



**KOSHYS**

INSTITUTE OF MANAGEMENT STUDIES

# WAREHOUSING AND INVENTORY MANAGEMENT

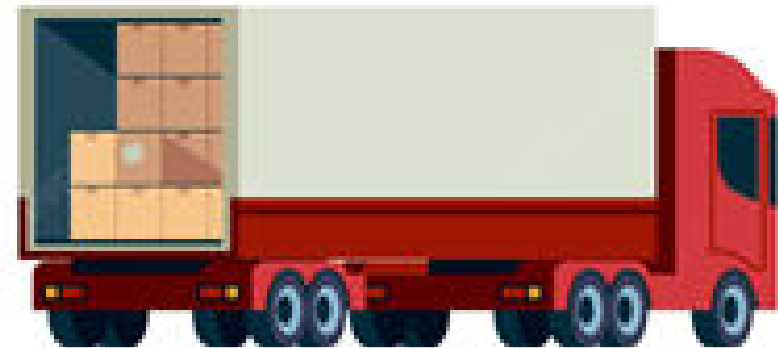
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MBA Department





# MODULE 1

# INTRODUCTION TO WAREHOUSING



# Introduction to Warehousing

## Warehouse

- A warehouse is a building for storing goods. Warehouses are used by manufacturers, importers, exporters, wholesalers, transport businesses, customs, etc. They are usually large plain buildings in industrial parks on the outskirts of cities, towns, or villages.

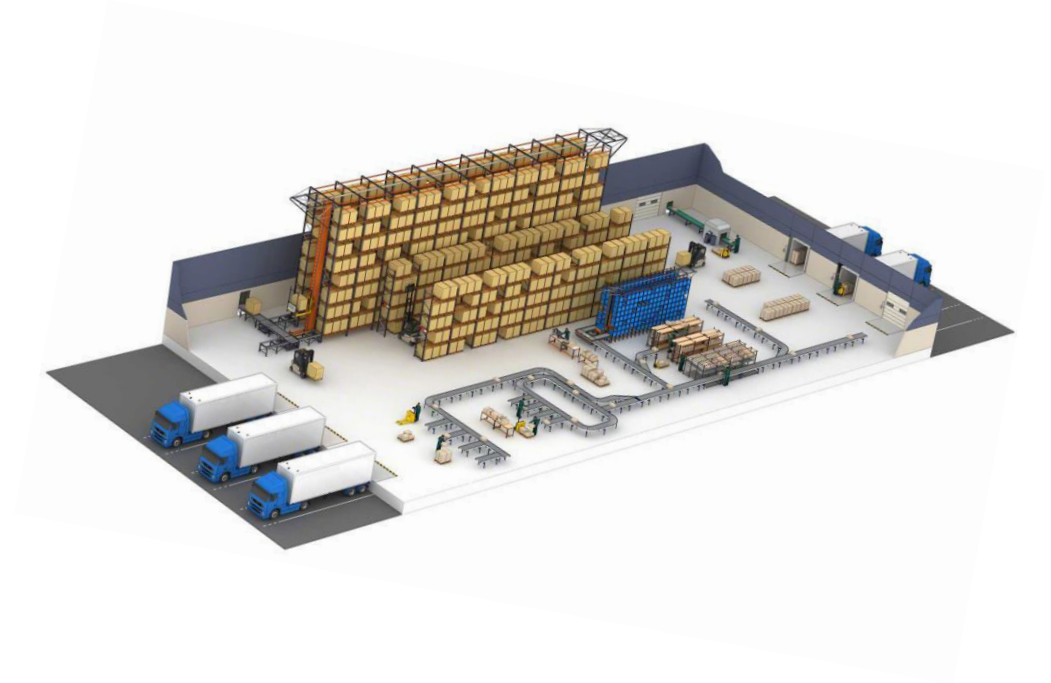
## Warehousing

- Warehousing is the process of storing physical inventory for sale or distribution. Warehouses are used by all different types of businesses that need to temporarily store products in bulk before either shipping them to other locations or individually to end consumers



# Types of Warehousing

- There are FIVE types of warehouse
  1. Private Warehouses
  2. Public Warehouses
  3. Bonded Warehouses
  4. Government Warehouses
  5. Co-operative Warehouses



# 1. Private Warehouse

- Private warehouses are owned and operated by big manufacturers and merchants to fulfill their own storage needs.
- some big business firms which need large storage capacity on a regular basis and who can afford money, construct and maintain their private warehouses.
- Ex: Amazon, Flipkart, etc

## 2. Public Warehouse

- A public warehouse is a specialized business establishment that provides storage facilities to the general public for a certain charge.
- It may be owned and operated by an individual or a cooperative society.
- It has to work under a license from the government in accordance with the prescribed rules and regulations.
- Ex: Automobile companies

### 3. Bonded Warehouses

- Bonded warehouses are licensed by the government to accept imported goods for storage until the payment of custom duty.
- The warehouse is required to give an undertaking or 'Bond' that it will not allow the goods to be removed without the consent of the custom authorities.
- Ex: ABC Company ships goods frequently to Romania to store the goods until they are sold to local customers. ABC company has to pay custom duties upon entry of the goods to Romania.

