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DEPARTMENT OF MBA

BA4023-MATERIALS MANAGEMENT

UNIT-I

2 MARKS:

1. Define Materials Management.

Materials management is an essential function within an organization that ensures the smooth flow of materials from suppliers to production and eventually to customers. It involves the planning, procurement, and control of materials to ensure that the right material is available at the right time, in the right quantity, and at the right cost.

2. What is aggregate planning?

Aggregate planning is a method for analyzing, developing and maintaining a manufacturing plan with an emphasis on uninterrupted, consistent production. Aggregate planning is most often focused on targeted sales forecasts, inventory management and production levels in the mid-term (3-to-18-month) future.

3. What is master production schedule?

Master production scheduling is the process that helps manufacturers plan which products and related quantities to produce during certain periods. It is proactive, driving the production process by determining what should be manufactured and what materials should be purchased.

4. What are make-to-stock products?

Make-to-stock (MTS) is a manufacturing strategy in which production planning and production scheduling are based on forecasted product demand. Products made during one production period are used to fulfill orders made in the next production period.

5. What are make-to-order products?

Make to order (MTO), or made to order, is a business production strategy that typically allows consumers to purchase products that are customized to their specifications. The manufacturing process of an MTO item begins only after a confirmed customer order is received.

6. List the risk carried by ERP.

- Poor project management and planning
- Inadequate user training and support
- Resistance to change from employees
- Limited stakeholder involvement
- Lack of alignment between ERP system and business processes

7. What do you understand by MPC?

The Manufacturing Planning and Control system is concerned with planning and controlling all aspects of manufacturing, including managing materials, scheduling machines and people, and coordinating suppliers and key customers.

8. Define ERP.

Enterprise resource planning (ERP) is a software system that helps you run your entire business, supporting automation and processes in finance, human resources, manufacturing, supply chain, services, procurement, and more. Enterprise resource planning (ERP) refers to a type of software that organizations use to manage day-to-day business activities such as accounting, procurement, project management, risk management and compliance, and supply chain operations.

9. List the types of aggregate planning strategies.

Level Strategy: The goal of an aggregate planning strategy is to keep the production rate and the workforce level. This requires strong forecasting of demand to know if production levels must be increased or decreased as customer demands grow and shrink.

Chase Strategy: As the name implies, you are chasing market demand. The production matches demand, and excess inventory isn't held over. This is part of a larger lean production strategy, which saves money by waiting until an order is placed.

Hybrid Strategy: There is a third alternative, which is a hybrid of the previous two strategies. This keeps the balance between the production rate, workforce and inventory levels, while still responding to demand as it changes.

10. State the inputs of MRP system.

Inputs for MRP are master schedules, bill of materials, and inventory status records, whereas outputs for MRP are purchase orders, material plan, work orders and reports. The MPS is simply the quantity and timing of all end goods to be produced over a specific time period. MPS is estimated through customer orders and demand forecasts.

11. Define Chase strategy.

A chase strategy is one that adjusts production output to match demand fluctuations. This means that the production capacity and workforce are increased or decreased as needed, depending on the demand forecast. A chase strategy minimizes inventory costs and avoids overproduction or underproduction.

12. Define Hybrid strategy.

A hybrid strategy is an approach that combines two or more different marketing strategies. The goal of a hybrid strategy is to provide the best of both worlds, by combining the strengths of each strategy to create a more effective overall plan.

13. Define Rough cut capacity planning.

Rough-cut capacity planning (RCCP) is a long-term capacity planning technique. RCCP validates the master production schedule (MPS). The goal is to ensure that companies don't purchase or release an excess of materials. It is not uncommon for the MPS to overstate the need for more materials than production can process.

14. List the objectives of MPS.

The MPS helps to ensure that the necessary resources, such as raw materials, labor, and equipment, are available to meet the production schedule. The MPS helps to control inventory levels by determining the quantity of finished products that should be produced and when they should be produced.

15. What is operating environment?

The operational environment of an organization consists of the organization and its stakeholders, social networks, the local community and society. The organization has to adapt its internal processes, resources and capabilities to the changing operational environment in the strategic plan.

16. List the approaches of aggregate planning.

The top-down (TD) approach uses an aggregate forecast model to develop a summary forecast, which is then allocated to individual items on the basis of their historical relative frequency. The bottom-up (BU) approach employs an individual forecast model for each of the items in the family.

17. What is closed loop MRP?

Closed loop MRP is a software system used for production planning and inventory control with a feedback feature that enables dynamic adjustments during the processes. It was developed during the 1970s as a successor to earlier open-loop materials requirements planning systems.

18. State the Inputs & outputs of MRP.

Inputs of MRP:

- Customer orders
- Forecast demand
- Master production schedule (MPS)
- Bill of material (BOM)
- Inventory Records

Outputs of MRP:

- Purchase Orders
- Material Plan
- Work Orders
- Reports

19. What is FAS(Fast Assembly Schedule)?

Final Assembly Schedule, often abbreviated as FAS and sometimes referred to as finishing schedule, is a schedule of end items to finish the product for specific customer orders in a make to order (MTO) or assemble-to-order (ATO) environment. The FAS fabricates the parts or subassemblies and assembles the end product according to customer order specifications.

20. List the objectives of aggregate planning.

- Minimize inventory investment
- Reduce workforce demand and fluctuation
- Maximize production rates while minimizing fluctuation
- Increase facility and production equipment utilization

21. List the chief benefits of ERP.

- Enhanced Business Reporting
- Better customer service
- Improved Inventory Costs
- Boosted Cash Flow
- Cost Savings
- Better Data & Cloud Security
- Business Process Improvements

22. List the factors that govern the operating environment.

The operating environment of for-profit organizations includes customers, suppliers, and competitors. The factors that make up operational environments are political, military, economic, social, information, infrastructure, physical environment, and time.

23. Why is a production plan is needed?

Production planning creates an efficient process for production according to customer and organizational needs. It optimizes both customer-dependent processes -- such as on-time delivery -- and customer-independent processes, such as production cycle time. Without production plan, businesses would not be able to meet their customers' needs or generate revenue.

