INVENTORY MANAGEMENT

What is Inventory?

The term inventory is used to denote the stock on hand at a particular time comprising 1.raw materials, 2. goods in the process of manufacture and (3) finished goods.

Classifications of inventory

- **Inventory classification based on demand**
  (1) Independent demand inventory– finished goods, items that are ready to be sold.E.g. a computer
  (2)Dependent demand inventory– components of finished products.E.g. parts that make up the computer
- **Types of Inventories based on purpose**
  (a) Raw Materials Inventory: - This consists of basic materials that have not yet been committed to production in a manufacturing firm. Raw materials that are purchased from firms to be used in the firm's production operations..
  (b) Works in Process Inventory: - This includes those materials that have been committed to the production process but have not been completed. The more complex and lengthy the production process, the larger will be the investment in work in process inventory.
  (c) Finished Goods Inventory: - These are completed products awaiting sale. The purpose of finished goods inventory is to uncouple the production and sale functions so that it is no longer necessary to produce the goods before a sale can occur.
  (d) Stores and Spares: - This includes those products which are accessories to the main products produced for the purpose of sale. Examples of stores and spares are bolts, nuts, clamps, screws, etc. These spare parts are generally bought from outside.
- **Types of Inventories based on functions**
  (i) Lot-size Inventories: - Some business firms prefer to purchase materials in bulk because they receive a discount on bulk purchases. Big business firms can afford to buy in large quantities. To produce the goods in exact amount of their demand is not generally possible and practical. Some inventories accumulate. The inventories accumulated as a result are known as lot-size inventories.
  (ii) Fluctuation Inventories: - Because of the demand and supply factors, the market for certain commodities or raw materials generally fluctuates.
  Since demand fluctuates over time and cannot be forecasted accurately, some reserve stocks are necessary. Those safety stocks are fluctuation inventories.
  (iii) Transportation Inventories: - The inventory manager of the business firm favours low inventories to reduce inventory cost. However, this policy increases stock outs, back orders, paper work, special production runs and high cost fast-freight transportation. Raw materials are transported from its place of production to the business firm which needs it. Since the goods and raw materials in transit cannot serve those for whom these have been sent, these goods or resources in transit represent transportation inventories.

(iv) Anticipation Inventories: - When a business firm anticipates a price rise or introduces the business promotion tools, it will need to accumulate inventories. The raw' materials may be stored in the form of semi-finished goods or stored in their original form. These inventories are known as anticipation inventories.

Functions of Inventory

- To meet anticipated demand
- To smooth production requirements
- To decouple operations
- To protect against stock-outs
- To take advantage of order cycles
- To help hedge against price increases
- To permit operations
- To take advantage of quantity discounts

Objective of Inventory Control

- To achieve satisfactory levels of customer satisfaction while keeping inventory costs within reasonable limit.
- To keep inventory turnover ratio at the optimum level.

  - ***Inventory turnover*** is the ratio of average cost of goods sold to average inventory investment.

Inventory turnover ratio= Avg.cost of good sold/ Avg. investment in inventory

- ***Cost of Holding Inventory:*** Holding of inventories has considerable costs. The burden of the cost of inventory is expressed in terms of money.
  - **Set up Cost:** These costs include clerical cost on orders and discount rates on quantity of goods purchased. The costs are included in the cost of material at two stages. Firstly, when material is purchased and stored, and secondly, when goods manufactured are stored from the said material. Every company has to store its goods that it wants to be sold. Storage function is necessary because production and consumption cycles rarely match.
  - **Cost of Spoilage and Obsolescence:** The next is the cost of spoilage and obsolescence. It refers to loss of goods while in stock. Any product or material is bound to spoil if stored for a long time. The risk of spoilage is an open risk. The cost of spoilage is bound to be taken into account. Similarly the cost of obsolescence, some spare parts and machine components may become obsolete if they are stored for a long time. This is true when there are rapid technological changes. As a result, the cost of spoilage and obsolescence gives rise to the accountability of inventory cost.