## 4. Government Warehouses

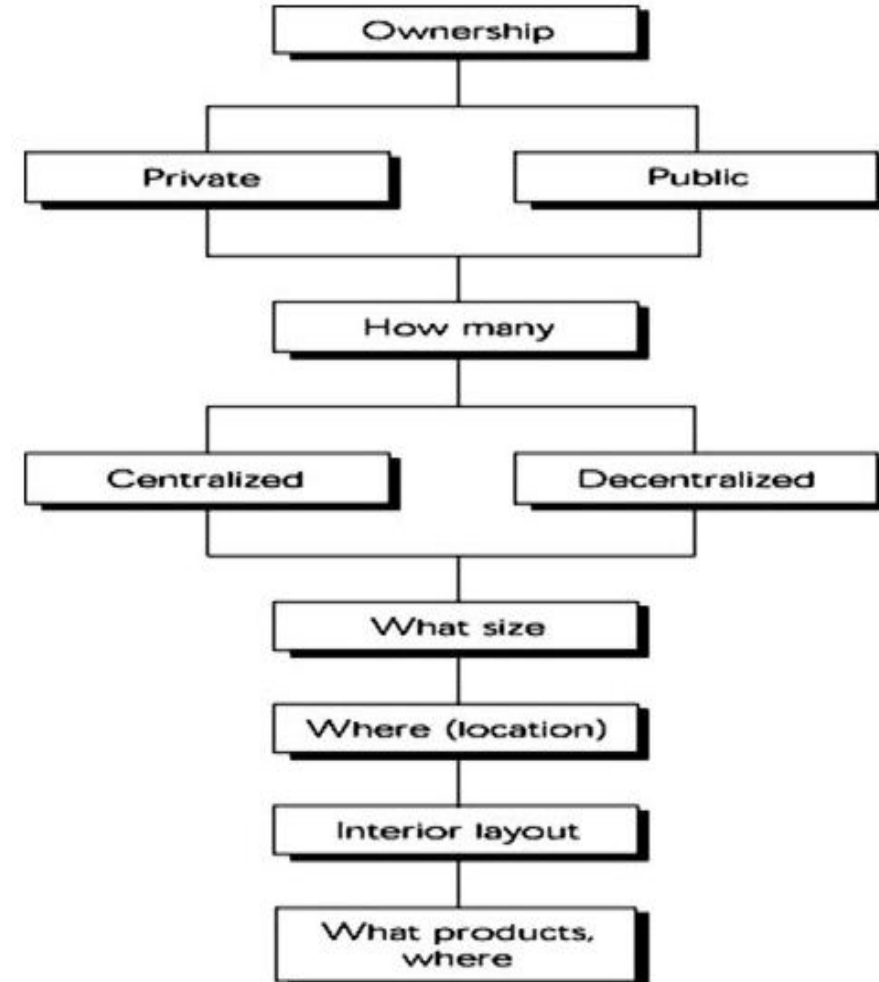
- These warehouses are owned, managed and controlled by central or state governments or public corporations or local authorities.
- Both government and private enterprises may use these warehouses to store their goods.
- Ex: Central Warehousing Corporation of India, State Warehousing Corporation of India.

## 5. Co-operative Warehouses

- These warehouses are owned, managed and controlled by cooperative societies.
- They provide warehousing facilities at the most economical rates to the members of their society
- Ex: Farmer and Winery Co-op (i.e., Mysore State Farmers Forum Co Op Cold Storage)

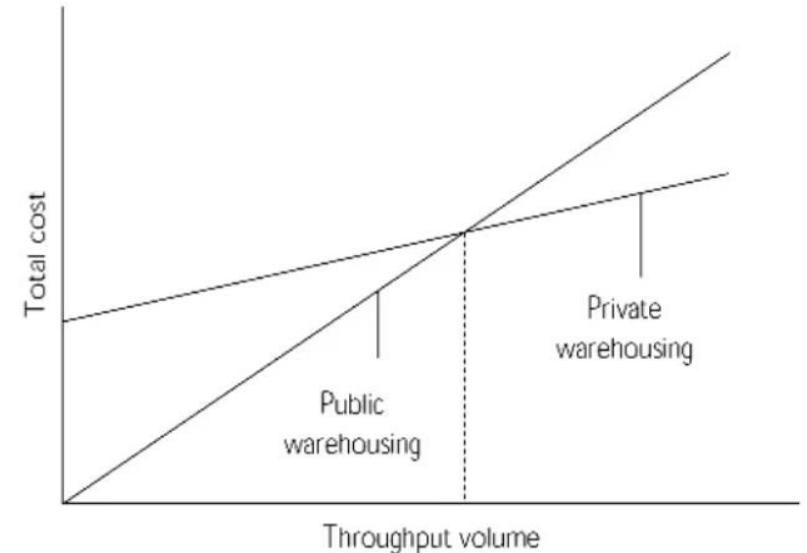
# Warehousing Decisions

- Ownership
  - Public versus contract versus private
- Centralized or Decentralized warehousing
  - How many
  - Locations
  - Size
  - Layout
  - What products where



## The Ownership decisions

- Mostly public warehousing cost are variable.
- Private warehousing cost have a higher fixed cost component.
- Private warehousing virtually requires a high and constant volume.