24. What is manufacturing resource planning?

Manufacturing resource planning, also known as MRP II, is a software system that expands the scope of material resource planning to involve other functions, such as finance and marketing, in a manufacturer's production operations. MRP allows managers to accurately visualize scheduling and inventory and effectively monitor costs by leveraging real-time data to create a production schedule that optimally uses raw materials, machines and human resources.

25. How is codification used in materials management?

It makes item entry and exit control more accurate and secure, helping to prevent theft, diversion, and other unscheduled forms of exit. Each coded product can only enter and exit once, and this also helps reduce errors in the shipment of goods to the customer. Codification is the process of assigning a number or symbol to each store item, along with a name, in order to make it easy and convenient to identify.

UNIT-II

2MARKS:

1. Define materials 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.

2. Define dependent demand.

Dependent demand refers to the demand for an item that is directly linked to the demand for another item or items. This usually occurs in a production environment where the demand for raw materials depends on the demand for the final product. Dependent demand items, in contrast, are the raw materials and components needed to make the finished product.

3. What is bill of materials?

A bill of materials (BOM) is a comprehensive inventory of the raw materials, assemblies, subassemblies, parts and components, as well as the quantities of each needed to manufacture a product. A bill of materials (BOM) is the data that identifies the items or raw materials used to produce any physical thing, whether that thing is a structure or a product.

4. What is product tree?

It helps product managers (PMs) organize, prioritize, and tame the barrage of product feature inputs from customers and internal stakeholders. A Product Tree is a visual tool used to prioritize product feature requests and manage input from stakeholders & customers. The entire product team can evaluate their ideas related to priority features in a simple and streamlined way.

5. What resource requirement planning?

Resource Requirements Planning uses data from a forecast of future sales to estimate the time and resources that are required to make a product. The process of converting the production plan or the master production schedule into the impact on key resources, e.g., man hours, machine hours, storage, standard cost dollars, shipping dollars and inventory levels.

6. What is capacity planning?

Capacity planning is the process of determining the potential needs of your project. The goal of capacity planning is to have the right resources available when you'll need them. Resources could mean individuals with the right skills, time available to add another project, or the necessary budget.

7. What is production activity control (PAC)?

Production activity control can be defined as the process which involves the co – ordination of the manufacturing resources – scheduled and controlled. Production activity control includes the various activities related to the scheduling, releasing and the tracking production orders and schedules and then reporting the materials and the resources used and the results of the production process.

8. What is symbolic approach in coding?

It is intelligent code system. This system uses either a numeric codification system or alphanumeric or mnemonic system. There are several systems possible for codification of materials depending on the choice of coding symbols-alphabets, numbers, or a combination of alphabets and numbers (alphanumeric).

9. What is codification?

Codification is a process of representing each item by a number, the digits of which indicate the group, the subgroup, the type and the dimension of item. The first two digits normally represent the major groups, such as raw tools, oil stationery, etc.

10. What are the types of codification?

- Alphabetic system,
- Simple numeric or sequence system,
- Combination system,
- Block system,
- Decimal system,
- Numerical system,
- Mnemonic system and

- Six letter – nine letter codes.

11. What is arbitrary approach in coding?

Arbitrary system as the word 'arbitrary' indicates, is based on the serial number under which a material is received and the same is allotted as a code number. Using this approach, all inventory items are simply assigned arbitrary numbers in sequence as they are added to the stores account.

12. What is the manufacturing application of bar codes?

Barcodes are used to control the manufacturing process (production line) and they play an important role in 'supply and demand', including the distribution and transport of products to the customer. Barcode technologies also add value to manufacturing processes. The ability to tie large amounts of data to an object via a small code or chip allows for greater accuracy in the manufacturing process and efficiencies in tracking inventory.

13. What is project manufacturing?

Project Manufacturing is an operation designed to produce unique but similar products. It takes advantage of common manufacturing requirements (and therefore efficiencies), while allowing for customization into “unique” combinations. Unique orders may be managed like a project.

14. What is planning horizon?

The planning horizon is the amount of time an organization will look into the future when preparing a strategic plan. Many commercial companies use a five-year planning horizon; however, a general Planning horizon is around one year. Planning horizons must be long enough to cover the cumulative lead time for all low-level components.

15. List the benefits of production scheduling.

- Optimal Resource Utilization
- Improved Efficiency and Productivity
- Minimized Inventory Costs
- Enhanced Customer Satisfaction
- Reduced Lead Times
- Flexibility and Adaptability
- Cost Reduction
- Improved Decision-Making
- Better Communication and Collaboration

16. What is inventory?

Inventory management is a discipline primarily about specifying the shape and placement of stocked goods. It is required at different locations within a facility or within many locations of a supply network to precede the regular and planned course of production and stock of materials.

17. What is flow manufacturing?

Flow Manufacturing is a strategy that aims to achieve a balanced production line. It's about creating a production process where work-in-progress smoothly flows through production with minimal (or no) buffers between steps. Manufacturing flow lines are also called transfer lines and production lines. The work areas are usually called

machines. Storage areas are often called buffers. The material in most cases consists of discrete parts.

18. State the application of bar coding in retail.

Barcodes are widely used in retail stores to track inventory and improve operational efficiency. Here are some of the benefits of using barcodes in retail stores: Increased accuracy: Barcodes help reduce manual errors when tracking inventory and managing sales, ensuring that data is accurate and up-to-date.

19. What is capacity management?

Capacity management refers to the act of ensuring a business maximizes its potential activities and production output—at all times, under all conditions. The capacity of a business measures how much companies can achieve, produce, or sell within a given time period.

20. Define material control.

Material Control is a management function that is concerned with the storage, handling, and use of materials to minimize waste and improve inventory accuracy. This process can be beneficial for companies to reduce costs and improve organization and productivity.

21. List the objectives of MRP.

- To ensure that raw materials are readily available for production and products are readily available for delivery to consumers.
- To sustain the lowest raw materials and finished product levels in store.
- To organize manufacturing, delivery schedules, and purchasing activities.

22. How to develop capacity alternatives?

Once a company has identified its capacity requirements for the future, the next step is to develop alternative ways to modify its capacity. One alternative is to do nothing and reevaluate the situation in the future. With this alternative, the company would not be able to meet any demands that exceed current capacity levels. Choosing this alternative and the time to reevaluate the company's needs is a strategic decision.

