)} = \frac{8}{12} = \frac{2}{3}; \text{ and } v = \frac{4 \times 8 - 0 \times 0}{(4+8)-(0+0)} = \frac{32}{12} = \frac{8}{3}.$$

Thus, the optimal strategy for A is (0, 0, 2/3, 1/3), for B it is (0, 0, 2/3, 1/3) and the game value v = 8/3.

5.(a) Listing the Objectives of pricing Policy.

(b) The cost function is C = 100+q , where the product is sold at ₹ 5 per unit . Determine break even sales and profit when 125 units are sold.

(c) The total cost function of a firm C = $\frac{x^3}{3} - 5x^2 + 28x + 10$, where C is total cost and 'x' is the output. A tax @ ₹2 per unit of output is imposed and the producer adds it to his cost. If the demand function is given by P = 2530 - 5x, where 'P' is the price per unit of output, Find the profit maximizing output and the price at the level.

(d) The price (P) per unit at which company can sell all that it produces is given by the function P(x) = 300 – 4x. The cost function is 500 + 28x, where 'x' is the number of units, find x, so that profit is maximum. [2+2+3+3]

Answer 5(a):

Objectives of a Pricing Policy

Each pricing decision of a firm has generally one of the following objectives:

- To achieve a given rate of return for the entire product line;
- To maintain or increase the existing market share of the firm;
- To maintain at least a particular level of price stability;

• To choose and adopt a price policy which fits into the market conditions faced by the different products in the product line;

Answer 5(b):

Let, Total Revenue (TR) = Pq = 5q [where, P = selling price per unit of the product
And, q = Quantity of the product]

And C = 100+q

For Break even TR = C $\Rightarrow$ 5q = 100+q $\Rightarrow$ q = 25

For Break even sales = 5 x 25 = ₹ 125

Again, say that Profit = π

Now π = TR - C = 5q – 100 . q =4q – 100.

As per question, q = 125 , π = 4 x125 – 100 = 400

So, Break Even sales is ₹ 125 and Break even profit is ₹ 400

Answer 5(c):

Given (C) = $\frac{x^3}{3} - 5x^2 + 28x + 10 + 2x$

P = 2530 – 5x

Revenue = xp = $2530x – 5x^2$

Profit = $2530x – 5x^2 + 5x^2 – 28x – 10 - \frac{x^3}{3} – 2x$

$= -\frac{x^3}{3} – 2{,}502x – 10 – 2x$

$\frac{dp}{dx} = \frac{-3x^2}{3} – 2{,}500$

$X^2 = 2{,}500$

$\therefore x = \sqrt{2{,}500} = 50$

$\frac{dp^2}{dx^2} = –2x$

For x = 50,

$\frac{dp^2}{dx^2} = –2x = -2 \times 50 = -100$ which is negative.

∴ Maximum profit is at x = 50 units
Price = 2,530 – 5 x 50 = ₹ 2,280

Answer 5(d):

P = 300 – 4x
$R = P(x) = 300x – 4x^2$
C = 500 + 28x
P = R – C

Profit = $300x - 4x^2 - 500 - 28x$

$= -4x^2 + 272x - 500$

$\frac{dz}{dx} = -8x + 272 = 0$

$-8x = -272$

$X = 272/8 = 34$

$\frac{d^2z}{dx^2} = -8$, which is Negative

Profit is maximum at x = 34 units.

