Unit – 1
Introduction to Inventory Management

Learning Objectives

After completion of the unit, you should be able to:

- Explain the meaning and types of inventory.
- Describe the meaning and objectives of inventory management.
- Know the factors affecting the level of inventory.
- Also understand the various techniques of inventory control – Modern techniques and Traditional techniques.

Structure

1.1   Introduction

A business can run smoothly its operating activities only when appropriate amount of inventory is maintained. Inventory affects all operating activities like manufacturing, warehousing, sales etc. The amount of opening inventory and closing inventory should be sufficient enough so that the other business activities are not adversely affected. Thus, inventory plays an important role in operations management.

1.2   Meaning & Types of Inventory

Inventory is an asset that is owned by a business that has the express purpose of being sold to a customer. Inventory refers to the stock pile of the product a firm is offering for sale and the components that make up the product. In other words, the inventory is used to represent the aggregate of those items of tangible assets which are –

- Held for sale in ordinary course of the business.
- In process of production for such sale.
- To be currently consumed in the production of goods or services to be available for sale.

The inventory may be classified into three categories:

- ➢ Raw material and supplies: It refers to the unfinished items which go in the production process.
- ➢ Work in Progress: It refers to the semi-finished goods which are not 100% complete but some work has been done on them.
- ➢ Finished goods: It refers to the goods on which 100% work has been done and which are ready for sale.

1.3   Meaning of Inventory Management

Inventory management is the practice overseeing and controlling of the ordering, storage and use of components that a company uses in the production of the items it sells. A component of supply chain management, inventory management supervises the flow of goods from manufacturers to warehouses and from these

facilities to point of sale. Inventory control means efficient management of capital invested in raw materials and supplies, work- in – progress and finished goods.

1.4 Significance of holding inventory

Inventory is considered to be one of the most important assets of a business. Its management needs to be proactive, accurate and efficient. Inventory is essential for every organization to ensure smooth running of the production process, to reduce the ordering cost of inventory, to take advantage of quantity discount, avoid opportunity loss on sales, to utilize and optimize the plant capacity and to reduce the overall price. Thus, it can be said that inventory is inevitable and has to be maintained in appropriate quantity. However, the concept of Just In Time (JIT) is becoming popular which is an inventory strategy companies employ to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs. This method requires producers to forecast demand accurately.

1.5 Objectives of Inventory Management

The objective of inventory management is to maintain inventory at an appropriate level to avoid excess or shortage of inventory. Inventory management systems reduce the cost of carrying inventory and ensure that the supply of raw material and finished goods remains continuous throughout the business operations. The objectives specifically may be divided into two categories mentioned below:

A. Operating objectives: They are related to the operating activities of the business like purchase, production, sales etc.

   a. To ensure continuous supply of materials.
   b. To ensure uninterrupted production process.
   c. To minimize the risks and losses incurred due to shortage of inventory.
   d. To ensure better customer services.
   e. Avoiding of stock out danger.

B. Financial Objectives:

  a. To minimize the capital investment in the inventory.

  b. To minimize inventory costs.

  c. Economy in purchase.

Apart from the above objectives, inventory management also emphasize to bring down the adverse impacts of holding excess inventory. Holding excess inventory lead to the following consequences:

- Unnecessary investment of funds and reduction in profit.
- Increase in holding costs.
- Loss of liquidity.
- Deterioration in inventory.

✓ **Check your progress**

Exercise 1

Suppose you are the inventory manager of a firm dealing in dairy products. State what would be your priority objectives of managing the inventory of dairy products.

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1.6 Factors affecting the level of inventory

The level of inventory should be appropriate. The appropriateness of the amount of inventory depends upon a number of factors. Some significant factors affecting the level of inventory are explained as follows:

1. Nature of business: The level of inventory will depend upon the nature of business whether it is a retail business, wholesale business, manufacturing business or trading business.

2. Inventory turnover: Inventory turnover refers to the amount of inventory which gets sold and the frequency of its sale. It has a direct impact on the amount of inventory held by a business concern.

3. Nature of type of product: The product sold by the business may be a perishable product or a durable product. Accordingly, the inventory has to be maintained.

4. Economies of production: The scale on which the production is done also affects the amount of inventory held. A business may work on large scale in order to get the economies of production.

5. Inventory costs: More the amount of inventory is held by the business, more will be the operating cost of holding inventory. There has to be a trade-off between the inventory held and the total cost of inventory which comprises of purchase cost, ordering cost and holding cost.

6. Financial position: Sometimes, the credit terms of the supplier are rigid and credit period is very short. Then, according the financial situation of the business the inventory has to be held.

7. Period of operating cycle: If the operating cycle period is long, then the money realization from the sale of inventory will also take a long duration. Thus, the inventory managed should be in line with the working capital requirement and the period of operating cycle.

8. Attitude of management: The attitude and philosophy of top management may support zero inventory concept or believe in maintaining huge inventory level. Accordingly, the inventory policy will be designed for the business.

1.7 Techniques of inventory control

Inventory control refers to a process of ensuring that appropriate amount of stock are maintained by a business, so as to be able to meet customer demand without delay while keeping the costs associated with holding stock to a minimum. Inventory control signifies a planned approach of finding when to shift, what to shift, how much to shift and how much to stock so that costs in buying and storing are optimally minimum without interrupting production or affecting sales. To solve these problems of inventory management various techniques are there.

These techniques are divided into two categories – modern techniques and traditional techniques.

(1) MODERN TECHNIQUES

      (a)   Economic Order Quantity (EOQ)

      (b)   Re-Order Point (ROP)

      (c)   Fixing Stock Levels

      (d)   Selective Inventory Control

            (i)   ABC Analysis

            (ii)   VED Analysis

            (iii)   SDE Analysis

            (iv)   FSN Analysis

(2) TRADITIONAL TECHNIQUES

      (a)   Inventory Control Ratios

      (b)   Two Bin System

      (c)   Perpetual Inventory System

      (d)   Periodic Order System

1.8 Modern Techniques

Modern techniques of inventory control refers to those techniques which are evolved through a scientific process. These techniques involve the use of a formula or a method which is logically derived to keep control on the inventory levels. These techniques are explained as below:

(a) ECONOMIC ORDER QUANTITY (EOQ)

The optimal size of an order for replenishment of inventory is called economic order quantity. Economic order quantity (EOQ) or optimum order quantity is that size of the order where total inventory costs (ordering costs + carrying costs) are

minimized. Economic order quantity can be calculated from any of the following two methods:

- Formula Method
- Graphic Method

Formula Method: It is also known as 'SQUARE ROOT FORMULA' or 'WILSON FORMULA' as given below:

$$EOQ = \sqrt{\frac{2RO}{C}}$$

Where, EOQ = Economic Order Quantity
       R = Annual Requirement or consumption in units
       O = Ordering Cost per order
       C = Carrying Cost per unit per year
No. of orders = R/EOQ
Time gap between two orders = No. of days in a year/No. of orders
Total Cost =   Purchase Cost + Carrying Cost + Order Cost
       =   (R x Unit Price) + (EOQ/2 x C) + (R/EOQ x O)