23. What is capacity requirement planning?

Capacity requirements planning (CRP) is the process of discerning a firm's production capacity and whether it can meet its production goals. Conducting a CRP analysis is a critical management tool, as it helps a company to know if it can meet the demand for its product.

24. What are the characteristics of a good coding system?

- Code should be Simple.
- Code should be unique.
- Coding should be compact, concise and consistent.
- Code should be sufficiently flexible to meet future demands

25. What is mean by Material Control?

Material Control is a management function that is concerned with the storage, handling, and use of materials to minimize waste and improve inventory accuracy. This process can be beneficial for companies to reduce costs and improve organization and productivity.

UNIT-III

2 MARKS:

1. What are probabilistic inventory models used by organizations?

Probabilistic inventory models consisting of probabilistic supply and demand are more suitable in most circumstances. Two methods are used based on the frequency of order placement for procuring inventory stock, these are single period and multi-period inventory systems. Method based on the assumption that the average demand for inventory items is reasonably constant over time. It is possible to describe the probability distribution of the demand, especially during replenishment lead time.

2. Differentiate EOQ and EBQ.

Economic Order Quantity (EOQ)	Economic Batch Quantity (EBQ)
Economic Order Quantity (EOQ) is used to calculate the optimum size when goods, parts and finished goods have to be delivered to an external supplier or outsourced when an order is placed.	Economic Batch Quantity (EBQ) is used to find out the batch size for a production run when manufacturing is internal.
In the EOQ model, it is assumed that the orders are received all at once.	EBQ is basically a refinement of the economic order quantity (EOQ) model to take into account circumstances in which the goods are produced in batches.
Economic Order Quantity (EOQ), also known as Financial Purchase Quantity or Economic Buying Quantity (EPQ), is the order quantity that minimizes the total holding costs and ordering costs in inventory management.	The goal of calculating EBQ is that the product is produced in the required quantity and required quality at the lowest cost.

3. Define Retail Discounting Model.

This involves offering a deep discount on one product line to encourage customers to pay full price for other products the brand sells. This retail discounting strategy can make sense if the brand can be sure it will make up for the initial loss in future sales.

4. What is inventory management?

Inventory management refers to the process of storing, ordering, and selling of goods and services. The discipline also involves the management of various supplies and processes. One of the most critical aspects of inventory management is managing the flow of raw materials from their procurement to finished products

5. What is carrying cost?

Carrying costs, also known as holding costs and inventory carrying costs, are the costs a business pays for holding inventory in stock. A business can incur a variety of carrying costs, including taxes, insurance, employee costs, depreciation, the cost of keeping items in storage, the cost of replacing perishable items, and opportunity costs.

6. What is EOQ?

Economic order quantity (EOQ) is the ideal quantity of units a company should purchase to meet demand while minimizing inventory costs such as holding costs, shortage costs, and order costs. This model comprises of selecting specific order quantity “Q” which helps in reducing average time and cost consumed on inventory management.

7. What is variable cost?

Variable costs are any expenses that change based on how much a company produces and sells. This means that variable costs increase as production rises and decrease as production falls. Some of the most common types of variable costs include labor, utility expenses, commissions, and raw materials.

8. Define stock out cost.

Stockout costs are both direct and indirect expenses incurred by a business when it runs out of stock. Left unaddressed, these costs can have a significant impact on a company's margins, revenue, and profitability. Direct stockout costs are expenses that are related to the loss of sales due to stockout.

9. Define setup cost.

Setup cost is the cost incurred to get equipment ready to process a different batch of goods. Hence, setup cost is regarded as a batch-level cost in activity-based costing. Setup cost is considered to be a non-value-added cost that should be minimized.

10. What is the variable of EBQ model?

In inventory management, **Economic Batch Quantity (EBQ)**, also known as Optimum Batch Quantity (OBQ) is a measure used to determine the quantity of units that can be produced at the minimum average costs in a given batch or product run.

Thus, variables Q , R , S , C , I can be defined, which stand for economic batch quantity, annual requirements, preparation and set-up cost each time a new batch is started, constant cost per piece (material, direct labor and overheads), inventory carrying charge rate per year, respectively.

11. Enumerate any two problems found in inventory management.

- Lack of visibility is one of the most common inventory management problems. Locating the correct item in the right place as quickly as possible is essential to inventory.
- If the hard-to-find inventory is part of the supply chain for manufacturing, it can impact the operations of the entire manufacturing process. If the inventory stock is being accessed for shipping and cannot be located, it leads to incomplete or wrong shipments and severely impacts customer satisfaction.

12. What is EBQ?

In inventory management, Economic Batch Quantity (EBQ), also known as Optimum Batch Quantity (OBQ) is a measure used to determine the quantity of units that can be

produced at the minimum average costs in a given batch or product run. EBQ is basically a refinement of the economic order quantity (EOQ) model to take into account circumstances in which the goods are produced in batches.

13. Define Inventory policy decisions.

An inventory management policy is a standard set of guidelines with boundaries that provides the framework for an organization to make informed make or buy inventory investment decisions. An Inventory management policy relies on an understanding of your supply chain's capability to support customer demand.

14. What is newsvendor model?

The newsvendor model is a mathematical approach in operations management to determine optimal inventory levels. The name is based on a newsboy trying to decide how many copies of newspaper will contemplate the demand of the day. The assumptions for this problem usually include fixed prices and uncertain demands for perishable products with limited availability.

15. What is mean by quantity discount models?

It is also called price-break model. It is one variation of the classic EOQ Model. In probabilistic inventory models one or more quantities can be represented by a random variable with a probability distribution. The quantity discount model is a pricing strategy in which companies offer lower prices to customers that purchase large quantities of a product. Quantity discounts are meant to entice customers to buy more products, often leading to increased overall revenue and production cost savings for companies.

16. Define probabilistic inventory models.

The probabilistic inventory model incorporates demand variation and lead time uncertainty based on three possibilities. The first is when lead time demand is constant but the lead time itself varies and the second is when lead time is constant but demand fluctuates during lead time.