6. (a) Describe the important Key Performance Indicators.
(b) Explain about the Financial Gearing Ratio. [8+2]

Answer of 6 (a):

The following are some important KPIs that should be monitored:

(i) **Stock turnover – days.** Reflects the number of days that it takes to sell inventory. The lower the ratio means the quicker the stock is sold.
(ii) **Debtors turnover – days.** Reflects average length of time from sale to cash collection. The lower the ratio means the quicker that accounts are paid. From a cash flow perspective, it is important to keep days outstanding to a minimum.
(iii) **Current ratio.** Indicates the extent to which current assets cover current liabilities and is a measure of the ability to meet short-term obligations. The rough rule of thumb is a ratio of 2:1. That is for every `1 of liabilities (within 12 months), there should be at least `2 in current assets to meet such liabilities.
(iv) **Debt/equity.** This is a measure of the extent to which a business relies on external borrowings to fund its on-going operations. The higher the ratio, the more heavily that debt financing is used. In order to provide a reliable measure, assets should be valued at market value.
(v) **Interest coverage.** Provides a measure of the ability of the business to meet its interest commitments out of profits and is linked to the debt/equity ratio. The rough rule of thumb used by banks is a ratio of 3:1. That is, operating profit before income tax exceeding interest expense three times.
(vi) **Return on investment.** Represents the after-tax return that owners are receiving on their investment and should be compared with alternative forms of investment.
(vii) **Gross profit margin.** An indication of the profitability of the business and reflects control over cost of sales and pricing policies. This ratio should be compared with prior periods and to any available industry data.
(viii) **Breakeven sales.** Reflects the sales that need to be generated in order to cover expenses. In other words, this is the level of activity at which neither a profit nor loss is incurred, nor where total costs equate with total revenue. This is a very important ratio that every owner should monitor on a monthly basis.

Answer of 6 (b):
Gearing ratios
In addition to managing profitability and liquidity it is also important for a company to manage its financial risk. The following ratios may be calculated:
Financial gearing
This is the long term debt as a percentage of equity.

$$\text{Gearing} = \frac{\text{debt}}{\text{equity}} \times 100$$

or

$$\frac{\text{debt}}{\text{debt} + \text{equity}} \times 100$$

A high level of gearing indicates that the company relies heavily on debt to finance its long term needs. This increases the level of risk for the business since interest and capital repayments must be made on debt, where as there is no obligation to make payments to equity.

The ratio could be improved by reducing the level of long term debt and raising long term finance using equity.

Section –B
[Answer any one]

7. (a) Explain the following terms:-
(i) Business 2 Business, (ii) Business 2 Customer, (iii) Customer to Business, (iv) Customer to Customer.
(b) Describe the doctrine demand of Six Sigma.
(c) Explain the usage of Artificial Neural Network.
(d) Describe about On – Line Analytical Processing [OLAP] [(4x2) +4+4+4]

Answer of 7 (a) :

(i) Business to Business (B2B)

Business to Business or B2B refers to e-commerce activities between businesses. These transactions are usually carried out through Electronic Data Interchange or EDI. This allows more transparency among business involved; therefore business can run more efficiently.

(ii) Business to Customer (B2C)

Business to Customer or B2C refers to e-commerce activities that are focused on consumers rather than on businesses.

(iii) Customer to Business (C2B)

Customer to Business or C2B refers to e-commerce activities, which uses reverse pricing models where the customer determines the prices of the product or services. There is increased emphasis on customer empowerment.

(iv) Customer to Customer (C2C):

Customer to Customer or C2C refers to e-commerce activities, which uses an auction style model. This model consists of person-to-person a transaction that completely excludes businesses from the equation.

Answer of 7 (b) :

Six Sigma:

Six Sigma at many organizations simply means a measure of quality that strives for near perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving toward six standard deviations between the mean and the nearest specification limit) in any process – from manufacturing to transactional and from product to service.

The fundamental objective of the Six Sigma methodology is the implementation of a measurement-based strategy that focuses on process improvement and variation reduction through the application of Six Sigma improvement projects. This is accomplished through the use of two Six Sigma sub-methodologies: DMAIC and DMADV. The Six Sigma DMAIC process (defines, measure, analyze, improve, control) is an improvement system for existing processes falling below specification and looking for incremental improvement. 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. Both Six Sigma processes are executed by Six Sigma Green Belts and Six Sigma Black Belts, and are overseen by Six Sigma Master Black Belts.