- Factors to consider
  - Throughput volume
  - Stability of demand
  - Density of market area to be served
  - Security and control needs
  - Customer service needs
  - Multiple use needs of the firm

Firm Characteristics Affecting the Ownership Decision		
Firm Characteristics	Private	Public
Throughput volume	High	Low
Demand variability	Stable	Fluctuating
Market density	High	Low
Special physical control	Yes	No
Customer service required	High	Low
Security requirements	High	Low
Multiple use needed	Yes	No

## Public Warehousing

- Rationale for public Warehousing
  - Limited capital investment
  - Flexibility
- Public warehousing services
  - Bonded warehousing
  - Field warehouse
- Public warehousing regulation:
  - Liability
  - Receipt
- Public Warehousing rates based upon
  - Value
  - Fragility
  - Potential damage to other goods
  - Volume and regularity
  - Weight density
  - Services required

## Public warehousing types

6 types;

- General merchandise warehouse
- Refrigerated – Cold storage warehouse
- Bonded warehouse
- Household goods and furniture warehouse
- Special commodity warehouse
- Bulk-storage warehouse

## **Contract Warehousing**

- Compensation for seasonality in products
- Increased geographical coverage
- Ability to test new markets
- Managerial expertise and dedicated resources
- Less strain on the balance sheet
- Possible reduction of transportation cost

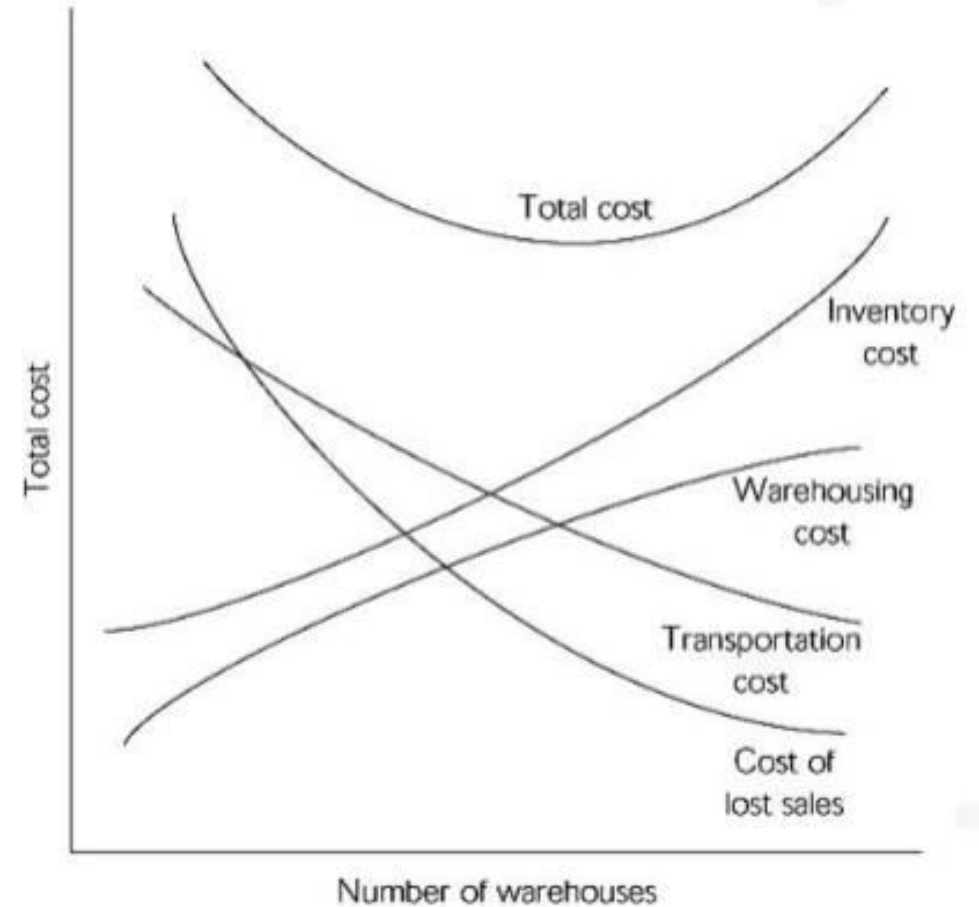
## **Private Warehousing decision**

- Owned and occupied on a long-term lease.
- Assumes both sufficient demand volume and stability so that warehouse remains full
- High fixed cost
- Control
- Flexibility
- Less costly
- Better use of human resources
- Tax benefits
- Intangible benefits

# Factors affecting the number of warehouses

- Inventory costs
- Warehousing costs
- Transportation costs
- Cost of lost sales
- Maintenance of customer service levels
- Service small quantity buyers

<i>Factor</i>	<i>Centralized</i>	<i>Decentralized</i>
Substitutability	Low	High
Product Value	High	Low
Purchase Size	Large	Small
Special Warehousing	Yes	No
Product Line	Diverse	Limited
Customer Service	Low	High