17. List the forms of inventory.

Companies should pay equal attention to all five inventory types:

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

18. Define ordering cost.

Ordering costs are the expenses your company incurs to purchase and receive the products it stocks in its inventory. These ordering costs can include shipping fees, unexpected transportation costs, inspection fees and other expenses necessary to acquire inventory products.

19. Define shortage cost.

Shortage costs are those costs incurred by an organization when it has no inventory in stock. These costs include the loss of business from customers who go elsewhere to make purchases, the loss of the margin on sales that were not completed, and overnight shipping costs to acquire goods that are not in stock.

20. List the basic inventory models.

- Economic Order Quantity (EOQ)

- Inventory Production Quantity
- ABC Analysis
- Fixed Reorder Quantity System
- Fixed Reorder Period System
- Fast, slow, and non-moving (FSN)

21. List the objectives of inventory management.

- Company's strategic goals
- Sales forecasting or demand management
- Sales and operations planning
- Production planning and MRP

22. What is ABC analysis?

ABC Analysis classifies inventory items into three categories based on their value and importance to the business: A (high-value items), B (medium-value items), and C (low-value items). The A items — typically the most expensive and most important — should be managed with extra care and attention.

23. What is their role in inventory control?

- Inventory control, also called stock control, is the process of ensuring the right amount of supply is available in an organization.
- With the appropriate internal and production controls, the practice ensures the company can meet customer demand and delivers financial elasticity.

24. Define safety stock.

Safety stock is an additional quantity of an item held in the inventory to reduce the risk that the item will be out of stock. It acts as a buffer stock in case sales are greater than planned and/or the supplier is unable to deliver the additional units at the expected time.

25. How is the reorder point determined? Illustrate with an example

Reorder point is calculated by adding your safety stock level to the amount of inventory you anticipate selling during the time it takes to receive an order after placing it. A simple reorder point calculation is daily unit sales multiplied by lead time between inventory order and its arrival in days, plus safety stock.

A simple reorder point calculation is daily unit sales multiplied by lead time between inventory order and its arrival in days, plus safety stock. So, if a business sells 30 printers a day and its supplier take 10 days to deliver an order, and it wants safety stock of at least 25 printers, then the reorder point is $30 \times 10 + 25 = 325$ printers. This means the business must reorder printers when it has 325 left in stock, or it will risk dipping below its safety-stock level before the new printers arrive.

UNIT-IV

2 MARKS:

- 1. What is price forecasting? Explain with an example.**

Price forecasting is predicting a commodity/product/service price by evaluating various factors like its characteristics, demand, seasonal trends, other commodities' prices (i.e., fuel), offers from numerous suppliers, etc.

Price forecasting may be a feature of consumer-facing travel apps, such as Trainline or Hopper, used to increase customer loyalty and engagement. At the same time, other businesses may also use information about future prices.

2. What is buying forecasting?

Forecasting in procurement is the process of predicting future demand for goods or services. It helps organizations make better decisions about purchasing, inventory, and production. Forecasting can be performed using various methods, including historical data analysis, statistical modeling, and market research.

3. What do you mean by international Purchasing?

International purchasing is an aspect of international trade. It is the process of allowing firms, buyers to obtain goods and services from another country for the running and maintaining their operational activities under the most favorable conditions. With the current surge for economic globalization, international buying activities are becoming more pronounced.

4. What is forward buying?

Buying forward is when a commodity is purchased at a price negotiated today for delivery or use at a future date. Buying forward commonly applies to currencies and commodities, but can also be done for almost any security using a forward contract. Forward buying is the purchase of any raw materials, supplies, components, or other items in advance of current requirements.

5. What is mixed buying strategy?

The opposite of buying forward is selling forward. If an investor believes that the price of a security or the demand of a currency is going to drop, selling forward can help the investor mitigate loss because he or she is selling now, while the price is still high as opposed to selling at a loss when prices drop.

6. Why are clear specifications critical to good purchasing?

A specification details the requirements of the procurement. It is the basis of all offers and therefore the foundation for a contract. A specification becomes an essential contract management document which is used to ensure that the chosen supplier provides what is specified. It must therefore be clear and accurately define what is expected from a supplier regarding the outputs or the functional and performance requirements.

7. What are causes of uncertainty while purchasing materials for the organization?

Some of these factors may significantly increase the uncertainty in a supply chain network, but other frequent parameters of uncertainty are product demand, raw material prices, costs (energy, labor, production and transportation costs) and lead times.

8. Define forecasting.

Forecasting is a technique that uses historical data as inputs to make informed estimates that are predictive in determining the direction of future trends. Businesses utilize forecasting to determine how to allocate their budgets or plan for anticipated expenses for an upcoming period of time.

9. What is purchase management?

Purchase management is managing the purchase of the goods and services that the company requires from suppliers and vendors. It is often an integral part of the company's operations and is an opportunity to improve the efficiency and profitability of the company.

10. What is vendor rating?

Vendor rating is a process having strategic implications for managing a supply chain. Vendor rating can be done using analytic hierarchy process either by a single decision maker or by a group of decision makers. This approach may suffer from some drawbacks including bias in estimation process.

11. List out the factors affecting supplier selection

- Good suppliers should have high organizational power and advanced coordination skills.
- The ability of the supplier to follow the predefined delivery schedule is always the prime criteria for selection in this fast-moving world.
- This means that suppliers who keep their promises are easier and profitable to work with.

12. List the purchasing policies.

- Procurement policies should provide guidelines for the entire lifecycle of activities employees will undertake when they acquire goods and services, including: Planning and sourcing.
- Solicitation management, including competitive and noncompetitive bidding. Vendor evaluation and selection.

13. List the seven steps in purchasing cycle.

- Step 1 – Identify Goods or Services Needed
- Step 2 – Consider a List of Suppliers
- Step 3 – Negotiate Contract Terms with Selected Supplier
- Step 4 – Finalize the Purchase Order
- Step 5 – Receive Invoice and Process Payment
- Step 6 – Delivery and Audit of the Order
- Step 7 – Maintain Accurate Record of Invoices

14. What factors influence the demand for firm's products?

- Price of the Product.
- The Consumer's Income.
- The Price of Related Goods.
- The Tastes and Preferences of Consumers.
- The Consumer's Expectations.
- The Number of Consumers in the Market.