Six Sigma doctrine demands the following conditions:

(i) Continuous efforts to achieve stable and predictable process results (i.e., reduce process variation) are of vital importance to business success.

(ii) Manufacturing and business processes have characteristics that can be measured, analyzed, controlled and improved.

(iii) Achieving sustained quality improvement requires commitment from the entire organization, particularly from top-level management.

(c) Artificial Neural Network (ANN)

An Artificial Neural Network (ANN) is a mathematical model that tries to simulate the structure and functionalities of biological neural networks. Basic building block of every artificial neural network is artificial neuron, that is, a simple mathematical model (function). Such a model has three simple sets of rules: multiplication, summation and activation.

Usage of Artificial Neural Networks

One of the greatest advantages of artificial neural networks is their capability to learn from their environment. Learning from the environment comes useful in applications where complexity of the environment (data or task) make implementations of other type of solutions impractical. As such artificial neural networks can be used for variety of tasks like classification, function approximation, data processing, filtering, clustering, compression, robotics, regulations, decision making, etc. Choosing the right artificial neural network topology depends on the type of the application and data representation of a given problem. When choosing and using artificial neural networks we need to be familiar with theory of artificial neural network models and learning algorithms. Complexity of the chosen model is crucial; using to simple model for specific task usually results in poor or wrong results and over complex model for a specific task can lead to problems in the process of learning. Complex model and simple task results in memorizing and not learning. There are many learning algorithms with numerous tradeoffs between them and almost all are suitable for any type of artificial neural network model. Choosing the right learning algorithm for a given task takes a lot of experiences and experimentation on given problem and data set. When artificial neural network model and learning algorithm is properly selected we get robust tool for solving given problem.

(d) On-Line Analytical Processing (OLAP)

On-Line Analytical Processing (OLAP) is a category of software technology that enables analysts, managers and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information that has been transformed from raw data to reflect the real dimensionality of the enterprise as understood by the user.

OLAP functionality is characterized by dynamic multi-dimensional analysis of consolidated enterprise data supporting end user analytical and navigational activities including:

(i) calculations and modeling applied across dimensions, through hierarchies and/or across members
(ii) trend analysis over sequential time periods
(iii) slicing subsets for on-screen viewing
(iv) drill-down to deeper levels of consolidation
(v) reach-through to underlying detail data
(vi) rotation to new dimensional comparisons in the viewing area

OLAP is implemented in a multi-user client/server mode and offers consistently rapid response to queries, regardless of database size and complexity. OLAP helps the user synthesize enterprise information through comparative, personalized viewing, as well as through analysis of historical and projected data in various "what-if" data model scenarios. This is achieved through use of an OLAP Server.

8. (a) State the key roles of for its successful implementation in Six sigma.

(b) Describe the methods of Statistical Process Control (SPC).

(c) "The MI is based on the concept of the Production function. This is a function of maximum possible production, with respect to a set of inputs pertaining to capital and labour" – Discuss it.

(d) Describe the Recurrent Artificial Neural Networks. [6+4+5+5]

Answer of 8(a) :

Six Sigma identifies several key roles for its successful implementation.

- Executive Leadership includes the CEO and other members of top management who are responsible for setting up a vision for Six Sigma implementation. They also empower the other role holders with the freedom and resources to explore new ideas for breakthrough improvements.
- Champions take responsibility for Six Sigma implementation across the organization in an integrated manner. The Executive Leadership draws them from upper management. Champions also act as mentors to Black Belts.
- Master Black Belts, identified by champions, act as in-house coaches on Six Sigma. They devote 100% of their time to Six Sigma. They assist champions and guide Black Belts and Green Belts. Apart from statistical tasks, they spend their time on ensuring consistent application of Six Sigma across various functions and departments.
- Black Belts operate under Master Black Belts to apply Six Sigma methodology to specific projects. They devote 100% of their time to Six Sigma. They primarily focus on Six Sigma project execution, whereas Champions and Master Black Belts focus on identifying projects/functions for Six Sigma.
- Green Belts are the employees who take up Six Sigma implementation along with their other job responsibilities, operating under the guidance of Black Belts.