## Warehousing Operations

- Warehouse operations covers a number of important areas, from the receiving, organization, fulfillment, and distribution processes. These areas include:
  - Receiving of goods
  - Cross-docking of goods
  - Organizing and storing inventory
  - Attaching asset tracking solutions (like barcodes) to assets and inventory
  - Integrating and maintaining a tracking software, like a warehouse management system
  - Overseeing the integration of new technology
  - Selecting picking routes
  - Establishing sorting and packing practices
  - Maintaining the warehouse facility
  - Developing racking designs and warehouse infrastructure

# Selection of location for a warehouse

- Rent Rates & Taxes
- Workforce Availability, Labor Skills & Costs
- Roads, Highways & Traffic Flow
  - Accessibility to highways & exit ramps
  - Highway inter-connectivity
  - Public transportation penetration
  - Average traffic speed
  - Average traffic volume
  - Traffic peak hours
  - Road safety & conditions
  - Proper roads signs & signals
- Proximity to Airport, Railway Stations & Ports
- Markets & Local Environment Factors
- Building Availability & Utility Costs

# Layout of the warehouse

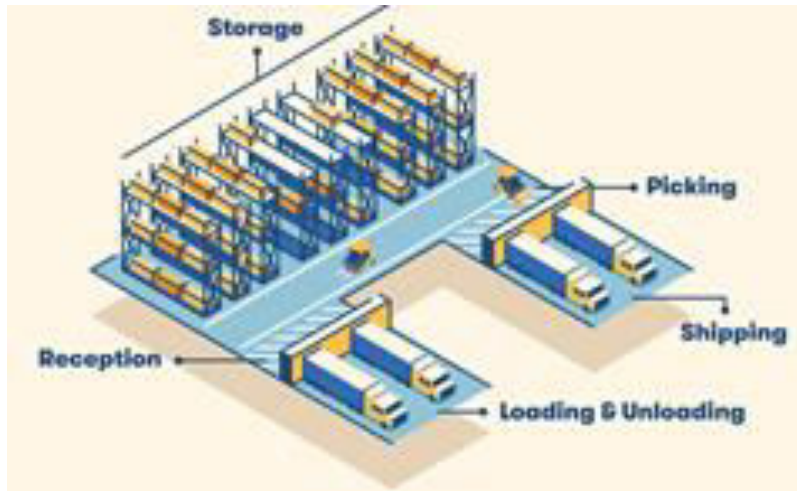
## 4 Tips for Designing Your Warehouse Layout

- Map it Out
- Plan for Space Optimization
- Pick the Right Equipment
  - Forklift
  - Pallet Jack
- Test the Plan and Record the Results

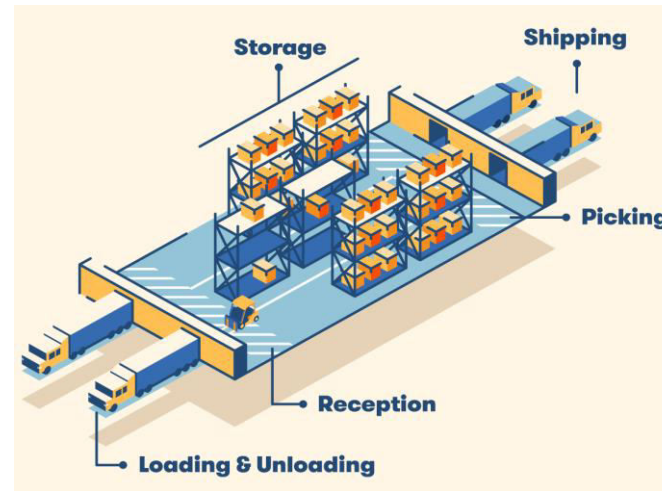


# Warehouse Layout Designs Suggestions

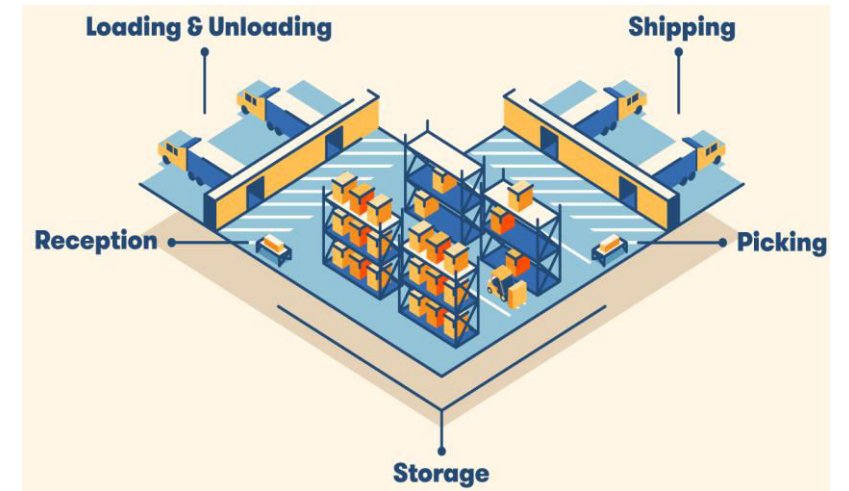
## U-Shaped Design



## I-Shaped Design



## L-Shaped Design



# Inventory Control

1. Inventory control is a system of ordering based on the maintenance of the stock in a store using a re-order rule based on the stock level.
2. Inventory control is concerned with various items stocked at predetermined level or within some safe limits.
3. Inventory control may be defined as planning, ordering and scheduling of materials used in the manufacturing process. It is possible to exercise control over three types of inventories recognized by accountant as raw material, work in progress and finished good.
4. Inventory control is the technique of maintaining the size of the inventory at some desired level keeping in view the best economic interests of an organization.