Graphic Method

The economic order quantity can also be determined with the help of graph. Under this method, ordering costs, carrying costs and total inventory costs according to different lot sizes are plotted on the graph. The intersection point at which the inventory carrying cost and the ordering cost meet, is the economic order quantity. At this point the total cost line is also minimum.
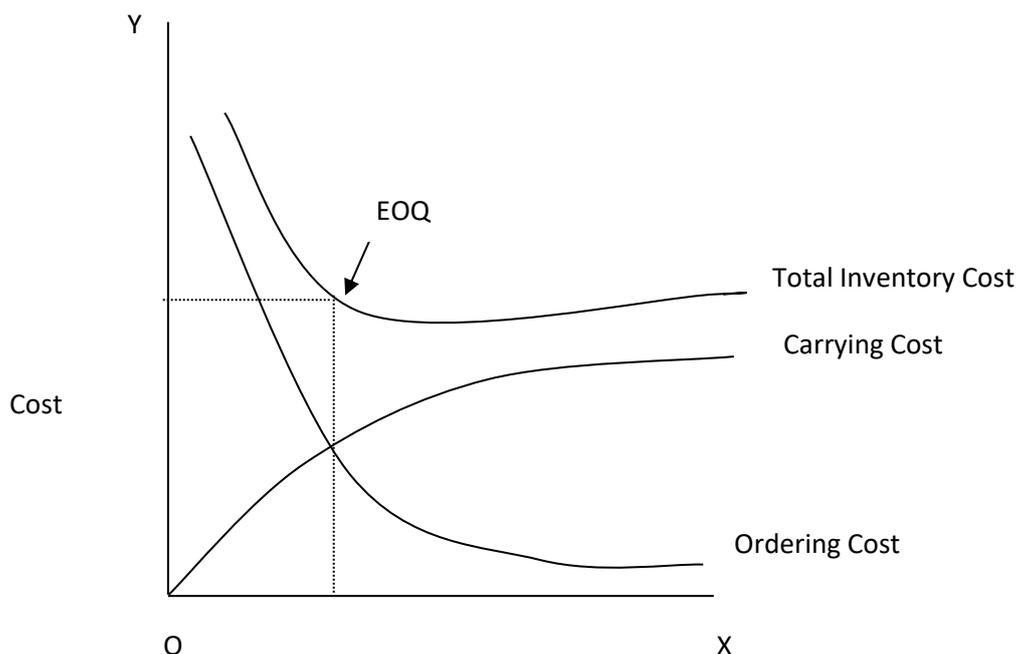
Assumptions: The following assumptions are made:

- The rate of consumption of inventory is assumed to be constant.
- Costs will not change over time.
- Lead time is assumed to be known and constant.
- Per order cost, carrying cost and unit price are constant.
- Carrying or holding costs are proportionate to the value of stock held.
- Ordering cost varies proportionately with the price.

(b) RE-ORDER POINT

After determining the optimum quantity of purchase order, the next problem is to specify the point of time when the order should be placed. Re-order level is that level of inventory at which an order should be placed for replenishing the current stock of inventory. The determination of re-order point depends upon the lead time, usage rate and safety stock. These terms are explained below:

1. **Lead Time:** Lead time refers to the time gap between placing the order and actually receiving the items ordered.

2. **Usage Rate:** It refers to the rate of consumption of raw material per day.

   Usage Rate = Total annual consumption / No. of days in a year

3. **Safety Stock:** It is the minimum quantity of inventory which a firm decides to maintain always to protect itself against the risk and losses likely to occur due to stoppage in production and loss of sale, due to non- availability of inventory.

Formulae:

Re Order Point = (Lead Time x Usage Rate) + Safety Stock   or

Re Order Point = Maximum usage x Maximum Re Order Period

Safety Stock = Usage Rate x Days of safety

(c) Fixing Stock Levels

Fixing of the stock levels is necessary to avoid increased cost on account of high inventory levels and to avoid loss of sales or stoppage of production due to low level of inventory. Therefore, efforts should be made to keep the inventory level within the specified minimum and maximum limits. The maximum & minimum stock levels are fixed after considering the following factors:

- Availability of ample storage space.
- Lead time involved i.e. time required in receiving the goods ordered.
- Availability of working capital to meet the routine expenses.
- Average rate of consumption of material
- Cost of storage and insurance of inventory.
- Risk of obsolescence and deterioration of the inventory.
- Economy in prices such as making bulk purchases during period of low prices.
- Re-order level.

Formulae

Maximum Level = (ROL + ROQ) – (Minimum Usage x Minimum Re Order Period)   or Maximum Level = Safety Stock + EOQ

Minimum Level = Re-order level – (Normal Usage Rate x Normal Re-order period)   = Re Order Level – (Normal Usage x Average Re Order Period)

Average stock level = (Maximum level + Minimum level) / 2   or

Average stock level = (Minimum level + 1/2 Re- order Quantity)

Note: ROL – Re Order Level

ROQ – Re Order Quantity

ROQ is also known as EOQ (Economic Order Quantity)

DANGER LEVEL

Danger level refers to the level below the minimum stock level. The following factors should be considered to determine the danger level:

- Causes for failure of regular supplies
- Easy and quick sources of supply
- Rescheduling of work- order in the light of such exigencies
- Quickest means of transportation
- Emergency period of procurement

Formula

Danger Level = Minimum rate of consumption x Emergency delivery period.

Danger Level = Maximum rate of consumption x Emergency delivery period.

(d) SELECTIVE INVENTORY CONTROL

Controlling all inventory in the stock is a very difficult task especially where huge inventories are maintained of variety of items. In such circumstances, following smart techniques for managing and controlling the different types of inventories held are as follows:

(i) **ABC Analysis**: ABC analysis may be defined as a technique where inventories are analyzed with respect to their value so that costly items are given greater attention and care by the management. Three categories are created namely A, B and C. Following table represents the approximate classification of items along with their value and quantity.

Category	% of Total Value	% of Total Quantity
A	70-80	5-10
B	20-25	20-30
C	5-10	60-70

(ii) **VED Analysis**:   VED stands for Vital, Essential and Desirable. Highest control is over vital items, medium control is exercised over essential items and least control is inferred over desirable items.

(iii) **SDE Analysis**: SDE stands for Scarce, Difficult and Easy. Highest control is over scarce items, medium control is exercised over difficult items and least control is inferred over easily available items.

(iv) **FSN Analysis**: FSN stands for Fast Moving (F), Slow Moving (S) and Non Moving (N). Highest control is kept over fast moving items, medium control is exercised over slow moving items and least control is inferred on non-moving items.

✓ **Check your progress**

Exercise 2

According to you which selective inventory technique is most appropriate to be applied for inventory control? State reasons to support your answer.

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1.9   Traditional Techniques

Traditional techniques refers to those techniques which are prevalent before the evolution of the modern techniques. These techniques were derived with the working practice and are based on experience and ease of usage by the workers and the small business enterprises. These techniques are explained as follows:

(a) INVENTORY CONTROL RATIOS

Ratios related to inventory are calculated and further used as a measure of control.

Stock Turnover =   Cost of goods sold / Average Stock

(b) TWO BIN SYSTEM

Under two bin system, all the inventory items are stored in two separate bins. Bin means container of any size. In the first bin, a sufficient amount of inventory is kept to meet the current requirement over a designated period of time. In the second bin, a safety stock is maintained for use during lead time. When the stock of first bin is completely used, an order for further stock is immediately placed. The material in second bin is then consumed to meet stock needs until the new order is received. On receipt of new order, the stock used from the second bin is restored and the balance is put in the first bin. Therefore, depletion of inventory in the first bin provides an automatic signal to re-order. Thus, this technique is traditional yet logical and can be used by illiterate workers also without using any formula.
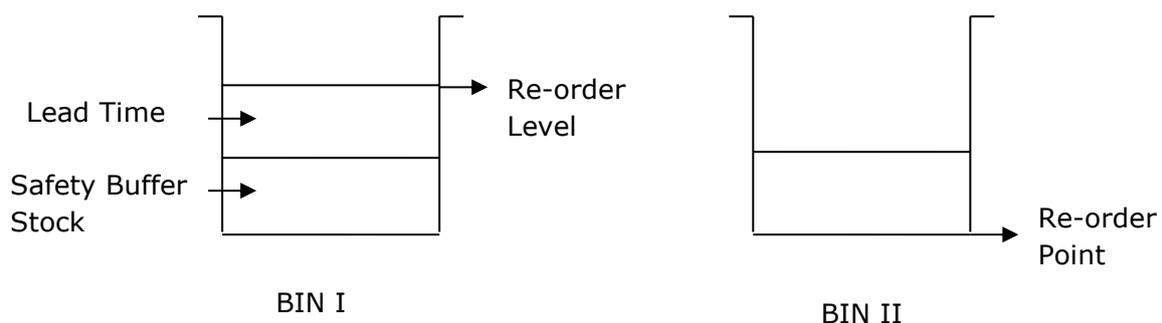
(c) PERPETUAL INVENTORY SYSTEM

Perpetual inventory system is defined as the method of recording stores balance after each receipt and each issue to facilitate regular checking of inventory. It is also known as continuous stock checking. The application of perpetual inventory control system involves –

    (i)   Attaching bin cards with bins.