The term "six sigma process" comes from the notion that if one has six standard deviations between the process mean and the nearest specification limit, as shown in the graph, practically no items will fail to meet specifications. This is based on the calculation method employed in process capability studies.

Capability studies measure the number of standard deviations between the process mean and the nearest specification limit in sigma units, represented by the Greek letter σ (sigma). As

process standard deviation goes up, or the mean of the process moves away from the center of the tolerance, fewer standard deviations will fit between the mean and the nearest specification limit, decreasing the sigma number and increasing the likelihood of items outside specification.

Answer of 8(b) :

Statistical Process Control (SPC) Methods

Statistical process control (SPC) monitors specified quality characteristics of a product or service so as:

To detect whether the process has changed in a way that will affect product quality and

To measure the current quality of products or services.

- **Control** is maintained through the use of control charts. The charts have upper and lower control limits and the process is in control if sample measurements are between the limits.
- **Control Charts for Attributes**

P Charts - measures proportion defective.

C Charts - measures the number of defects/unit.

- **Control Charts for Variables**
  X bar and R charts are used together - control a process by ensuring that the sample average and range remain within limits for both.

- **Basic Procedure**
  a. An upper control limit (UCL) and a lower control limit (LCL) are set for the process.
  b. A random sample of the product or service is taken, and the specified quality characteristic is measured.
  c. If the average of the sample of the quality characteristic is higher than the upper control limit or lowers than the lower control limit, the process is considered to be "out of control".

Answer of 8(c) :

Malm Quist Index (MI)

The **Malmquist Index** (MI) is a bilateral index that can be used to compare the production technology of two economies. It is named after Professor Sten Malmquist, on whose ideas it is based. It is also called the Malmquist Productivity Index.

The MI is based on the concept of the Production function. This is a function of maximum possible production, with respect to a set of inputs pertaining to capital and labour. So, if S_a S_a is the set of labour and capital inputs to the production function of Economy A, and Q is the production function of Economy A, we could write $Q = f(S_a)$.

While the production function would normally apply to an enterprise, it is possible to calculate it for an entire region or nation. This would be called the aggregate production function.

To calculate the Malmquist Index of economy A with respect to economy B, we must substitute the labour and capital inputs of economy A into the production function of B, and vice versa. The formula for MI is given below.

$$MI = \sqrt{(Q_1 Q_2) / (Q_3 Q_4)}$$

Where

$$Q_1 = f_a(S_a)$$

$$Q_2 = f_a(S_b)$$

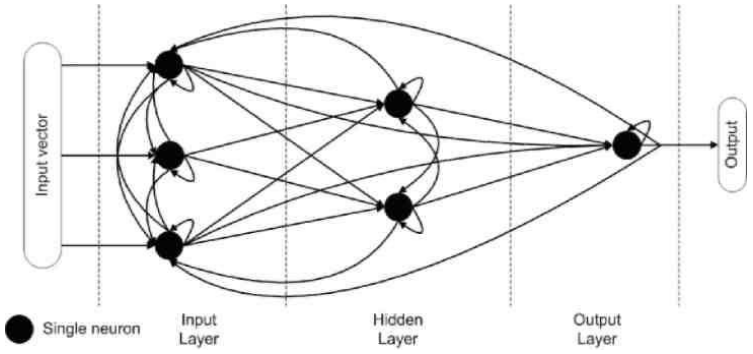
$Q_3 = f_b(S_a)$

$Q_4 = f_b(S_b)$

Note that the MI of A with respect to B is the reciprocal of the MI of B with respect to A. If the MI of A with respect to B is greater than 1, the aggregate production technology of economy A is superior to that of economy B.