# Importance and scope of inventory control

## Importance

1. Inventory control protects a company from fluctuations in demand of its products.
2. It enables a company to provide better services to its customers.
3. It keeps a smooth flow of raw-materials and aids in continuing production operations.
4. It checks and maintains the right stock and reduces the risk of loss.
5. It helps to minimise administrative workload, manpower requirement and even labour cost.
6. It tries to protect fluctuation in output.
7. It makes effective use of working capital by avoiding over-stocking.
8. It helps to maintain a check on loss of materials due to carelessness or pilferage (stealing).
9. It facilitates cost accounting activities.
10. It avoids duplication in ordering of stock.

# Scope of Inventory Control

1. Formulation of Policy
2. Organization structure
3. Determination of Economic Order Quantity
4. Determination of Safety Stock
5. Determination of Lead Time
6. Minimum Material handling and Storage cost
7. Effectives towards running store

# Types of Inventory

## 13 Types of Inventory

1. Raw Materials
2. Components
3. Work In Progress (WIP)
4. Finished Goods
5. Maintenance, Repair and Operations (MRO) Goods
6. Packing and Packaging Materials
7. Safety Stock and Anticipation Stock
8. Decoupling Inventory
9. Cycle Inventory
10. Service Inventory
11. Transit Inventory
12. Theoretical Inventory
13. Excess Inventory

# Selective Inventory Control

- Selective Inventory Control is an essential part of Materials Management. Selective inventory control is emphasized on variations in methods of control from item to item based on a selective basis. We can not apply uniform control since it's expensive and gives diffused effect.

## **Classification of Inventory Control**

- ABC Analysis
- VED Analysis
- HML Analysis
- SDE Analysis
- GOLF Analysis
- SOS Analysis
- FSN Analysis
- XYZ Analysis



# MODULE 2

# WAREHOUSE OPERATIONS



# Warehouse and Inventory Operations

- Warehouse inventory management is a process that involves receiving, storing, and tracking inventory in a warehouse; managing warehouse staff; and optimizing storage space and costs; all of which directly impacts fulfillment, shipping, and the customer experience.

# Why warehouse inventory management important

1. Improves order fulfillment accuracy
2. Boosts warehouse productivity
3. Faster shipping and deliveries
4. Saves you money
5. Increases customer satisfaction

# warehouse inventory management processes

1. Warehouse layout optimization
2. Warehouse inventory control tracking and recording
3. Picking and packing
4. Shipping
5. Reporting and optimizing

# Role of warehousing in distribution system



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- **Inventory Control**
- **Centralization Of Goods**
- **Value Adding Operation**
- **Economic Benefit**
- **Social Benefit**
- **Cross- docking**

# WMS

- A warehouse management system (WMS) is a software solution that offers visibility into a business' entire inventory and manages supply chain fulfillment operations from the distribution center to the store shelf.



# Using WMS for Managing Warehouse Operations

- Fulfillment process—Rapid implementation
- Cloud-based WMS—No upgrades required
- Connect logistics—Lower upfront costs
- Scalability and flexibility of supply chain operations
- Seamless Integration—Warehouse management and ERP