    (ii)   Continuous stock taking to compare the actual stock.

Bin cards refers to the cards attached to every bin in which the details regarding the quantity of material received, issued and balance left in that bin is recorded hand to hand. Under this system, statement of material, follow up actions, monitoring etc. can be smoothly carried out.

(d) PERIODIC ORDER SYSTEM

Under this system, the stock levels of all types of inventories held, are reviewed after a fixed time interval. Time interval may be weekly, fortnightly, monthly, quarterly etc. depending upon the criticality of the item. Critical items may require a short review cycle and on the other hand, lower cost and non-moving items may require long review cycle. Therefore, for different items different time intervals should be used. After the review, the items which are less than the required level, order is placed to replenish their exhausted level.

✓ **Check your progress**

Exercise 3

Which techniques of inventory control are better – traditional techniques or modern techniques? Give reasons to support your answer.

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1.10   Practice Problems

Q.1. Calculate the economic order quantity from the following particulars:

Annual requirement =2,000 units

Cost of materials per unit =Rs. 20

Cost of placing and receiving one order= Rs. 40

Annual carrying cost of inventory, 20% of inventory value.

Solution: Here, R = 2,000   O = 40   Unit Price = 20

C = 20% of Unit Price = 20% of 20 = 4

$$EOQ = \sqrt{2RO / C}$$

$$= \sqrt{2(2000)(40) / (4)} \qquad = 200 \text{ units}$$

Q.2. Compute EOQ and the total variable cost from the following information:

Annual demand   = 4,000 units

Units Price   = Rs. 40

Order Cost   = Rs. 20

Storage Rate   = 7% Per annum

Interest Rate   = 3% Per annum

Solution: Here, R = 4,000   O = 20   Unit Price = 40

C = 10% of Unit Price = 10% of 40 = 4

$$EOQ = \sqrt{2RO / C}$$

$$= \sqrt{2(4000)(20) / (4)} \qquad = 200 \text{ units}$$

Total Variable Cost = Carrying Cost + Order Cost

$$= (EOQ/2 \times C) + (R/EOQ \times O)$$

$$= (200/2 \times 4) + (4000/200 \times 20) = 400 + 400 = Rs.\ 800$$

Total Cost = Purchase Cost + Carrying Cost + Order Cost

$$= (R \times Unit\ Price) + (EOQ/2 \times C) + (R/EOQ \times O)$$

$$= (4000 \times 40) + (200/2 \times 4) + (4000/200 \times 20) = 1,60,000 + 400 + 400 = Rs.\ 1,60,800$$

Q.3. Two components P and Q are used as follow:

Normal usage 600 units per week each.

Maximum usage 900 units per week each

Minimum usage 300 units per week each

Re-order quantity- P = 4,000 units; Q = 7,000 units

Re-order period- P = 4 to 6 weeks; Q = 2 to 4 weeks

        a. Re-order level

        b. Minimum Level

        c. Maximum Level

        d. Average stock level

Solution:

For P

Re-order Level = Maximum usage x Maximum Re Order Period = 900 x 6 = 5, 400 units

Minimum Level = Re-order level – (Normal Usage Rate x Normal Re-order period)

$$= 5,400 – (600 \times 5) = 2,400\ units$$

Maximum Level = (ROL + ROQ) – (Minimum Usage x Minimum Re Order Period)

$$= (5, 400 + 4, 000) – (300 \times 4) = 8, 200 \text{ units}$$

Average stock level = (Maximum level + Minimum level) / 2

$$= (8, 200 + 2, 400) / 2 = 5, 300 \text{ units}$$

For Q

Re-order Level = Maximum usage x Maximum Re Order Period = 900 x 4 = 3, 600 units

Minimum Level = Re-order level – (Normal Usage Rate x Normal Re-order period)

$$= 3, 600 – (600 \times 3) = 5, 400 \text{ units}$$

Maximum Level = (ROL + ROQ) – (Minimum Usage x Minimum Re Order Period)

$$= (3, 600 + 7, 000) – (300 \times 2) = 10, 000 \text{ units}$$

Average stock level = (Maximum level + Minimum level) / 2

$$= (10, 000 + 5, 400) / 2 = 7, 700 \text{ units}$$

1.11   Let's Sum-up

Inventory management is a very significant part of logistics and supply chain management. Inventory may be classified into three categories – raw material, work-in-progress and finished goods. Every organization hold inventory for different purposes. Inventory should be maintained in appropriate quantities in such a manner that the inventory cost is not very high and at the same time the losses due to shortage of inventory does not take place. Various techniques may be used for controlling the level of inventory. These methods may be divided into two categories – Traditional techniques and Modern techniques. Traditional techniques include the use of inventory related ratios, two bin system, perpetual inventory system and periodic order system. Modern techniques envisage the use of scientifically developed formulas for maintaining the level of inventory and deciding the quantity which should be ordered. It includes the calculation of economic order quantity, maximum level, minimum level, average level and re

order level. Modern techniques also involve the selective inventory control methods wherein some items are controlled more than the others depending upon their criticality and importance. Organizations use a combination of traditional as well as modern techniques to manage and control their inventory levels.

1.12   Key Terms

Inventory: Inventory refers to the stock pile of the product a firm is offering for sale and the components that make up the product.

Inventory Management: Inventory management is the practice overseeing and controlling of the ordering, storage and use of components that a company uses in the production of the items it sells.

Economic Order Quantity: The optimal size of an order for replenishment of inventory is called economic order quantity.

Re-Order Level: Re-order level is that level of inventory at which an order should be placed for replenishing the current stock of inventory.

1.13   Self-Assessment Questions

Q.1. Kuber Enterprises require 2, 70,000 units of a certain item annually. The cost per unit is Rs. 3, the cost per purchase order Rs. 100 and the inventory carrying cost Rs.6 per unit per year. What is the economic order quantity?

Q.2. Explain the factors affecting the level of inventory in an organization.

1.14   Further Readings

- Bose Chandra D., *Inventory Management,* PHI Learning.
- Jhamb L.C., *Inventory Management,* Everest Publishing House.
- Wild Tony, *Best Practice in Inventory Management,* John Wiley.
- Granville Emmett, *Excellence in Inventory Management,* Cambridge Academic.

1.15   Model Questions

Q.1. Define inventory. What do you understand by inventory management?

Q.2. Discuss the objectives of inventory management.

Q.3. What is inventory control? Explain the various techniques of inventory control.

Q.4. Jaidev enterprises manufacture a product 'EMR'. The following particulars are collected for the year 2016:

1. Annual demand of EMR- 1,000 units
2. Cost of placing an order Rs. 100
3. Annual carrying cost per units Rs. 10
4. Normal usages 100 units per week
5. Minimum usages 50 units per week
6. Maximum usages 150 units per week
7. Re-order period 2 to 6 weeks

Calculate the following:

   a. Re-order Quantity
   b. Re-order level
   c. Minimum Level
   d. Maximum Level
   e. Average stock level

Q.5. A manufacturing company will require 1, 00,000 units of a product during the next year. The cost of processing an order is Rs. 40 and the carrying cost per unit is Rs.2 per year. Lead time of an order is 5 days and the company will keep a safety stock of two days usage.