(d) Recurrent Artificial Neural Networks:

Artificial neural network with the recurrent topology is called Recurrent Artificial Neural Network. It is similar to feed-forward neural network with no limitations regarding back-loops. In these cases information is no longer transmitted only in one direction but it is also transmitted backwards. This creates an internal state of the network which allows it to exhibit dynamic temporal behaviour. Recurrent artificial neural networks can use their internal memory to process any sequence of inputs. The following figure shows small Fully Recurrent artificial neural network and complexity of its artificial neuron interconnections. The most basic topology of recurrent artificial neural network is fully recurrent artificial network where every basic building block (artificial neuron) is directly connected to every other basic building block in all direction. Other recurrent artificial neural networks such as Hopfield, Elman, Jordan, bi-directional and other networks are just special cases of recurrent artificial neural networks.



Section – C
[Answer any one]

9. (a) Define the Risk Management and describe the objectives of that.
(b) Explain about the Total Loss Distribution and Probability of Ruin.
(c) Describe the benefits of Risk Mapping. [(3+5)+(4+5) +3]

Answer of 9 (a) :

Definition of Risk Management

Risk management is the process of measuring or assessing risk and developing strategies to manage it. Risk management is a systematic approach in identifying, analyzing and controlling areas or events with a potential for causing unwanted change. It is through risk management that risks to any specific program are assessed and systematically managed to reduce risk to an acceptable level. Risk management is the act or practice of controlling risk. It includes risk

planning, assessing risk areas, developing risk handling options, monitoring risks to determine how risks have changed and documenting overall risk management program.

Risk management is a systematic approach to setting the best course of action under uncertainty by identifying, assessing, understanding, acting on and communicating risk issues. A Key ingredient of the risk measurement process is the accuracy and quality of master data that goes into the computation of different aspects of risk. It is no surprise therefore that Master Data Management is a key area. Risk management is first and foremost a 'science' and then an 'art'. Given the appetite for risk, if one uses accurate and relevant data, reliable financial models and best analytical tools, one can minimize risk and make the odds work in one's favour.

Risk Management process needs to identify measure and manage various risks so that comparison of risks and returns is possible to set corporate strategies. Risk Management is the identification and evaluation of risks to an organization including risks to its existence, profits and reputation (solvency) and the acceptance, elimination, controlling or mitigation of the risks and the effects of the risks.

Risk Management framework need a common metric to rank return and potential losses from different portfolios and risk categories.

Integrated risk management is a continuous, proactive and systematic process to understand, manage and communicate risk from an organization-wide perspective. It is about making strategic decisions that contribute to the achievement of an organization's overall corporate objectives.

Objectives of Risk Management

Risk management basically has the following objectives:

(i) Anticipating the uncertainty and the degree of uncertainty of the events not happening the way they are planned.
(ii) Channelizing events to happen the way they are planned.
(iii)Setting right, at the earliest opportunity, deviations from plans, whenever they occur.
(iv) Ensuring that the objective of the planned event is achieved by alternative means, when the means chosen proves wrong, and
(v)In case the expected event is frustrated, making the damage minimal.

Answer of 9 (b) :

Total Loss Distribution

Probability distributions can be very useful tools for evaluating the expected frequency and/or severity of losses due to identified risks. In risk management, two types of probability distribution are used: empirical and theoretical. To form an empirical probability distribution, the risk manager actually observes the events that occur, as explained in the previous section. To create a theoretical probability distribution, a mathematical formula is used. To effectively use such distributions, the risk manager must be reasonably confident that the distribution of the firm's losses is similar to the theoretical distribution chosen.

Three theoretical probability distributions that are widely used in risk management are: the binomial, normal, and poison.