# Documents in Warehousing Operations

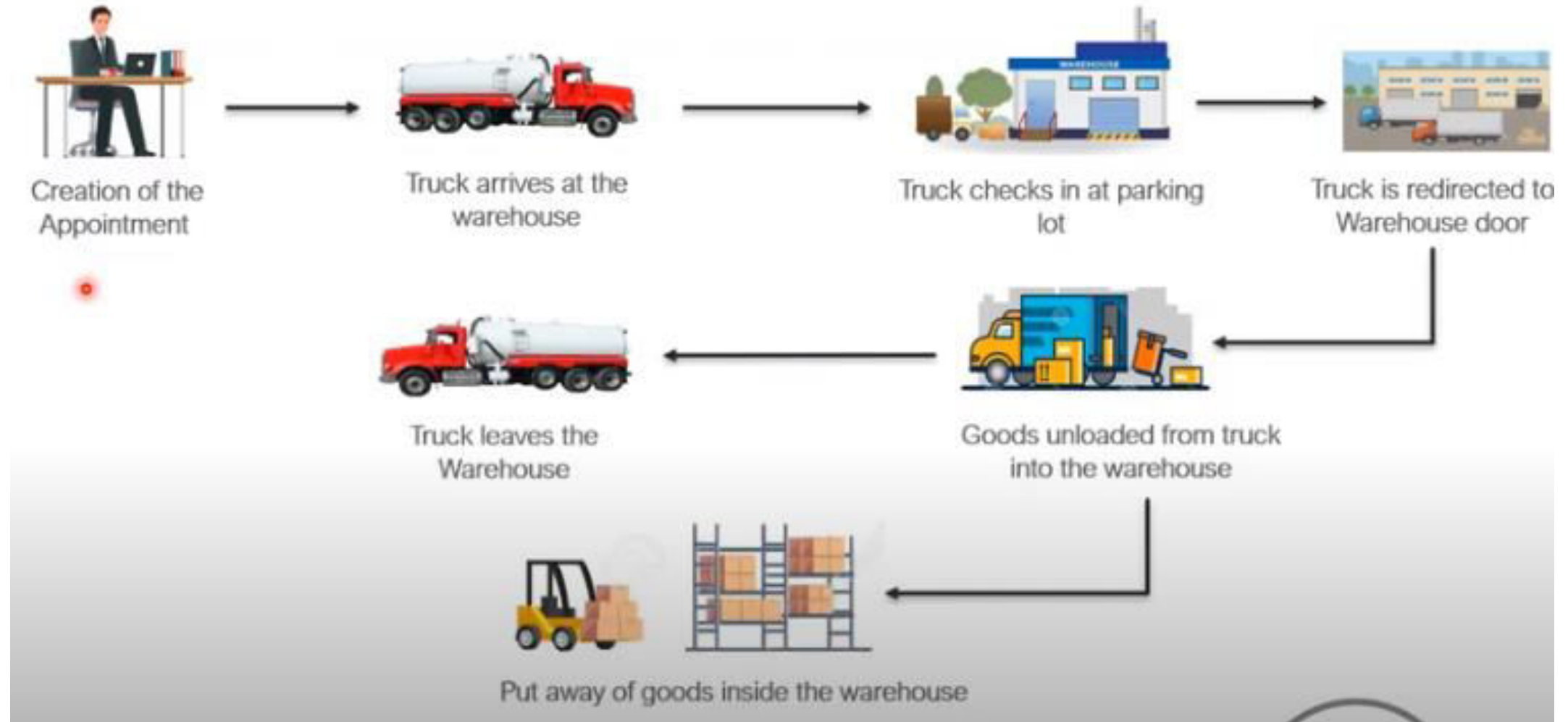
- Lorry Receipt (L/R) ...
- Railway Receipt (R/R) ...
- Consignment Note. ...
- Bill of Lading (B/L) ...
- Air way bill (AWB) ...
- Dock Warrant or Warehouse Warrant. ...
- Warehouse Keeper's Receipt...
- Delivery Order...



# Warehouse Receiving operations

- Warehouse receiving is the first step of the ecommerce fulfillment process and refers to the process of delivering, unloading, and storing ecommerce inventory in a warehouse or fulfillment center. A well-established warehouse receiving process can help make inventory management and fulfillment easier, cost-effective, and more efficient.
- The standard warehouse receiving process
  1. Create proper documentation and then send your inventory
  2. Receive and unload stock
  3. Count and confirm inventory
  4. Store and file product

# Warehouse operations



# Unloading

- The unloading process consists of the movement of the received goods from the container (trailer, rail car, or other delivery method) to the dock floor for proper checking. These goods can arrive on the floor of the container or on pallets. How they arrive helps determine what receiving method is deployed.

# Palletization

- Palletization is the logistics process consisting of placing goods together on top of a pallet to consolidate the load, making it easier for the handling equipment to transport it. The pallet, a horizontal platform formed by boards, provides a base for the products so that the forks of a forklift or pallet jack can pick up and move the load as a whole.
- Among other factors, the type of pallet you select will depend on:
  - The different storage systems that make up the warehouse.
  - The handling equipment (manual or automatic).
  - The type of product stored.
  - The company's various suppliers.



# Advantages of palletization

- More efficient goods loading and unloading
- Streamlined goods flows in the installation
- Improved safety for products and operators
- Inventory control
- Optimization of storage space

# Stock Update

- Control of inventory
- Tracking of items
- Management of the space
- Visibility of management information

## Location and zone management

- Physical makeup
- Geographical proximities and accessibility
- Availability and use of technology
- Future expansion possibilities



## Module – 3

# Role of Inventory Management

# Importance of role of Inventory Management

- Cash Flow
- Business intelligence
- Maximize profits
- Limits employee mishandling
- Reduce labour costs

# Inventory management system

- An inventory management system (or inventory system) is the process by which you track your goods throughout your entire supply chain, from purchasing to production to end sales. It governs how you approach inventory management for your business.
- There are two main ways in which companies manage inventory: periodic systems and perpetual systems. Let's take a look at the difference between the two.



## What is periodic inventory?



Periodic inventory is a way of managing stock that relies entirely on stock taking. Businesses with a periodic system count their stock regularly — say, every 3 to 6 months — to verify stock accuracy, checking whether stock levels match up to sales figures.

## What is perpetual inventory?



Perpetual inventory is a system that involves tracking stock levels as goods are received, produced, sold, or returned to the store. Perpetual inventory systems tend to deliver the most up-to-date inventory figures, with less dependence on stock takes for accuracy.