15. Define average inventory level.

Average inventory is the average amount or value of your inventory over two or more accounting periods. It is the mean value of inventory over a given amount of time. That value may or may not equal the median value derived from the same data. Average inventory is a calculation that estimates the value or number of a particular good or set of goods during two or more specified time periods.

16. Mention the elements of good purchasing system.

- Vendor information
- Purchase order number
- Date and delivery details
- Item descriptions, quantities, and prices
- Terms and conditions
- Streamlined procurement process
- Improved communication with vendors
- Accurate financial tracking

17. Define Centralized purchase.

Centralized purchasing or procurement is a system in which one department manages the purchasing of goods and services for the entire organization. The purchasing department is usually located in the organization's headquarters, where it handles the purchasing for all the branches of the firm.

18. What is demand management?

Demand management is a planning methodology used to forecast, plan for and manage the demand for products and services. This can be at macro-levels as in economics and at micro-levels within individual organizations. For example, at macro-levels, a government may influence interest rates to regulate financial demand.

19. List the functions of purchase department.

- Sourcing
- Negotiation
- Contracting
- Monitoring of suppliers' performance
- Compliance with business protocols
- Leveraging technology to help in procurement functions
- Collaboration with Other Departments
- Forecasting the Procurement Trends
- Effective Monitoring of the Procurement Team
- Competitor Analysis

20. What is Multiple Sourcing?

Multiple sourcing is a procurement strategy in which companies seek to obtain goods or services from more than one supplier. There are a number of reasons why companies might choose to use multiple suppliers, including reducing costs, improving quality, and diversifying product offerings.

21. What is seasonal buying?

Seasonal Purchasing occurs when Buyers and Vendors determine the order quantities based on a purchase per season. This method is typical for seasonal product, such as swimwear, where the selling season is too short to re-order product.

22. What is supply seasonality?

Seasonality (Supply Chain) In supply chain, the demand - or the sales - of a given product is said to exhibit seasonality when the underlying time-series undergoes a predictable cyclic variation depending on the time within the year.

23. What is Blanket Order?

A blanket order, blanket purchase agreement or call-off order is a purchase order which a customer places with its supplier to allow multiple delivery dates over a period of time, often negotiated to take advantage of predetermined pricing. It is normally used when there is a recurring need for expendable goods.

24. Differentiate between solo and single sourcing.

In single sourcing, businesses have the option to choose from multiple suppliers while in sole sourcing there is one monopolistic supplier. It is the decision of businesses and their procurement teams to pick the appropriate sourcing strategy based on their needs and circumstances.

25. Define JIT.

Just-in-time, or JIT is a form of inventory management that requires working closely with suppliers so that raw materials arrive as production is scheduled to begin, but no sooner. The goal is to have the minimum amount of inventory on hand to meet demand. JIT processes focus on producing exactly the amount you need at exactly the time your customers need it.

UNIT-V

2 MARKS:

1. How does a firm identify obsolete materials?

Monitoring Product Life Cycle. Another effective way to identify obsolete inventory is to monitor the product life cycle. The product life cycle describes the stages that a product goes through from introduction to decline, and businesses can use this model to identify when a product is approaching obsolescence.

2. Distinguish between store and warehouse.

A Warehouse is something that deals with finished goods. These are distribution channels located in various cities to help improve the delivery of goods and products to end users. A Store is a space inside the company that has storage of both raw materials that are needed to be processed and the finished goods as well.

3. What is operational efficiency?

Operational efficiency is the relationship between an organization's output and input, that when healthy, helps businesses cut down on unnecessary costs while increasing revenue. It's what businesses strive to do: produce a high-quality product at scale with as few resources as possible.

4. Define performance measurement.

Performance measurement is generally defined as regular measurement of outcomes and results, which generates reliable data on the effectiveness and efficiency of programs.

Input. Resources (human resources, employee time, funding) used to conduct activities and provide services.

5. Define store management.

Store management is the activity of running and monitoring all operations in a store. Its main responsibilities include working with employees, creating work schedules, communicating with suppliers, and dealing with customer complaints.

6. What is productivity?

Productivity is a measure of how efficiently a person completes a task. We can define it as the rate at which a company or country produces goods and services (output), usually judged based on the amounts of inputs (labor, capital, energy, or other resources) used to deliver those goods and services.

7. List any two performance measurements.

- 1- Profitability indicator.
- 2- Productivity Indicator.
- 3 – Employee turnover indicator.
- 4- Customer lead conversion indicator.

8. What are material receipts?

Material receipts refer to data, such as quantities and lot numbers, associated with items that are used for work done on-site by your employees. When you receive inventory items against a purchase order, the quantities are updated in inventory and an inventory transaction is generated.

9. Define Order Processing.

Order processing is the process or work-flow associated with the picking, packing, and delivery of the packed items to a shipping carrier and is a key element of order fulfillment. Order processing operations or facilities are commonly called “distribution centers” or “DC 's”.

10. What are the advantages of centralized stores?

- A better supervision of store is possible because the store is located under a single supervision.
- A better layout of store and its control are possible.
- Less space is occupied.
- Investment in stock is minimized.
- It is economical for storing materials.
- Safety of materials is possible according to the nature of materials.
- Trained and specialized persons can be appointed.
- Wastage of materials can be minimized.

11. Distinguish between LIFO and FIFO.

FIFO	LIFO
It stands for First-In-First-Out approach in programming.	It stands for Last-In-First-Out approach in programming.

FIFO	LIFO
<p>In this, the new element is inserted below the existing element, so that the oldest element can be at the top and taken out first.</p>	<p>In this, the new element is inserted above the existing element, so that the newest element can be at the top and taken out first.</p>
<p>Therefore, the first element to be entered in this approach, gets out First.</p>	<p>Therefore, the first element to be entered in this approach, gets out Last.</p>
<p>In computing, FIFO approach is used as an operating system algorithm, which gives every process CPU time in the order they arrive.</p>	<p>In computing, LIFO approach is used as a queuing theory that refers to the way items are stored in types of data structures.</p>

12. Define surplus and scrap.

Surplus – This materials / equipment does not have immediate use, but have been amassed due to faulty planning and purchasing. But they do have a usage value in the future. Scrap – This refers to the process wastage, such as borings, turnings, flashes and borings, which have an end use and hold commercial values.