Probability of Ruin

Ruin theory also known as collective risk theory, was actually developed by the insurance industry for studying the insurers vulnerability to insolvency using mathematical modeling. It is based on the derivation of many ruin-related measures and quantities and specifically includes the probability of ultimate ruin. This can be also related to the sphere of applied probability as

the techniques used in the ruin theory as fundamentally arising out of stochastic processes. Many problems in ruin theory relate to real-life actuarial studies but the mathematical aspects of ruin theory have really been of interest to actuarial scientists and other business research people. Normally an insurers' surplus has been computed as the net of two opposing cash flows, namely, cash inflow of premium income collected continuously at the rate of c and the cash outflow due to a series of insurance claims that are mutually independent and identically distributed with a common distribution function P(y). The path of the series of claims is assumed to respond to a Poisson process with intensity rate λ which would mean that the number of claims received N(t) at a time frame of t is controlled by a Poisson distribution with a mean λ_t. Therefore, the insurer's surplus at any time t is represented by the following-formula:

$$X(t) = x + ct - \sum_{i=0}^{N(t)} Y_i$$

Where, the business of the insurer starts with an initial level of surplus capital.
X (0) = x under probability measure as explained in the previous paragraph.

Towards the end of the 20th century, Garbur and Shiu introduced the concept of the expected discounted penalty function derived from the probability of ultimate ruin. This concept was utilized to gauge the behaviour of insurer's surplus using the following formula:

$$m(x) = E^x \left[e^{-\delta T} K_T \right]$$

where, δ is the discounting force of interest, K_T is a general penalty function representing the economic costs of the insurer at the time of ruin and the expectation relates to the probability measure. Quite a few ruin-related quantities fall into the category of the expected discounted penalty function.
In short, this theory of the probability of ruin is applied in the case of risk of insolvency of a company with diversified business activity. For the purpose of study, resources between diversified activities are allowed to be transferred and are limited by costs of transaction. Terminal insolvency happens when capital transfers between the business lines are not able to compensate the negative positions. Actuarial calculations are involved in the determination of ultimate ruin as discussed.

Answer of 9 (c) :

Benefits of Risk Mapping:

(i) Promotes awareness of significant risks through priority ranking, facilitating the efficient planning of resources.
(ii) Enables the delivery of solutions and services across the entire risk management value chain.
(iii) Serves as a powerful aid to strategic business planning.
(iv) Aids the development of an action plan for the effective management of significant risks.
(v) Assigns clear responsibilities to individuals for the management of particular risk areas.
(vi) Provides an opportunity to leverage risk management as a competitive advantage.
(vii) Facilitates the development of a strategic approach to insurance programme design.
(viii) Supports the design of the client's risk financing and insurance programmes, through the development of effective/optimal retention levels and scope of coverage etc.

10. (a) "It is a fact that some companies perform well and that some underperform and some fails. In many, if not most cases, these companies are led by executives that are quite experienced. Below are some recommendations that can help to reduce the risk of failures of organizations"- Justify the statements.
(b) Explain the L. C. Gupta Model under the Predictions of Corporate Failure.
(c) Describe the causes of corporate failure and their examples. [4+6+10]

Answer of 10 (a):

The statement explained about the Preventing Corporate Failures. It is a fact that some companies perform well and that some underperform and some fails. In many, if not most cases, these companies are led by executives that are quite experienced. Below are some recommendations that can help to reduce the risk of failures of organizations:

(i) Appointment of non-executive directors

The non-executive directors will bring their special expertise and knowledge on strategies, innovative ideas and business planning of the organization. They will monitor the work of the executive management and will help to resolve situations where conflict of interest arises. Overall, the non-executive directors will act as a Cross Check.

(ii) Audit committees

Very often, there is occurrence of fraud in management and financial reporting. The presence of the audit committees will help to resolve this problem. Audit committees have the potential to reduce the occurrence of fraud by creating an environment where there is both discipline and control.