# Replenishment of Inventory

- Replenishment is the controlled and regular movement of inventory from an upstream point on the supply chain to a downstream location that requires sufficient stock to cover demand. The process of inventory replenishment varies depending on the type of business and circumstances.
- For example, it can refer to any of the following situations:
  - shipping raw materials from suppliers to manufacturing facilities;
  - moving inventory from reserve product storage to packing and shipment locations;
  - ordering inventory from suppliers to ensure that a warehouse or fulfillment center has adequate product; and
  - relocating stock from a warehouse to a pickup facility or retail.

# Forecasting Techniques

- Inventory forecasting — also known as demand planning — is the practice of using past data, trends and known upcoming events to predict needed inventory levels for a future period. Accurate forecasting ensures businesses have enough product to fulfill customer orders while not tying up cash in unnecessary inventory.
- Techniques
  - Trend forecasting
  - Graphical forecasting
  - Qualitative forecasting
  - Quantitative forecasting

# Selective Inventory Control

- Selective Inventory Control is an essential part of Materials Management. Selective inventory control is emphasized on variations in methods of control from item to item based on a selective basis. We can not apply uniform control since it's expensive and gives diffused effect. For this purpose, we can use some criterion such as lead time, consumption, criticality, cost of the items, procurement difficulties etc. The following classification can be used for the selective treatment of various types of materials.
  - ABC Analysis
  - VED Analysis
  - HML Analysis
  - SDE Analysis
  - GOLF Analysis
  - SOS Analysis
  - FSN Analysis

# Economic Order Quantity

- Economic order quantity (EOQ) is a calculation companies perform that represents their ideal order size, allowing them to meet demand without overspending. Inventory managers calculate EOQ to minimize holding costs and excess inventory.
- Economic order quantity is a useful metric for businesses that buy and hold inventory for manufacturing, resale, internal use or any other purpose. Businesses that follow EOQ look at all costs related to purchasing and delivery while also factoring in demand for the product, purchase discounts and holding costs.

# Safety Stocks

- Safety stock is an extra quantity of a product which is stored in the warehouse to prevent an out-of-stock situation. It serves as insurance against fluctuations in demand.

# Inventory Management Systems

- Inventory management software is a software system for tracking inventory levels, orders, sales and deliveries. It can also be used in the manufacturing industry to create a work order, bill of materials and other production-related documents



# Execution of IMS

1. Receive and inspect products
2. Sort and stock products
3. Accept customer order
4. Fulfil package and ship order
5. Reorder new stock

# Ratio Analysis on Inventory

- Inventory Turnover Ratio

Inventory Turnover = Cost of Goods Sold / Average Inventory

Average Inventory Value = (Beginning Value + Ending Value) / 2

- Gross Margin Return on Investment

Gross Margin Return on Inventory = Net Sales / Average Inventory x Gross Margin

where Gross Margin = (Net Sales - COGS) / Net Sales

- Holding Inventory Ratio

Holding Inventory Ratio = Holding Costs / Average Inventory Value

- Days Sales of Inventory Ratio

Days Sales of Inventory = Average Inventory / Net Sales x # of days in a year

# Profit Margin

- Determining your business's profit margin is an important part of inventory management.
- Profit margin can help you determine two primary things: whether your business is performing well with the inventory you're stocking and whether certain items should be marked up more in order to realize an optimum profit.

# UNIT –IV

## MATERIAL REQUIREMENT PLANNING

# Costs associated with Inventories

- Inventory cost includes the costs to order and hold inventory, as well as to administer the related paperwork. This cost is examined by management as part of its evaluation of how much inventory to keep on hand.

1. Ordering Costs
2. Inventory Holding Costs
3. Shortage Costs
4. Spoilage Costs
5. Inventory Carrying Costs



# Material Requirement Planning

- Material requirements planning (MRP) is a system for calculating the materials and components needed to manufacture a product. It consists of three primary steps: taking inventory of the materials and components on hand, identifying which additional ones are needed and then scheduling their production or purchase.

# Accounting for Inventories

- Inventory accounting is the body of accounting that deals with valuing and accounting for changes in inventoried assets.
- A company's inventory typically involves goods in three stages of production: raw goods, in-progress goods, and finished goods that are ready for sale.

# Purpose of Inventory

- The purpose of the inventory is to provide a buffer between production and sales, smoothing out the flow of goods and ensuring that products are available when customers order them.
- To achieve this goal, companies must carefully manage their inventory levels, investing in an appropriate system if necessary.
  1. Smooth production
  2. Plan to Succeed
  3. Manage Costs
  4. Reduce Errors

# Goods & Types of Goods

- Goods are physical, produced objects for which a demand exists, over which ownership rights can be established and whose ownership can be transferred from one institutional unit to another by engaging in transactions on markets.

## Types of Goods

1. Private goods
2. Common goods
3. Club goods
4. Public goods
5. Capital goods
6. Intermediate goods
7. Fast-moving consumer goods
8. Durable goods
9. Luxury goods
10. Inferior goods
11. Merit goods and demerit goods

# Finished Goods Inventories

- Finished goods inventory is the total number of manufactured products that are available, in stock, and ready for purchase by vendors, retailers, and consumers.
- With that said, finished products are often a relative concept, since a seller's goods may actually become another buyer's raw materials inventory.