13. Define stock verification.

Stock Verification is a process of confirming the accuracy and integrity of inventory records stored in an organization's database. This involves physically verifying or counting stock items to compare their actual count with the recorded count in the database.

14. Define material handling.

Material handling is the movement, protection, storage and control of materials and products throughout manufacturing, warehousing, distribution, consumption and disposal. Material Handling refers to activities, equipment, and procedures related to the moving, storing, protecting and controlling of materials in a system.

15. What is warehouse management?

Warehouse Management System aims to simplify day-to-day warehousing operations, improve inventory accuracy and provide real-time visibility into warehousing activities. ERP (enterprise resource planning software) is a suite of business management solutions with multiple modules to manage every area of the organization.

16. What is material requisition?

A material requisition, also known as a materials requisition form, or a material request, is a document used by the production department to request materials they need to complete a manufacturing process. A requisition order is a document used to request the purchasing of goods or services on behalf of a firm, submitted by an authorized employee or department, and approved by the financial department.

17. What is value analysis?

Value analysis is a set of techniques, knowledge, and skills used to improve the value of a product by eliminating unnecessary costs or improving its functions without compromising its quality, reliability, and performance. It involves understanding the components of a product and related costs.

18. List the functions of warehousing.

- Storage.
- Movement of goods.
- Safeguarding goods
- Quality inspections
- Stock counts
- Documentation
- Pest control
- Financing.

19. Define ranking method

After determining which factors are critical, a method is devised that allows the vendor to be judged or rated on each individual factor. It could be numeric rating or a Likert-scale ranking. The individual ratings can then be weighted according to importance, and pooled to arrive at an overall vendor rating.

20. What is the basic purpose of stores accounting?

Stores accounting is the process of recording details of stock movements and balance in value. It is sometimes undertaken by the finance department, but there is much to be said for it being handled by the store functionaries. These records are maintained to provide personal accountability for the receipt and custody of materials and to document the monetary worth of such materials.

21. List the reasons for measuring performance.

- Performance measurement enhances management decision making.
- It allows control of the inputs, outputs and outcomes of performance.
- Data generated by performance measurement can be used to determine program efficiency and effectiveness and to make decisions about what services to continue, start and stop.

22. What is traffic management?

Traffic Management refers to the combination of measures that serve to preserve traffic capacity and improve the security, safety and reliability of the overall road transport system. These measures make use of ITS systems, services and projects in day-to-day operations that impact on road network performance.

23. List the factors influencing the efficiency of material handling.

- A focus on materials, processes, facility, costs, and suppliers, is crucial to increase your chances of success in procuring the best material handling equipment.

- Equipment that best fits your needs maximizes operational efficiency, process output, and employee productivity and safety.
- Type of building (single or multi-stored)
- Cost of materials handling (alternative, usual life, operating costs)

24. What is material handling ratio?

Material Handling-Labor Ratio, the ratio should be less than 1, and a reasonable value would be less than 0.30 in a plant, while in a warehouse a higher value should be accepted. The Material Handling Equation is Material + Move = Method: consider the characteristics of the material, along with the characteristics of the move, in order to choose a method for moving the material.

25. Write the types of warehousing.

- Public Warehouses.
- Private Warehouses
- Distribution Centers
- Climate-controlled Warehouses
- Bonded Warehouses
- Smart Warehouses
- Centralized and Flexible Operations for More Efficient Warehouses.

UNIT-I

13 MARKS:

1. Explain the factors govern the operating environment. Describe the factors affecting aggregate planning

Operating Environment Factors

There are two types of primary factors that we will be looking into, internal and external factors. These factors define the business environment in its most understandable manner.

External Environment Factors

A business is a socio-economic entity. Thus, the various aspects of society play a crucial role in every business's success or failure and in creating its environment. The common term given towards **external business environment** factors is PESTLE. This abbreviation stands for political, economic, social, technological, legal, and environmental factors.

Political Factors

From the political climate of the business' geography to the international relations it holds, every aspect of politics affects a business. Many countries have laws that facilitate some businesses, others have laws that restrict businesses. The condition of local politics and its relation to other countries highly affect the business condition.

Economic Factors

The current economic condition in most countries is highly volatile. And this is relevant to every business large and small. However, the presence of the open market has been highly

beneficial towards businesses as well. Since the global economy is volatile most big business has to be careful of its impact at all times.

Socio-cultural Factors

Every society has its unique requirements and choices. These shape regional business personas and are one of the primary external factors for all businesses worldwide. For example, let's see the current trend towards a western lifestyle throughout the world. This has led to a rise in demand for western food and fashion.

Technological Factors

Technology is one of the primary drivers in today's world. Businesses that are unable to match up to the current technological progress are having a hard time establishing their existence. And the businesses that are using tech to their advantage are moving ahead of their competitors. IT itself has become a leading business in the past few decades.

Legal Factors

There are laws for businesses in every country in the world and every business has to abide by these laws. So, regulations are a primary factor that every business needs to consider in its external environment. But there are also regulations that help businesses thrive.

Environmental Factors

The world is currently facing an environmental crisis. As a result, all businesses are expected to adhere to a process that harms the environment in the least way possible. Also, certain environmental conditions in areas affect businesses. For instance, a cold season might bring down the agricultural business, but it will boost tourism.

Internal Environment Factors

The forces present within a business organization define its characteristics. These include the work culture, the level of machinery used, the management process, etc. Here are some of the primary internal factors that affect the business environment.

Value Framework

This is basically the business' functional process and how the value in a business is judged. The value framework of a business defines the manner in which its employees will perform their roles. And, how their work culture will be regulated.

Business Path

Every company has a reason to exist and a purpose to serve. These two factors along with how the business sees itself in the future constitute the business path. These define the changes that will be enforced into the business framework.

Structure

The hierarchical or non-hierarchical structure of a business that defines each employee's and management's role is one of the central aspects of the internal business environment. There are various business structures such as matrix, bureaucratic, functional, etc.

Organizational Culture

Although undefinable in exact terms, every business has a unique culture that it adheres to. This includes the treatment of employees, resources, clients, etc.