- **Cost of Placing an Order:** This cost may be for placing order on outside suppliers for procuring raw goods to be manufactured inside the firm.
  Depending upon the type of stock, this cost may vary. Cost of placing an order includes the following:
  (i) Set up cost of machines
  (ii) Cost involved in follow-up
  (iii) Cost involved in receiving the order
  (iv) Paper work costs.
- **Cost of Running out of Stock:** Whenever stock exhausts for any item, this cost is incurred. These costs are different in nature. The cost of running out of stock for a raw material or spare part is made up of plant down time and possible special delivery costs. For a finished good, such costs are known as dissatisfaction to customers or lost customers.
- **Cost of Carrying Stock:** This is the cost which a firm actually incurs for carrying the stock. Cost of carrying stock is calculated by taking into consideration the following items:
  (i) Interest on capital
  (ii) Tax and insurance charges
  (iii) Storage cost
  (iv) Allowance for spoilage
  (v) Obsolescence.

Methods of Inventory Control:

- Inventory control is concerned with the periodic review of materials in stock to detect those not required for planned production or for other purposes not required and whether obsolete materials continue to occupy storage space until removed from stores.

  The inventory control methods give us a means for determining an optimal level of inventory as well as how much should be ordered and when. There are several methods suggested for inventory controls.

  The following are the most important systems used for inventory control:

  (a) ABC System: A firm using ABC system segregates its inventory in to three groups-A, B and C. The 'A' items are those in which it has the largest rupee investment. This group consists of the 20 per cent of the firm's rupee investment.

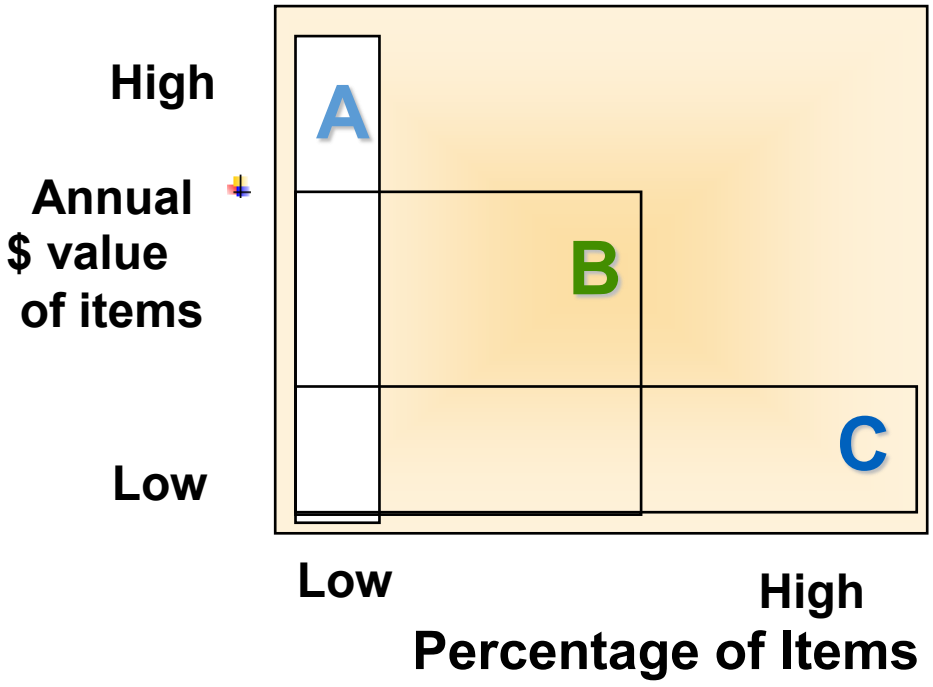
  The B group consists of the items accounting for the next largest investment, i.e., the B group consists of the 30 per cent of the items accounting for about 8 per cent of the firm's rupee investment. The C group typically consists of a large number of items accounting for small rupee investment. C group consist of approximately 50 per cent of all the items of inventory but only about 2 per cent of the firm's rupee investment.

  Classifying inventory according to some measure of importance and allocating control efforts accordingly.

  A - very important

B - mod. important

C - least important



The advantages of this system are listed below:

(i) It helps in achieving the main objective of inventory control at minimum cost.

(ii) It helps in developing a scientific method of controlling inventories.

(iii) It gives closer control on costly items.