You are required to calculate the following:

1. Economic order Quantity
2. Re-order Point
3. Minimum Inventory

4. Maximum Inventory

5. Average Inventory.   [Assume 250 days in a year.]

Answers to Self-Assessment Questions

1. Here, R = 2, 70,000   O = 100   Unit Price = 3

         C = 6

$$EOQ = \sqrt{2RO/C}$$
$$= \sqrt{2(270000)(100)/(6)} = 3,000 \text{ units}$$

2. Some significant factors affecting the level of inventory are explained as follows:

1. Nature of business: The level of inventory will depend upon the nature of business whether it is a retail business, wholesale business, manufacturing business or trading business.

2. Inventory turnover: Inventory turnover refers to the amount of inventory which gets sold and the frequency of its sale. It has a direct impact on the amount of inventory held by a business concern.

3. Nature of type of product: The product sold by the business may be a perishable product or a durable product. Accordingly, the inventory has to be maintained.

4. Economies of production: The scale on which the production is done also affects the amount of inventory held. A business may work on large scale in order to get the economies of production.

5. Inventory costs: More the amount of inventory is held by the business, more will be the operating cost of holding inventory. There has to be a trade-off between the inventory held and the total cost of inventory which comprises of purchase cost, ordering cost and holding cost.

6. Financial position: Sometimes, the credit terms of the supplier are rigid and credit period is very short. Then, according the financial situation of the business the inventory has to be held.

7. Period of operating cycle: If the operating cycle period is long, then the money realization from the sale of inventory will also take a long duration. Thus, the inventory managed should be in line with the working capital requirement and the period of operating cycle.

8. Attitude of management: The attitude and philosophy of top management may support zero inventory concept or believe in maintaining huge inventory level. Accordingly, the inventory policy will be designed for the business.

Unit – 2
Inventory Cost and ABC Analysis

Learning Objectives

After completion of the unit, you should be able to:

- Explain the meaning and purpose of ABC analysis.
- Describe the Pareto principle and criteria for ABC classification.
- Understand the detailed steps for classifying the items into A, B and C categories.
- Know the applications of ABC Analysis

Structure

2.1 Introduction

Inventory management is very essential for every organization especially manufacturing and trading organizations. Optimization of the investment in inventory and managing the level of inventory are the key objectives of inventory management. Inventory control is essential to keep a track on the types of inventories held and the cost involved. Many techniques are used to control the inventory namely traditional techniques and modern techniques. This unit will focus upon the most popularly used selective inventory control technique – ABC Analysis.

2.2 Meaning of Inventory Cost

Maintaining varied types of inventories involve different costs associated with them. Some inventory items are low priced, some are medium priced and some are very expensive. Thus, inventory costs has to be looked into first before deciding the type of control to be exercised on it. The costs associated with inventory include the purchase cost, ordering cost and the holding cost. In case of selective inventory control technique – ABC analysis, inventory cost plays a very significant role as the category classification and the kind of control exercised, completely depend upon the cost of inventory.

2.3 Meaning and purpose of ABC Analysis

Inventory ABC Classification, known as ABC Analysis, is a term used to define an inventory categorization method used in materials management to exercise selective inventory control.

The ABC Classification provides a mechanism for identifying the inventory items that captures the significant portion of the overall inventory cost. It also provides a mechanism for identifying different categories of stock on which different inventory policy and inventory control practices can be used.

ABC analysis divides the inventory items into three categories namely A, B and C. The classification is based on their cost. Costly items are categorized 'A' and highest control is exercised on these items. Least valuable items are categorized

'C' and least control is exercised on them and remaining items are categorized as 'B' on which moderate control is exercised.

The basic purpose of ABC Analysis is to provide basis for material management processes and helps to define how stock is to be managed. Further, it can form the basis for various activities comprising plans on alternative stock arrangements and reorder calculations. It also helps to determine at what intervals inventory checks should be carried out. For instance – 'A' class items are to be checked more frequently than 'C' class items. Thus, ABC analysis forms the basis of many such activities and policy frameworks. ABC analysis also serves the following purposes directly or indirectly:

- Significant reduction in investment in inventory.
- Protection against stock outs.
- Reducing the work load involved in different activities such as ordering, procuring, receiving, inspecting, handling and storage of inventory items.
- Reduction in obsolescence losses.
- Increase in profits.

2.4   The Pareto Principle

The Pareto Principle is developed by Vilfredo Pareto (1848 - 1923). According to Pareto Analysis, critical few is separated from the trivial many. Pareto principle is also known as the 80/20 rule. Pareto principle is based upon the theory that 20% of the population owns 80% of the nation's wealth, most of the businesses get 80% of their sales revenue from 20% of the customers, 80% of the problems are caused because of 80% of the employees and 20% of the items accounts for 80% of the firms expenditure.

Therefore, the classification of the inventory is done on the basis of the Pareto principle, in which 20% of the impactful items should fall into 'A' classification category.

This rule, in general, applies well and is frequently used by inventory managers to put their efforts where greatest benefits, in terms of cost reduction as well as maintaining a smooth availability of stock, are required.

The principle emphasizes on working out the rupee value of each individual inventory item on annual consumption basis. Then the ratio between the number of items and the currency value of the items is calculated and the following categorization is done:

- 10-20% of the items (**'A' class**) account for 70-80% of the consumption
- the next 15-25% (**'B' class**) account for 10-20% of the consumption
- the balance 65-75% (**'C' class**) account for 5-10% of the consumption
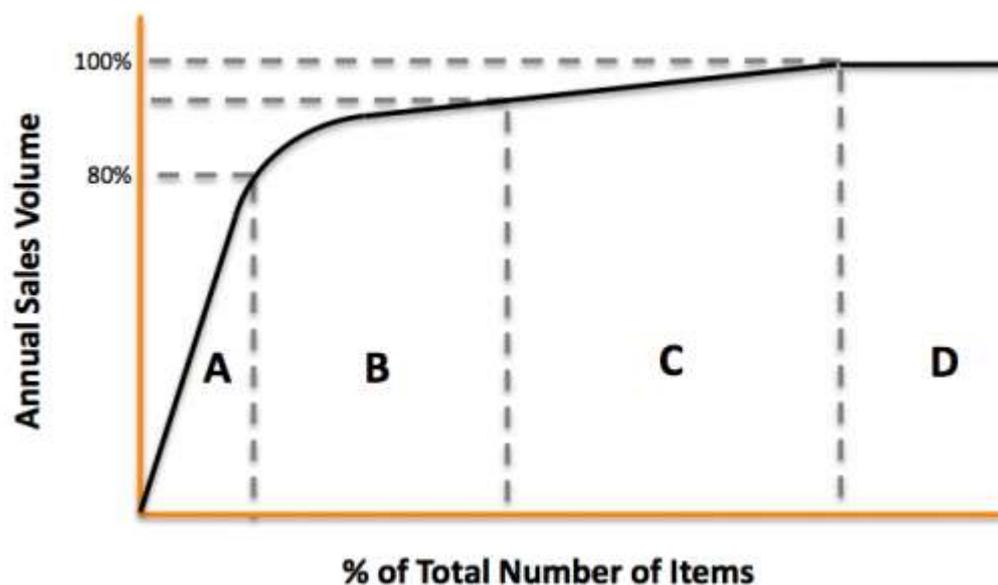
ABC Classification & The Pareto Rule for Inventory Management

The above figure depicts the classification according to the Pareto principle. All the items are divided into three broad categories – A, B and C, according to the calculation of the above mentioned ratio.

Exercise 1

Visit a nearby grocery store and collect the information about quantity and price of any twenty products. Classify them in category A, B and C.