Human Resources

HR is a rather new concept that has flooded the world of business. With the size of businesses growing every day, the management of employees at a micro-level is performed by human resources. Thus, it plays an important role in defining the business environment.

Physical Resources

Every business runs on resources, and how it manages these resources is highly impactful towards its internal environment.

Technology

The modern tech landscape continuously defines a business environment both from the outside and from the inside. From the inside it depends on the tech being used by business and from the outside, it depends on the tech being used by its competitors.

Factors Affecting Aggregate Planning

Aggregate planning is an operational activity critical to the organization as it looks to balance long-term strategic planning with short term production success.

Following factors are critical before an aggregate planning process can actually start;

- A complete information is required about available production facility and raw materials.
 - A solid demand forecast covering the medium-range period
 - Financial planning surrounding the production cost which includes raw material, labor, inventory planning, etc.
 - Organization policy around labor management, quality management, etc. For aggregate planning to be a success, following inputs are required;
 - An aggregate demand forecast for the relevant period
 - Evaluation of all the available means to manage capacity planning like sub-contracting, outsourcing, etc.
 - Existing operational status of workforce (number, skill set, etc.), inventory level and production efficiency
- Aggregate planning will ensure that organization can plan for workforce level, inventory level and production rate in line with its strategic goal and objective.

Aggregate planning as an Operational Tool

Aggregate planning helps achieve balance between operation goal, financial goal and overall strategic objective of the organization. It serves as a platform to manage capacity and demand planning.

In a scenario where demand is not matching the capacity, an organization can try to balance both by pricing, promotion, order management and new demand creation. In scenario where capacity is not matching demand, an organization can try to balance the both by various alternatives such as.

- Laying off/hiring excess/inadequate excess/inadequate workforce until demand decrease/increase.
- Including overtime as part of scheduling there by creating additional capacity.
- Hiring a temporary workforce for a fix period or outsourcing activity to a sub-contractor.

2. Discuss the aggregate planning strategies. Describe the role and need of aggregate planning

Aggregate planning is a method for analyzing, developing and maintaining a manufacturing plan with an emphasis on uninterrupted, consistent production. Aggregate planning is most often focused on targeted sales forecasts, inventory management and production levels in the mid-term (3-to-18-month) future.

3 Types of Aggregate Planning Strategies

Success depends on having the following inputs: an aggregate demand forecast for the period you're planning for, evaluating capacity management (including using subcontractors, outsourcing, etc.), and the existing operational status of your workforce. All this will lead to greater accuracy, and therefore, a greater likelihood of success.

You can achieve this by applying a variety of aggregate planning strategies. There are three main ones that organizations have used:

Level Strategy: The goal of an aggregate planning strategy is to keep the production rate and the workforce level. This requires strong forecasting of demand to know if production levels must be increased or decreased as customer demands grow and shrink. This aggregate production planning strategy will keep your workforce steady but can increase your inventory and backlog.

Chase Strategy: As the name implies, you are chasing market demand. The production matches demand, and excess inventory isn't held over. This is part of a larger lean production strategy, which saves money by waiting until an order is placed. However, productivity and quality can be reduced, and it can negatively impact the morale of your workforce.

Hybrid Strategy: There is a third alternative, which is a hybrid of the previous two strategies. This keeps the balance between the production rate, workforce and inventory levels, while still responding to demand as it changes. This alternative offers a bit of flexibility that can satisfy demand while working to keep production costs low.

Need of aggregate planning

Aggregate planning is a proven technique that brings an element of foresight and stability into manufacturing. It helps the management to achieve the long-term objectives of a company. The importance of aggregate planning include-

- Creates a satisfied and happy workforce
- Reduce changes in the levels of the workforce
- Helps to determine resources for the short-term
- Helps in maximum utilization of space
- Meets the overall goals and objectives of a company
- Helps to adjust capacity to meet demand
- Minimizes costs associated with inventory stocking
- Reduce investments related to various inventories
- Matching demand with supply and minimizing the waiting time for the customers to maximize customer service
- Offers better customer value
- Proper utilization of production facilities
- Maximum usage of various types of equipment
- Reducing the changes in production rates
- Removes variable cost and improves the bottom line of the financial statement for achieving the business goals of an organization

Roles of Aggregate Planning

Aggregate planning aims to reduce operating costs by matching production demand with production capacity. The ideal outcome of aggregate planning is to maximize a facility's productivity while minimizing the manufacturer's costs.

The strategic objectives of aggregate planning include the following, with the primary goals of minimizing costs and maximizing profits:

- **Minimize inventory investment** – Through material resource planning, aggregate planning software optimally balances efforts to minimize the cost of inventory management and storage with efforts to ensure sufficient inventory to meet both independent and dependent demands.
- **Reduce workforce demand and fluctuation** – Aggregate planning software uses data from demand forecasts and material resource planning to calculate an optimal workforce

plan, balancing the cost of onboarding/layoffs due to workforce fluctuation with the cost of worker idle time and/or overtime.

- **Maximize production rates while minimizing fluctuation** – Aggregate planning software compares production capacity to demand forecasts in order to maximize overall production rates while avoiding idle capacity periods.
- **Increase facility and production equipment utilization** – Aggregate planning software takes into account available production equipment and facilities and aims for maximum utilization over the aggregate planning period.

3. Describe the Manufacturing Planning and Control system activities

A manufacturing planning and control system is a crucial element in optimizing production processes and ensuring efficient operations. It involves the coordination and management of resources, schedules, and activities to meet customer demand while minimizing costs and maximizing productivity. In this blog, we will explore the importance of a manufacturing planning and control system, its key components, and strategies for effective implementation.

The Importance of a Manufacturing Planning and Control System

A manufacturing planning and control system is vital for the following reasons:

1. Efficient Resource Management

A well-designed manufacturing planning and control system allows for optimal management of resources, such as labor, materials, and equipment. By analyzing demand forecasts and capacity, it helps determine the required resources at each stage of the production process, reducing waste and maximizing efficiency.

2. Meeting Customer Demand

Effective manufacturing planning and control ensure that customer demand is met on time. By aligning production schedules with sales forecasts and customer orders, it helps prevent stockouts or overstock situations. Meeting customer demand promptly enhances customer satisfaction and strengthens business relationships.