	Percentage of items	**Percentage value of annual usage**	
Class A items	About 20%	About 80%	Close day to day control

Class B items	About 30%	About 15%	Regular review
Class C items	About 50%	About 5%	Infrequent review

Example 1

Item number	101	102	103	104	105	106	107	108	109	110
Unit cost	5	11	15	8	7	16	20	4	9	12
Annual demand	48000	2000	300	800	4800	1200	18000	300	5000	500

Step 1

Calculate the total spending per year

Item number	Unit cost	Annual demand	Total cost per year
101	5	48,000	240,000
102	11	2,000	22,000
103	15	300	4,500
104	8	800	6,400
105	7	4,800	33,600
106	16	1,200	19,200
107	20	18,000	360,000
108	4	300	1,200
109	9	5,000	45,000
110	12	500	6,000

Total usage			737,900

Total cost per year: Unit cost * total cost per year

Step 2

Calculate the usage of item in total usage

Item number	Unit cost	Annual demand	Total cost per year	Usage as a % of total usage
101	5	48,000	240,000	32,5%
102	11	2,000	22,000	3%
103	15	300	4,500	0,6%
104	8	800	6,400	0,9%
105	7	4,800	33,600	4,6%
106	16	1,200	19,200	2,6%
107	20	18,000	360,000	48,8%
108	4	300	1,200	0,2%
109	9	5,000	45,000	6,1%
110	12	500	6,000	0,8%
Total usage			737,900	100%

Usage as a % of total usage = usage of item/total usage

Step 3

Sort the items by usage

Item number	Cumulative % of items	Unit cost	Annual demand	Total cost per year	Usage as a % of total usage	Cumulative % of total
107	10%	20	18,000	360,000	48,8%	48,8%
101	20%	5	48,000	240,000	32,5%	81,3%
109	30%	9	5,000	45,000	6,1%	87,4%
105	40%	7	4,800	33,600	4,6%	92%
102	50%	11	2,000	22,000	3,0%	94,9%
106	60%	16	1,200	19,200	2,6%	97,5%
104	70%	8	800	6,400	0,9%	98,4%
110	80%	12	500	6,000	0,8%	99,2%
103	90%	15	300	4,500	0,6%	99,8%
108	100%	4	300	1,200	0,2%	100%
Total usage				737,900	100%	

Step 4

Results of calculation

Cathegory	Items	Percentage of items	Percentage usage (%)	Action

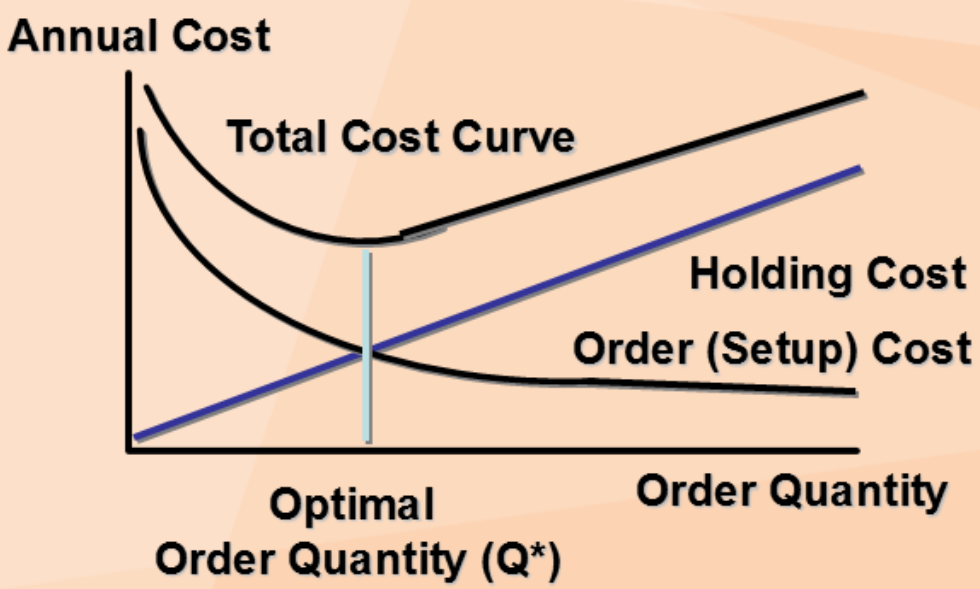
Class A	107, 101	20%	81,6%	Close control
Class B	109, 105, 102, 106	40%	16,2%	Regular review
Class C	104, 110, 103, 108	40%	2,5%	Infrequent review

- **(b)Economic Order Quantity Models:** The Economic order quantity (EOQ) refers to the optimal order size that will result in the lowest total of order and carrying costs for an item of inventory given its expected usage, carrying cost and ordinary cost. By calculating an economic order quantity, the firm attempts to determine the order size that will minimise the total inventory costs.