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2.5   Criteria for ABC classification

The ABC analysis suggests that inventories of an organization are not of equal value. It specifies that the company should rate the inventory items from A to C, based upon their quantity and value. The three categories A, B and C possess the following characteristics:

"A" Category

- These items generally represent approximately 15%-20% of an overall inventory by quantity, but represent 80% of the value of an inventory.
- These are high value items and are extremely important.
- By paying close attention to the optimization of these items in inventory, a significantly positive impact may be created with a nominal increase in the inventory management costs.
- Very strict control is kept on these items.
- Accurate records need to be maintained for these items.
- Because of the high value of these items, frequent value analysis is required.
- Appropriate order pattern should be chosen such as 'Just- in- time' to avoid excess capacity

"B" Category

- These items represent 30%-35% of inventory items by item type, and about 15% of the value.

- These are intermediary value items.
- These items can generally be managed through period inventory and should be managed with a formal inventory system.
- Comparatively less control than 'A' category items is needed.
- Proper records should be maintained for these items.

"C" Category

- These items represent 50% of actual items but only 5% of the inventory value.
- These are low value items and are marginally important.
- Most organizations can afford a relatively relaxed inventory process surrounding these items.
- Least amount of control is required.
- Minimum possible records should be maintained in the simplest form.

2.6   Steps for Classification of Items

The categorization of the inventory items requires a particular process to be followed. The inventory items are first classified, then their total cost is ascertained, thereafter ranking is done followed by the computation of ratio or percentages. Then finally the A, B and C categories are determined. The process generally consist of six basic steps as explained below:

1. Identify the objective for ABC analysis. An ABC analysis can accomplish one of two primary goals: to reduce procurement costs or to increase cash flow by having the right items available for production.
2. Collect data related to the inventory under analysis. The data can be obtained from standard accounting if used in the organization. The data required is the raw material purchased or weighted cost including all ordering costs and carrying costs.
3. Rank the inventory in decreasing order of their cost.
4. Calculate the cumulative impact for all inventory items by dividing item annual cost by total inventory annual expenditure, then adding that amount to the cumulative total of percentage spent.

5. Draw a curve of percentage items and percentage value. Take a holistic view taking into account the Pareto principle.

6. Mark the limits bifurcating the three classes as A, B and C rationally. Analyze classes and make appropriate decisions. The key to this step is follow-up and tracking. The periodic review should be done for monitoring the success or failure of the decisions and categorization done.

2.7   Difference between A, B and C class items

There is a difference in the various classes A, B and C. Following differences present the suggested policy guidelines for different categories which may differ for different businesses:

Basis	A class items	B class items	C class items
Control	Very strict control	Moderate control	Least control
Safety stock	No or very low safety stock	Low safety stock	High safety stock
Order delivery	weekly	Once in three months	Once in six months
Control report	Weekly Control report	Monthly Control report	Quarterly Control report
Follow up	Maximum follow up	Periodic follow up	Optional
Sources of supply	Should have as many sources as possible	Should have two or more reliable sources	Should have two reliable sources
Forecast	Accurate forecasts are needed	Estimates based on past data are sufficient	Rough estimate is required
Purchasing function	Should have centralised purchasing function	May have centralised or decentralised or a combination of both purchasing function	Should have decentralised purchasing function
Officers	Should be handled by senior officers	Should be handled by middle level officers	Can be delegated to lower level staff.

Exercise 2

List any four significant differences between category A and category C.

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2.8   Applications of ABC Analysis

The ABC classification system leads to grouping of items according to their annual issue value. Apart from exercising varying degree of control over the inventory items, there are other applications where ABC analysis has proved to be useful. Following represent some applications of ABC analysis:

- It highlights specific items on which efforts can be concentrated profitably.
- It provides a sound basis on which the allocation of funds and time is done.
- It helps in reviewing the stock levels especially minimum and maximum levels of the inventory items. 'A' items will generally have greater impact on projected investment and purchasing expenditure, and therefore should be managed more aggressively in terms of minimum and maximum inventory levels. The inactive items will fall at the bottom of the 'C' category. It is the best place to start when performing a periodic obsolescence review.
- The frequency of usage can be worked out and accordingly the time gap between orders is decided. 'A' category items are very frequently used and their accurate record balances need to be kept. Thus, frequent stock taking is done for these items. Accordingly, the strategy is planned for B and C category items.
- It helps in identifying the inventory items for potential consignment or vendor stocking.

- Separate inventory goals may be specified for each category of inventory items.

2.9   Practice Problems

Q. The following data is related to Paroma Ltd.:

Item No.	11	12	13	14	15	16	17
Unit Cost	5	10	14	7	6	15	20
Annual Demand	47000	1500	200	700	4700	1100	17000

Categorize the items according to ABC analysis.

Solution:

Total Spending per year

Item No.	Unit Cost	Annual Demand	Total Cost per year
11	5	47000	235000
12	10	1500	15000
13	14	200	2800
14	7	700	4900
15	6	4700	28200
16	15	1100	16500
17	20	17000	340000

Usage of item in total usage

Item No.	Unit Cost	Annual Demand	Total Cost per year	% of Total Usage
11	5	47000	235000	36.58%
12	10	1500	15000	2.33%
13	14	200	2800	0.43%
14	7	700	4900	0.76%
15	6	4700	28200	4.38%
16	15	1100	16500	2.56%
17	20	17000	340000	52.92%
			642400	**100%**

Sort the items by usage

Item No.	Unit Cost	Annual Demand	Total Cost per year	% of Total Usage	Cumulative % of total
17	20	17000	340000	52.92%	52.92%
11	5	47000	235000	36.58%	89.50%
15	6	4700	28200	4.38%	93.88%
16	15	1100	16500	2.56%	96.44%
12	10	1500	15000	2.33%	98.77%
14	7	700	4900	0.76%	99.53%
13	14	200	2800	0.47%	100%
			642400	**100%**	

ABC classification

Category	Items	% usage	Action Needed
A	17, 11	89.5%	Close control
B	15,16,12	9.27%	Regular review
C	14, 13	1.23%	Infrequent review

2.10   Let's Sum-up

ABC analysis is a valuable tool to enable companies dedicated to strategic cost management to measure the current status for their materials management system and introduce certain changes in the inventory control policies in such a manner that it yields the largest cost management benefits in the near and middle term periods. ABC analysis is based upon the Pareto principle which focuses on the concept 'Critical Few Trivial Many'. ABC analysis divides the inventory items into three categories - A, B and C. These categories are identified on the basis of the number of items and the total value in rupees for each inventory item. The process starts from the classification of inventory, then ascertaining their cost and assigning ranks which is followed by the calculation of percentages. On the basis of these, the categories A, B and C are determined. After determining the categories, the inventory management policies, control mechanisms, procurement and warehousing policies are framed for each category in a different manner according to their impact on overall inventory cost. Thus, ABC analysis suggests that inventories of an organization are not of equal value and so different policies and treatment should be given in order to minimize the efforts and time as well as maximize the profits through savings in cost.

2.11   Key Terms

Inventory Cost: It refers to the costs associated with the inventory including the purchase cost, ordering cost and the holding cost.

ABC Analysis: It is a term used to define an inventory categorization method used in materials management to exercise selective inventory control.

Pareto Principle: According to Pareto Analysis, critical few is separated from the trivial many. Pareto principle is also known as the 80/20 rule. It says that 20% of the impactful items should fall into 'A' classification category and accordingly the other categories may be determined.

Self-Assessment Questions

Q.1. Briefly explain the characteristics of 'A' category inventory items under ABC analysis.

Q.2. Discuss the Pareto principle on the basis of which ABC classification technique is developed.

2.13   Further Readings

- Bowersox, *Supply Chain Logistics Management,* McGraw Hill Education India.

- Slater Phillip, *Smart Inventory Solutions,* Industrial Press.

- Michael Chirchir et al, *Fundamentals of Inventory Management,* LAP Lambert Academic.

- Catherine Milner & Geoff Relph, *Inventory Management: Advanced Methods for Managing Inventory within Business Systems,* Kogan Page.

2.14   Model Questions

Q.1. Differentiate between A, B and C categories of inventory items based on ABC inventory analysis.