(iii) Development of environment learning mechanism

Some organizations fail because they lose touch with their environment. Therefore, to counter this problem, there is a need to develop the environmental learning mechanism. Through it, new information can be brought on continuous basis. This is mainly done by carrying customer-feedback surveys. In this way, the organization can realign itself with the new needs and challenges.

(iv) Focus on research and development

Organizations can generate new knowledge by investing and focusing more on research and development. Thus, there will be more ideas how to make the products much better than that of their competitors.

Conclusion

It can be deducted that a director has a big responsibility that he has to assume there commendations mentioned above can help directors to reduce corporate failure, provided that the directors abide. Proper planning also is critical to the success of a business.

Answer of 10 (b):

Dr. L.C. Gupta's Sickness Prediction Model

Dr. L.C. Gupta made an attempt to distinguish between sick and non-sick companies on the basis of financial ratios. He used a simple non-parametric test for measuring the relative predicting power of different financial ratios. A mixed sample of sick and non-sick companies was made and the companies in the sample were arranged in a single ordered sequence from the smallest to the largest, according to the financial ratio that is tested for its predictive power. Let [profit after tax ÷ Net worth] is a financial ratio that is to be tested for its predictive power. The companies in the sample are arranged in increasing order of this particular ratio. Let the sick companies be denoted by the letter 'S' and the non-sick ones by the letter 'N'. Let us assume that 8 sick companies and 8 non-sick companies are taken for building up the sample. When arranged in a sequential order as stated above, the sequence may result in any pattern as shown below:

(A) S -N-S-N-S-S-N-S-N-N-S-N-S-N-S-N

(B) S -S-S-S-S-S-S-S-N-N-N-N-N-N-N-N

(C) S -S-S-S-N-N-N-N-N-N-N-N-S-S-S-S
(D) S -S-S-N-S-S-N-N-S-S-N-N-S-N-N-N

Observing the pattern of occurrence of 'S' and 'N' a cutoff point is chosen to separate the sick group from the non-sick group. Companies that fall to the left of the cutoff point lie in the sick group while companies that fall to the right of the cutoff point lie in the non-sick group. The cutoff point is so chosen that the number of misclassifications is minimized. The ratio that showed the least percentage classification error at the earliest possible time is deemed to have the highest predicative power. Referring to the four patterns shown above, the pattern of sequence shown in (B) is the most accurate one since the cutoff point will be located exactly midway in the sample group and the percentage of classification error will be zero since there are no misclassifications. Pattern shown in (C) is bound to have a higher error since the sick companies are concentrated on both the extreme ends.

Dr. L.C. Gupta used Indian data on a sample of 41 textile companies of which 20 were sick companies and 21 were non-sick companies. He studied the predictive power of 63 financial ratios and observed that the following two ratios have comparatively better predictive power.

(i) (Earnings before Interest and Taxes) ÷ Sales
and

(ii) (Operating cash flow) ÷ Sales

[Note: Operating cash flow = profit after tax + depreciation]

Answer of 10 (c):

Causes of Corporate Failure:

Technological causes

Traditional methods of doing work have been turned upside down by the development of new technology. If within an industry, there is failure to exploit information technology and new production technology, the firms can face serious problems and ultimately fail.

By using new technology, cost of production can be reduced and if an organization continues to use the old technology and its competitors start using the new technology; this can be detrimental to that organization. Due to high cost of production, it will have to sell its products at higher prices than its competitors and this will consequently reduced its sales and the organization can serious problems.

This situation was seen in the case of Mittal Steel Company taking over Arcelor Steel Company. Arcelor Steel Company was using its old technology to make steel while Mittal Steel Company was using the new technology and as a result, Mittal Steel Company was able to sell steel at lower price than Arcelor Steel Company due to its low cost of production. Arcelor Steel Company was approaching corporate failure and luckily, Mittal Steel Company merged with Arcelor Steel Company and became Arcelor Mittal Steel Company, thus preventing Arcelor from failure.