# General Inventory

- General Inventory means any Inventory of Borrower or any of its Domestic Subsidiaries (excluding compressors held for lease to third parties and any and all accessions thereto), now or hereafter owned by Borrower or any of its Domestic Subsidiaries.

# Management of Inventory

- Field inventory management commonly known as inventory management is the function of understanding the stock mix of a company and the different demands on that stock.
- The demands are influenced by both external and internal factors and are balanced by the creation of purchase order requests to keep supplies at a reasonable or prescribed level.

# Management of Inventory

Inventory management in the retail supply chain follows the following sequence:

1. Request for new stock from stores to head office,
2. Head office issues purchase orders to the vendor,
3. Vendor ships the goods,
4. Warehouse receives the goods,
5. Warehouse stores and distributes to the stores,
6. Shops and/or consumers (e.g. wholesale shops) receive the goods,
7. Goods are sold to customers at the shops.

# Stocks & Types of Stocks

- Stock is the supply of finished goods available for sale, and inventory includes both finished goods and components that create a finished product. In other words, all stock is inventory, but not all inventory is stock.

## **Types**

- Raw materials.
- Work-in-progress (WIP) inventory.
- Finished goods.
- Maintenance, repair & operations (MRO) goods.
- Packing materials.



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## Inventory

- Refers to the value of parts and raw material used for manufacturing, work in process goods, and the final product
- Helps you arrive at the sale price of the stock
- Needs to be updated and managed on a quarterly or yearly basis (end of accounting period)
- Term used in both retail and manufacturing
- Arrive at the value of inventory using methods, such as FIFO, LIFO, and weighted average methods

## Stock

- Refers to the value of all items that are available and directly sold to the customers
- Helps you determine business revenue
- Needs to be updated and managed on daily (maybe even multiple times a day)
- More common in production and manufacturing
- Value of stock is based on the current market value or the price at which goods are sold to the customer

# Tracking the Paper Life

- An inventory tracking system follows inventory every step of the way through your supply chain: from order to transit, receiving, storage and order fulfilment—and the returns, exchange and warranty processes if applicable.
- Organizations use accurate, real-time inventory tracking data to reduce expenses, analyze supply chain trends and drive revenue. These tracking features are often part of inventory management systems.



# MODULE 5

# INVENTORY DECISIONS

# Work-in-Process Inventories

- Work in process (WIP) inventory refers to materials that are waiting to be assembled and sold.
- WIP inventory includes the cost of raw materials, labor, and overhead costs needed to manufacture a finished product.
- Work in process inventory encompasses all inventory types in the intermediate stage between raw materials inventory and final products.
- For example, if a company sells bags of coffee, their WIP inventory would include bags, labels, coffee beans, and shipping boxes.

# Finished Goods & Spare Parts Inventories

## Finished Goods Inventory

- Finished goods inventory is the total number of manufactured products that are available, in stock, and ready for purchase by vendors, retailers, and consumers.
- With that said, finished products are often a relative concept, since a seller's goods may actually become another buyer's raw materials inventory.

## Spare Parts Inventory

- Spare part inventory refers to a list of stock items maintenance technicians use to replace failed equipment parts.
- Manufacturing facilities keep spare part supplies—like belts, motors, gears, and grease—on hand so they can fix equipment failures without needing to order and then wait for a part to be delivered.

# Multi-Echelon Inventory Systems

- Multi-echelon inventory optimization is a method that combines all the distribution levels to help companies optimize inventory levels throughout their distribution networks.
- This method combines inventory optimization (how much stock to keep at each distribution level) and multi-echelon planning (deciding where to keep inventory at each distribution).
- Single-inventory optimization is a type of supply planning in which supply at each location is optimized independently of each other.
- The problem with using a single-echelon inventory optimization model is that in treating each distribution level independently of one another, you fail to recognize the impact that one level has on another.

# MODULE 6

## IT IMPACT IN INVENTORY MANAGEMENT

# Use of Computers in Inventory Management

## Evaluation of Performance of Materials Function

- In organisations, goods such as raw materials, finished products, spares, consumables etc. are kept in stock so that whenever need arises these items are available off the shelf and the business does not suffer on account of non-availability of the items. r4
- Computers are used to control the level of inventories and to provide materials at the right time. Computers can handle various data such as price, lead time, ordering cost, carrying cost, historical data on delivery performance and so on very easily.
- ABC analysis, Economic Order Quantity etc are a few techniques, which are programmed into the computer to avoid tedious and time-consuming calculations. Statistical and mathematical analysis of reserve stock, safety stock and reorder points for thousands of items becomes almost impossible to control manually which is made easier by using computer programmes for each of' these factors.

# Criteria and methodology of evaluation

- A computerized inventory system enables a company to monitor inventory levels in real time throughout the day. Also known as inventory management software, businesses can stay updated with inventory orders, counts and sales.
- A computerized inventory system can help you avoid costly mistakes, know what is and isn't moving, get your whole team on the same page, and help you keep track of inventory from anywhere.

## Advantages

- Avoid Costly Mistakes
- Know What is Selling and What Isn't
- Get The Entire Team On Board
- Stay on Top of Things From Anywhere



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# Thank You.

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