Q.2. Discuss the applications of ABC analysis in various management areas.

Q.3. Explain the process of classification of inventory items under ABC analysis.

Q.4. Mention a few procurement, warehousing and inventory management policies suggested to be adopt with respect to A, B and C category items.

Q.5. The following data is related to a manufacturing company:

Item No.	1	2	3	4	5	6	7
Unit Cost	80	9	28	20	29	10	3
Annual Demand	75	145000	500	17500	2900	19000	9500

Categorize the items according to ABC analysis.

Answers to Self-Assessment Questions

1. Following are the characteristics of the 'A' category items under ABC analysis:

   - These items generally represent approximately 15%-20% of an overall inventory by quantity, but represent 80% of the value of an inventory.
   - These are high value items and are extremely important.
   - By paying close attention to the optimization of these items in inventory, a significantly positive impact may be created with a nominal increase in the inventory management costs.
   - Very strict control is kept on these items.
   - Accurate records need to be maintained for these items.
   - Because of the high value of these items, frequent value analysis is required.
   - Appropriate order pattern should be chosen such as 'Just- in- time' to avoid excess capacity.

2. According to Pareto Analysis, critical few is separated from the trivial many. Pareto principle is also known as the 80/20 rule. Pareto principle is based upon the theory that 20% of the population owns 80% of the nation's wealth, most of the businesses get 80% of their sales revenue from 20% of the customers, 80% of the problems are caused because of 80% of the employees and 20% of the items accounts for 80% of the firms expenditure.

Therefore, the classification of the inventory is done on the basis of the Pareto principle, in which 20% of the impactful items should fall into 'A' classification category.

This rule, in general, applies well and is frequently used by inventory managers to put their efforts where greatest benefits, in terms of cost reduction as well as maintaining a smooth availability of stock, are required.

The principle emphasizes on working out the rupee value of each individual inventory item on annual consumption basis. Then the ratio between the number of items and the currency value of the items is calculated and the following categorization is done:

C. 10-20% of the items (**'A' class**) account for 70-80% of the consumption

D. the next 15-25% (**'B' class**) account for 10-20% of the consumption

E. the balance 65-75% (**'C' class**) account for 5-10% of the consumption

Unit – 3

Logistics and Supply Chain Management

Learning Objectives

After completion of the unit, you should be able to:

- Explain the meaning and concept of logistics management.
- Describe the meaning and objectives of supply chain management.
- Know the key essentials and principles of supply chain.
- Also understand the various differences between logistics and supply chain management.

Structure

3.1   Introduction

It has been noticed that there has been a drastic change in the manner in which business was conducted many years ago and now. Due to the improvement in the technology, significant developments in all the areas of business have been made. Supply Chain Management also evolved as an improvement over Logistics Management, from past years. Logistics and supply chain are sometimes used interchangeably. Both these terms are closely related to each other and plays a significant role in the firm's value chain process. This unit will discuss about logistics and supply chain management, the relationship among them and the key points of difference between them.

3.2   Meaning & Concept of Logistics Management

The management process which integrates the movement of goods, services, information and capital, right from the sourcing of raw material, till it reaches its end consumer is known as Logistics Management.

According to Phillip Kotler, "Market logistics involve planning, implementing and controlling physical flow of material and final (finished) goods from the point of origin to the point of use to meet customer requirements, at a profit."

The objectives of logistic management are stated as below:

- To provide the right product with the right quality at the right time in the right place at the right price to the ultimate customer.
- To offer best service to the consumers.
- To reduce the cost of operations and maximize the profits.
- To maintain transparency in operations.

The 7 R's of logistics are as follows:

- Right product
- Right customer
- Right quantity
- Right condition

- Right place
- Right time
- Right cost

The activities covered under logistic management are illustrated as follows:

(i) Network Design

It is required to determine the number and location of manufacturing plants, warehouses, material handling equipment's etc. on which logistical efficiency depends.

(ii) Order Processing

Order processing includes activities for receiving, handling and recording of orders. Efforts are made to minimize the time between receipt of orders and date of dispatch of the consignment to ensure speedy processing of the order. Delays in execution of orders can become serious grounds for customer dissatisfaction; which must be avoided.

(iii) Procurement

It is related to obtaining materials from suppliers. It includes supply sourcing, negotiation, order placement, inbound transportation, receiving and inspection, storage and handling. Its main objective is to support manufacturing, by providing timely supplies of qualitative materials, at the lowest possible cost.

(iv) Material Handling

It involves activities such as handling raw-materials, parts, semi-finished and finished goods into and out of the manufacturing plant, warehouses and transportation terminals. Efforts should be made to minimize losses due to breakage, spoilage etc.

(v) Inventory Management

The basic objectives of inventory management are to minimize the amount of working capital blocked in inventories, minimize the holding costs and ensure continuous flow of materials and goods. Inventory for raw material, semi-finished goods and finished goods has to be maintained.

(vi) Packaging and Labelling

Packaging and labelling are an important aspect of logistics management. Packaging involves enclosing a product into suitable packets or containers, for convenient handling of the product. Good and attractive packaging, acts like a silent salesman.

Labelling means putting identification marks on the package of the product. A label provides information about the date of packing and expiry, weight or size of product, ingredients used, instructions for safe handling of the product, price payable by the buyer etc.

(vii) Warehousing

Warehousing creates time utility by storing goods from the time of production till the time they reaches to the ultimate consumers. **Here, the management has to decide about t**he number and type of warehouses needed as well as the location of the warehouses.

(viii) Transportation

Transportation is that logistical activity which creates place utility. Transportation is needed for the movement of raw-materials from suppliers to the manufacturing unit, movement of work-in-progress within the plant and movement of finished goods from plant to the final consumers.

✓ **Check your progress**

Exercise 1

Explain the activities performed under logistics management.

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3.3   Types of Logistics

The logistic activities are divided into two broad categories as mentioned below:

- **Inbound Logistics**: Inbound Logistics refers to movement of goods and raw materials from suppliers to the company. It include the activities which are concerned with procurement of material, handling, storage and transportation.
- **Outbound Logistics**: Outbound Logistics refers to movement of finished goods from your company to customers. It include the activities which are concerned with the collection, maintenance, and distribution or delivery to the final consumer. The following figure illustrates the concept:
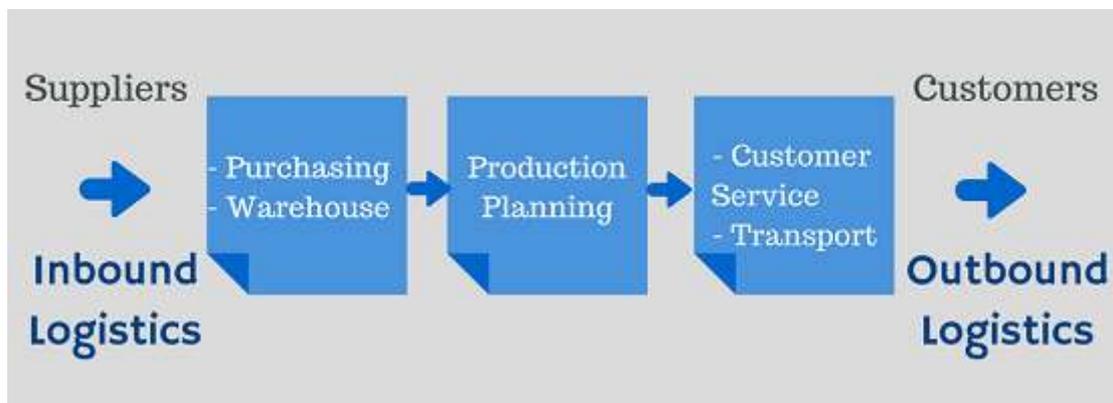
In the above figure, purchasing and warehouse function communicates with suppliers and can be referred as supplier facing function. Customer service and transport function communicates with customers and thus, referred as customer facing function.