Assumptions of EOQ Model

- Only one product is involved
- Annual demand requirements known
- Demand is even throughout the year
- Lead time does not vary
- Each order is received in a single delivery
- There are no quantity discounts

EOQ Model



EOQ Formula Derivation

D =	Annual demand (units)
C =	Cost per unit (Rs)
Q =	Order quantity (units)
S =	Cost per order (Rs)
I =	**Holding cost (%)**
H =	Holding cost (Rs) = I x C

Number of Orders = D / Q
Ordering costs = S x (D / Q)

Average inventory = Q / 2
In Rs = (Q / 2) C

Cost to carry
average inventory = (Q / 2) x I x C
= (Q /2) x H

Total cost TC = (Q/2) x I x C + S x (D/Q)
inv carry cost *order cost*

Take the 1st derivative:

$d(TC)/d(Q) = (I \times C) / 2 - (D \times S) / Q^2$

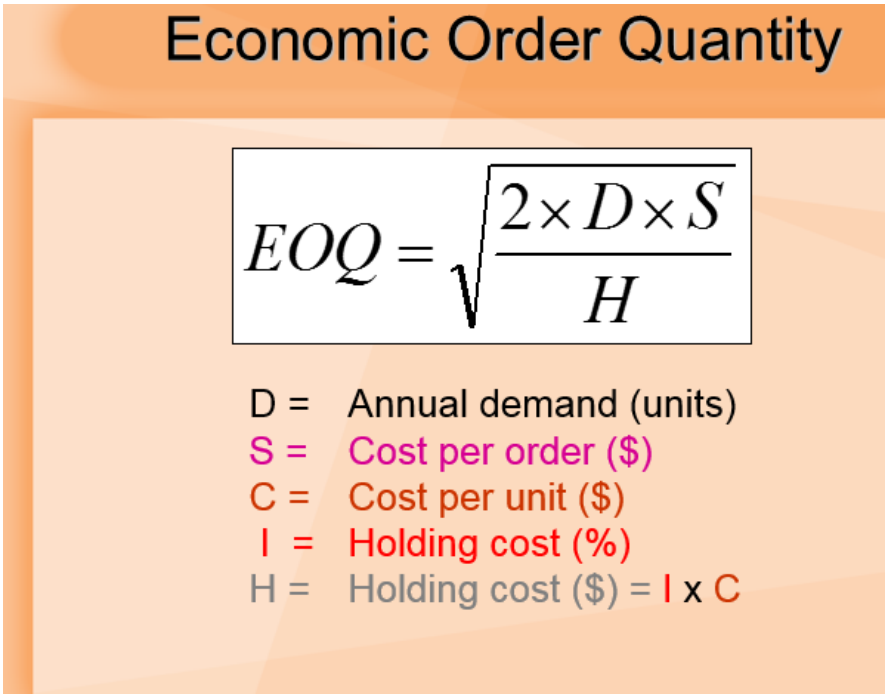
To optimize: **set d(TC)/d(Q) = 0**

$DS/ Q^2 = I C / 2$

$Q^2/DS = 2 / IC$

$Q^2 = (DS \times 2)/ IC$

$Q = \text{sqrt} (2DS / IC)$



EOQ Example:

You're a buyer for BigBazar.

BigBazar. needs 1000 coffee makers per year. The cost of each coffee maker is $78. Ordering cost is $100 per order. Carrying cost is 40% of per unit cost. Lead time is 5 days. BigBazar is open 365 days/yr.

What is the optimal order quantity?

Ans.

$$EOQ = \sqrt{\frac{2 \times D \times S}{H}}$$

D = 1000
S = $100
C = $ 78
I = 40%
H = C x I
H = $31.20

$$EOQ = \sqrt{\frac{2 \times 1000 \times \$100}{\$31.20}}$$

$$EOQ = 80 \text{ coffeemakers}$$