Working capital problems

Organizations also face liquidity problems when they are in financial distress. Poor liquidity becomes apparent through the changes in the working capital of the organization as they have insufficient funds to manage their daily expenses.

Businesses, which rely only on one large customer or a few major customers, can face severe problems and this can be detrimental to the businesses. Losing such a customer can cause big problems and have negative impact on the cash flows of the businesses.

Besides, if such a customer becomes bankrupt, the situation can even become worst, as the firms will not be able to recover these debts.

Economic distress
A turndown in an economy can lead to corporate failures across a number of businesses. The level of activity will be reduced, thus affecting negatively the performance of firms in several industries. This cannot be avoided by businesses.

The recent economic crisis in the USA led to many cases of corporate failures. One of them is the insurance AIG insurance company. It is facing serious problems and it might close its door in the near future.

Mismanagement
Inadequate internal management control or lack of managerial skills and experience is the cause of the majority of company failures. Some managers may lack strategic capability that is to recognize strengths, weaknesses, opportunities and threats of a given business environment. These managers tend to take poor decisions, which may have bad consequences afterwards.

Furthermore, managers of different department may not have the ability to work closely together. There are dispersed department objectives, each department will work for their own benefits not towards the goal of the company. This will bring failure in the company. One example can be WorldCom, where the finance and legal functions were scattered over several states and communication between these departments were poor.

Over-expansion and diversification
Research has shown that dominant CEO is driven by the ultimate need to succeed for their own personal benefits. They neglect the objective set for the company and work for their self-interest. They want to achieve rapid growth of the company to increase their status and pay level. They may do so by acquisition and expansion.

The situation of over expansion may arise to the point that little focus is given to the core business and this can be harmful as the business may become fragment and unfocused. In addition, the companies may not understand the new business field. Enron and WorldCom can be an example for this situation where the managers did not understand how growing overcapacity would influence its investment and therefore did not comprehend the risks associated with it.

Fraud by management
Management fraud is another factor responsible for corporate collapse. Ambitious managers may be influenced by personal greed. They manipulate financial statements and accounting reports. Managers are only interested in their pay checks and would make large increase in executive pay despite the fact that the company is facing poor financial situation. Dishonest managers will attempt to tamper and falsify business records in order to fool shareholders about the true financial situation of the company. These fraudulent acts or misconduct could indicate a serious lack of control. These frauds can lead to serious consequences: loss of revenue, damage to credibility of the company, increased in operating expenses and decrease in operational efficiency.

Poorly Structured Board
Board of Directors is handpicked by CEO to be docile and they are encouraged by executive pay and generous benefits. These directors often lack the necessary competence and may not control business matters properly. These directors are often intimated by dominant CEO and do

not have any say in decision making. Example Enron and WorldCom where poorly structured board was a contributor towards their failure.

Financial distress

Firms that become financially distressed are found to be under- performing relative to the other companies in their industry. Corporate failure is a process rooted in the management defects, resulting in poor decisions, leading to financial deterioration and finally corporate collapse. Financial distresses include the following reasons also low and declining profitability, investment Appraisal, Research and Development and technical insolvency amongst others.

A firm may fail, as its returns are negative or low. A firm that consistently reports operating losses probably experiences a decline in market value. If the firm fails to earn are turn greater than its cost of capital, it can be viewed as having failed. Falling profits have an obvious link with both financial and bankruptcy as the firm finds it is not generating enough money to meet its obligations as they fall due.

Another cause that will lead the company to fail is the investment appraisal. Many organizations run into difficulties as they fail to appraise investment projects carefully. The long-term nature of many projects means that outcomes are difficult to forecast and probabilities are usually subjective. "Big project gone wrong" is a common cause of decline. For example, the acquisition of a loser company, this has happen in the case for the failure of Parmalat Co Ltd of Italy, which made the acquisition of several losses making company where Inappropriate evaluation of the acquired company, its strengths and weaknesses.