Logistics may be of various kinds depending upon the purpose for which it is used, the kind of organization by which it is used and the objective it is required to achieve. Following are the different types of logistics:

Business Logistics: It is the part of the supply chain process that plans, implements and controls the efficient flow and storage of goods and services from point of origin to point of use or consumption.

Military Logistics: The design and integration of all aspects of support for the operational capability of the military forces as well as the reliability and efficiency of the equipments used by them.

Event Logistics: The network of activities, facilities and personnel required to organize, schedule and deploy the resources for an event are referred as event logistics.

Service Logistics: The activities related to acquisition, scheduling and management of the facilities, personnel and material with the objective to support and sustain a service operation or business are termed as service logistics.

International logistics: International Logistics, also known as Global Logistics, focuses on how to manage and control overseas activities effectively as a single business unit. Therefore, company should try to transform the value of overseas product, services, marketing, R&D into competitive advantage.

3PL or Third Party Logistics: 3PL or Third Party Logistics refers to the outsourcing of logistics activities, ranging from a specific task to broader activities serving the whole supply chain such as inventory management, order processing and consulting.
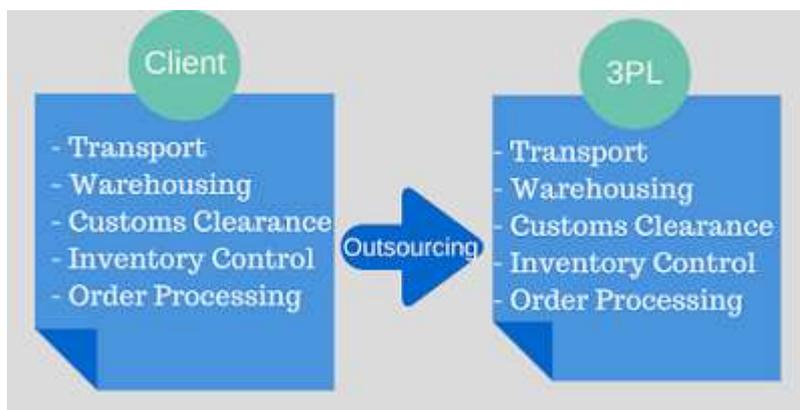
4PL or Fourth Party Logistics: Fourth Party Logistics or 4PL is the concept proposed by Accenture Ltd in 1996. It refers to a party who works on behalf of client to finalise the contract negotiations and management of performance of 3PL providers including the design of the whole supply chain network and controlling the routine operations performed by them. The reasons for using 4PL by a company are lack of technology to integrate supply chain process, the increase in operating complexities and sharp increase in global business operations.

3.4   Meaning and Concept of Supply Chain Management

Supply Chain Management (SCM) is a series of interconnected activities related to the transformation and movement of raw material to the finished goods till it reaches to the end user. It is the outcome of the efforts of multiple organisations that helped in making this chain of activities successful.

'Supply Chain is the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer.'
- By Martin Christopher

'Supply chain management (SCM) refers to the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served.'   - By Michael Hugos

The most commonly used supply chain concept is shown below:

Supplier ➡ Manufacturer ➡ Wholesaler ➡ Retailer

Supply Chain Management has a multi-dimensional approach which manages the flow of raw materials and work in progress within the organisation and the final product outside the organisation till it reaches the hands of the final consumer. All the activities are done keeping in view the customer requirements.

The activities included in SCM are stated as follows:

- Integration
- Performance measurement
- Product development
- Logistics
- Information sharing
- Procurement & Manufacturing
- Customer service
- Sourcing
- Supplier relationship management
- Order fulfilment
- Returns management
- Transportation
- Warehousing
- Demand management
- Customer relationship management

The significant components of supply chain management are as follows:

- **It is a Network**: Many companies have the department that controls various activities within the supply chain. Supply Chain Management is the planning, implementing and controlling of the networks.
- **Information Flow**: supply chain management involves the flow of material, information and finance. The most important one is information flow or information sharing. When information is shared from retailer down to supplier, everyone in the supply chain is not required to maintain heavy stocks which further results in lower costs for everyone.

- **Coordination**: Information sharing requires coordination or integration among the various network partners.

- **Avoid Conflicting Objectives**: In the supply chain network, the different parties involved might have conflicting objectives or in the same organization different departments may have conflicting objectives. For example, purchasing people always place the orders to the cheapest vendors (with a very long lead-time) but production people needs material more quickly. To avoid conflicting objectives, it must be decided whether to adopt time-based strategy, low cost strategy or differentiation strategy. A clear direction is needed so people can make the decisions accordingly.

- **Balance between cost and service**: When efforts are made to improve service, cost goes up. When efforts are directed to cut cost, service suffers. Thus, there should be a balance between cost and service.

- **Foster long-term relationship**: To work as the 'supply chain team', long-term relationship is a key. Focus should be on creating long-term relationship with suppliers of key products and items with limited source of supply because these are people who can make or break the supply chain.

✓ **Check your progress**

Exercise 2

Differentiate between inbound logistics and outbound logistics.

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3.5   Objectives of Supply Chain Management

Supply chain focuses on ensuring economic supply of goods, supplies, and services to keep the company in operation. SCM contribute to profit, growth and

competitive advantage by efficiently managing the supply activities with an aim to reach company's corporate goals.

Supply chain management has the fundamental objective to 'add value'. Apart from this objective, it focuses on the accomplishment of the following strategic objectives:

- Reducing working capital
- Build a competitive infrastructure
- Accelerating cash-to-cash cycles
- Increasing inventory turns
- Leveraging worldwide logistics
- Synchronizing supply chain demand
- Measuring performance globally
- Cost Quality improvement
- Shortening the lead time
- Minimize the total system cost
- Satisfy customer service requirements
- Improve standardization
- Face global competition
- Enhance organizational responsiveness

3.6   Difference between logistics and supply chain management

Logistics Management is a part of **Supply Chain Management** which deals with the management of goods in an efficient and effective manner. To understand the conceptual differences between logistics and supply chain management, the following points are discussed:

- The flow and storage of goods inside and outside the firm is known as Logistics. The movement and integration of supply chain activities is known as Supply Chain Management.

- The main aim of logistics is customer satisfaction. On the other hand, the main aim behind supply chain management is to gain a substantial competitive advantage.

- There is only one organisation involved in logistics while multiple organisations are involved in SCM.

- Supply Chain Management is a new concept as compared to Logistics. Sometimes, it is said that SCM is the refinement of the old concept of logistics. Thus, SCM is a modern concept.

- Logistics deals with strategy and coordination between the marketing and production functions of the organization. On the other hand, supply chain management focuses more on purchasing and procurement along with other functions.

- SCM include factors relating to inventory, materials and production planning also. On the contrary, logistics includes factors relating to demand management and forecasting.

Thus, it can be concluded that supply chain management takes care of the design, planning, execution, control, and monitoring of supply chain activities with the sole objective of creating net value and leveraging worldwide logistics. Whereas the concept of logistics covers the management of the flow of goods and the services between the point of origin and the point of consumption in order to meet the requirements of customers.

✓ **Check your progress**

Exercise 3

Explain the fundamental objectives of supply chain management.

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3.7 Key Essentials of Supply Chain

Supply chain to be successfully managed has certain pre-requisites to be fulfilled. Since, many organizations are involved it is difficult to bring harmony in their operations and establish common objectives which will provide benefit to all the parties. Thus, in order to make the supply chain competitive enough to gain market leadership, the following key essentials are required:

1. The firm should try to lower down the end user prices.
2. The firm must focus on reducing the percentage of supply chain costs in the overall cost in order to make the supply chain more competitive.
3. End user metrics are necessary to know the level and extent of customer satisfaction and their involvement.
4. Identify the key areas which might lead to reduction in time and cut the overall supply chain cycle that moves a product through the supply chain.
5. Collaborative planning among trading partners, with shared management of resources, is required.
6. There should be focus on visibility of usage, forecasts, orders, shipments, and inventories.

3.8 Principles of Supply Chain

Supply Chain Management has become a distinct and important discipline in the field of management. Thus, there is a need to specify certain key underlying principles of SCM which provides a crucial base for managing the activities involved in the supply chain management. The seven principles as articulated by Andersen Consulting are as follows:

1. **Segment customers on the basis of their service needs**: Effective supply-chain management groups customers by distinct service needs without considering their industry. Then, they provide them the customized services to each group.

2. **Customise the Supply Chain Management network:** In designing their Supply Chain Management network, companies need to focus intensely on the service requirements and profitability of the customer segments identified. Thus, every company frames its own supply chain network which is unique and based on customized requirements.

3. **Identify the market demand pattern and plan accordingly**: Sales and operations planning of the company should include a mechanism wherein it could detect early warning signals of changing demand in ordering patterns, customer promotions etc. This demand-intensive approach leads to more consistent forecasts and optimal resource allocation.

4. **Differentiate product closer to the customer:** The companies need to postpone product differentiation in the manufacturing process closer to actual consumer demand.

5. **Strategically manage the sources of supply:** Companies should work with the suppliers strategically to reduce the overall costs associated with materials and services. The supply chain management leaders enhance margins both for themselves and their suppliers. Now, the focus should be on sharing of the gains.

6. **Develop a supply-chain-wide technology strategy**: The company should make efforts to develop information technology which support multiple levels of decision making. It should be capable enough to provide a clear view of the flow of products, services, and information which will in the long run lead to a successful SCM.

7. **Adopt channel-spanning performance measures**: In order to make the SCM of an organization better than the others, it should monitor the internal functions and adopt measures that apply to every link in the supply chain.

When the above mentioned principles are followed consistently and comprehensively, then they will bring a host of competitive advantages for the company. Thus, every organization must strive for implementing as many principles as possible to improve the supply chain and enhance the benefits arising from it.

✓ **Check your progress**

Exercise 4

Discuss the principles of supply chain management which are essential for gaining competitive advantage.

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3.9 Logistics – An Integral Component of Supply Chain Management

Logistics refers to the activities that occur within the boundaries of a single organization and supply chains refer to networks of companies that work together and coordinate their actions to deliver a product to market. Logistics focuses its attention on activities such as procurement, distribution, maintenance, and inventory management. Supply Chain Management includes not only logistics but also the activities such as marketing, new product development, finance, and customer service. Thus, logistics is an integral part of SCM.

Logistics is the backbone on which supply chains are driven. Logistics facilitates the management of the flow of goods and supplies involving information, data and documentation between two entities. Logistics plays important role in post procurement function also. The goods flow through a network of transportation by road, rail, air or ship and intermediary warehouses to hold inventories before moving to the forward locations. The entire activity involves multi-tier suppliers, and agencies including freight forwarders, packers, customs department, distributors and logistics service providers, etc.

Supply chain design in an organization would detail, plan and strategize the procurement strategy, manufacturing location selection, design and develop distribution network and strategy for finished goods. While logistics planning

would deal with the details of procurement logistics, finished goods distribution, sales order fulfilment, and inventory management, etc.

In the case of finished goods distribution, SCM strategy will define overall network design for stock holding and other channels of distribution. Logistics deals with the entire designing of the transportation network, partnering with 3rd party logistics providers to establish distribution centres and warehouses, planning inventory management and operations process including packing, promotional bundling and at the end the complete documentation and information process for the entire chain of activities.

Logistics planning drives the strategic direction and framework for its design planning from SCM Strategy. Logistics therefore is an integral component of Supply Chain Management.

3.10   Let's Sum-up

Logistics is a very old term, firstly used in the military, for the maintenance, storage and transportation of army persons and goods. Nowadays, a new term has evolved namely Supply Chain Management. It is said that SCM is an addition over Logistics Management as well as SCM comprises of logistics. Both are inseparable. Hence they do not contradict but supplement each other.

The management process which integrates the movement of goods, services, information and capital, right from the sourcing of raw material, till it reaches its end consumer is known as Logistics Management. On the other hand, SCM refers to the series of interconnected activities related to the transformation and movement of raw material to the finished goods till it reaches to the end user. Logistics include activities like warehousing, transportation, procurement, material handling, order processing etc. There are various kinds of terms associated with logistics like inbound logistics, outbound logistics, service logistics, event logistics and international logistics.

SCM includes the coordination and management of the supply chain network partners. The simplest form of supply chain includes supplier, manufacturer,

wholesaler and retailer. Thus, logistics is a sub-component and extension of Supply Chain.

In contemporary times, supply chains can be sources of competitive advantage as efficient management of the supply chain leads to cost savings and synergies between the components of the supply chain leads to greater profitability for the firms.

3.11   Key Terms

Logistics: *Logistics* is the management of the flow of things between the point of origin and the point of consumption in order to meet requirements of customers or corporations.

Logistics Management: *Logistics management* is the part of supply chain *management* that plans, implements, and controls the efficient, effective forward, and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customer's requirements.

Supply Chain: A supply chain is the network of all the individuals, organizations, resources, activities and technology involved in the creation and sale of a product, from the delivery of source materials from the supplier to the manufacturer, through to its eventual delivery to the end user.

Supply Chain Management: Supply Chain Management (SCM) is a series of interconnected activities related to the transformation and movement of raw material to the finished goods till it reaches to the end user.

3.12   Self-Assessment Questions

Q.1. Explain the objectives of logistics management.

Q.2. Illustrate the fundamental purpose of supply chain management.

3.13 Further Readings

- Michael H.Hugos, *Essentials of Supply Chain Management*, Second Edition.

- D.V. Kalra, Peter Meindl, Sunil Chopra, *Supply Chain Management*, Pearson Education.

- Janat Shah, *Supply Chain Management – Text and Cases*, Pearson Education.

- R.P. Mohanty, S.G. Deshmukh, *Supply Chain Management-Theories and Practices*, Dreamtech Press.

3.14 Model Questions

Q.1. Define Logistics. Explain the difference between inbound and outbound logistics.

Q.2. What do you understand by Supply Chain Management?

Q.3. Differentiate between logistics and supply chain management.

Q.4. Briefly discuss the key essentials of supply chain.

Q.5. 'Logistics is an integral part of supply chain management'. Comment.

Answers to Self-Assessment Questions

1. Logistic management has the following objectives:

(i) Cost Reduction and Profit Maximization:
Logistics management results in cost reduction and profit maximization due to:

- Improved material handling
- Safe, speedy and economical transportation
- Optimum number and convenient location of warehouses

(ii) Efficient Flow of Manufacturing Operations:
Inbound logistics helps in the efficient flow of manufacturing operations, due to on-time delivery of materials, proper utilisation of materials and semi-finished goods in the production process.

(iii) Competitive Edge:
Logistics provide, maintain and sharpen the competitive edge of an enterprise by:

- Increasing sales through providing better customer service

- Arranging for rapid and reliable delivery
- Avoiding errors in order processing

(iv) Effective Communication System:

An efficient information system is a must for sound logistics management. As such, logistics management helps in developing effective communication system for continuous interface with suppliers and rapid response to customer enquiries.

(v) Sound Inventory Management:

Logistics management automatically leads to sound inventory management.

2. The basic purpose of supply chain management is to enhance the organization's competitive position by cost optimization, asset utilization and value creation. SCM aims to achieve the following key objectives:

- To support operational requirements i.e. providing an uninterrupted flow of high quality goods and services that internal customers require.
- To manage the purchase process efficiently and effectively.
- To manage the supply base i.e. to select, develop, and maintain sources of supply.
- To develop strong relationship with other functional groups.
- To support organizational goals and objectives i.e. aligning sourcing and corporate goals.
- To develop integrated purchasing strategies that support organizational strategies.