3. Cost Optimization

A manufacturing planning and control system enables cost optimization through effective inventory management, resource allocation, and process efficiency. By minimizing excess inventory, reducing production downtime, and streamlining workflows, it reduces costs and improves profitability.

4. Enhanced Production Efficiency

Efficient manufacturing planning and control systems streamline workflows, minimize bottlenecks, and optimize production sequences. By identifying and eliminating process inefficiencies, it improves overall production efficiency, reduces cycle times, and increases output and productivity.

Strategies for Implementing an Effective Manufacturing Planning and Control System

Implement the following strategies to ensure the effectiveness of your manufacturing planning and control system:

1. Integration and Collaboration

Integrate manufacturing planning and control processes with other functional areas such as sales, procurement, and finance. Foster collaboration and information sharing among different departments to ensure alignment and efficient coordination.

2. Real-Time Data and Reporting

Leverage technology and real-time data collection to monitor production processes, track inventory levels, and capture key performance indicators. Implement reporting mechanisms that provide visibility into production performance and enable timely decision-making.

3. Continuous Improvement

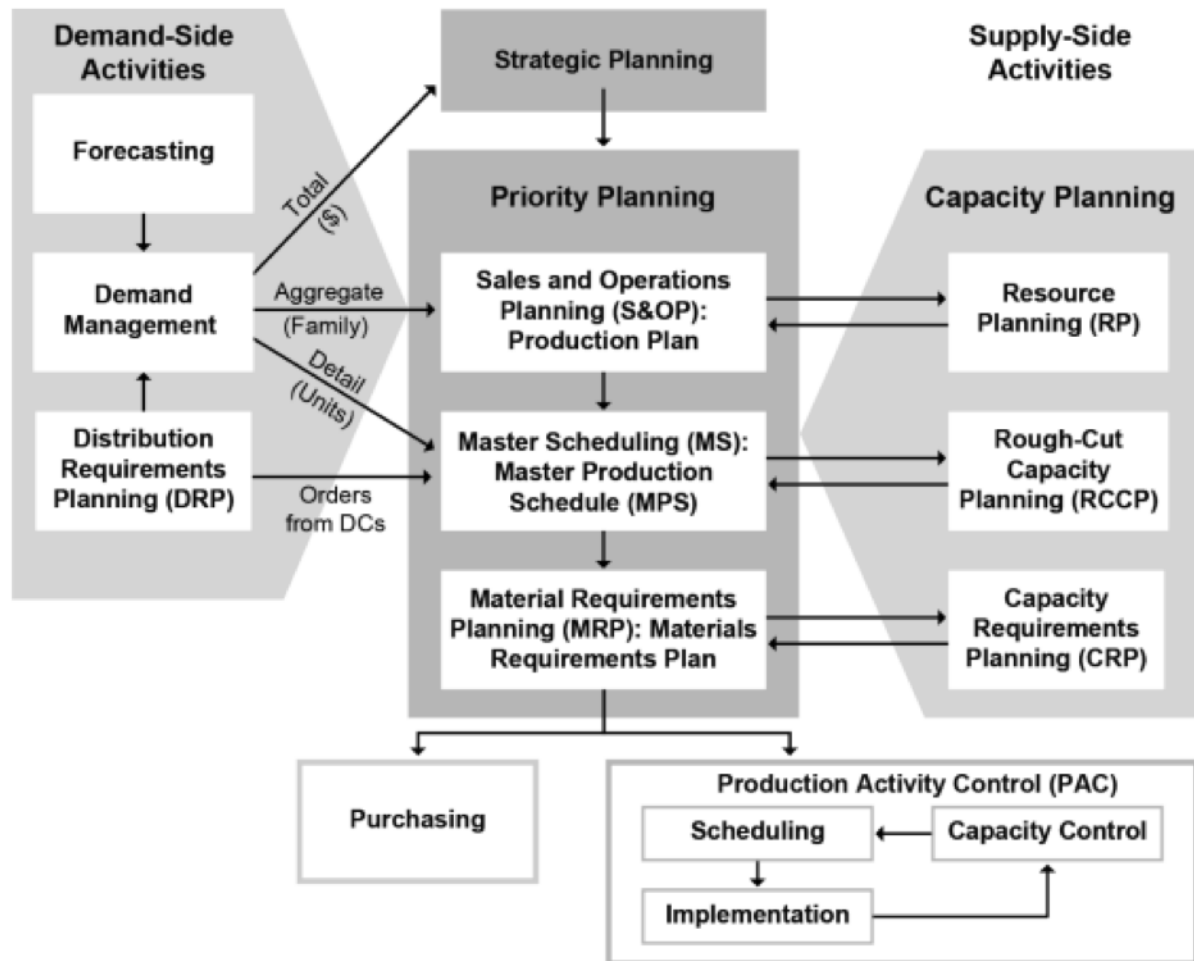
Adopt a culture of continuous improvement by regularly reviewing and analyzing production data, identifying areas for optimization, and implementing changes. Encourage employee involvement and empowerment in suggesting process improvements and problem-solving.

4. Supplier Collaboration

Establish strong relationships with suppliers and collaborate closely with them. Share production forecasts, engage in joint planning efforts, and develop mutually beneficial partnerships. Collaborative supplier relationships contribute to improved supply chain efficiency and reliability.

5. Training and Skill Development

Invest in training programs to enhance the skills and knowledge of employees involved in manufacturing planning and control. Provide them with the tools and resources necessary to effectively utilize the manufacturing planning and control system.



Key Components of a Manufacturing Planning and Control System

A comprehensive manufacturing planning and control system typically includes the following key components:

1. Demand Forecasting

Demand forecasting involves analyzing historical data, market trends, and customer demand patterns to estimate future demand. Accurate demand forecasts serve as the foundation for production planning and control decisions.

2. Master Production Schedule (MPS)

The master production schedule outlines the quantity and timing of each finished product to be manufactured. It takes into account demand forecasts, inventory levels, and production capacity. The MPS serves as a reference for detailed production planning and scheduling.

3. Material Requirements Planning (MRP)

Material requirements planning involves determining the materials and components needed for production based on the master production schedule. MRP considers lead times,

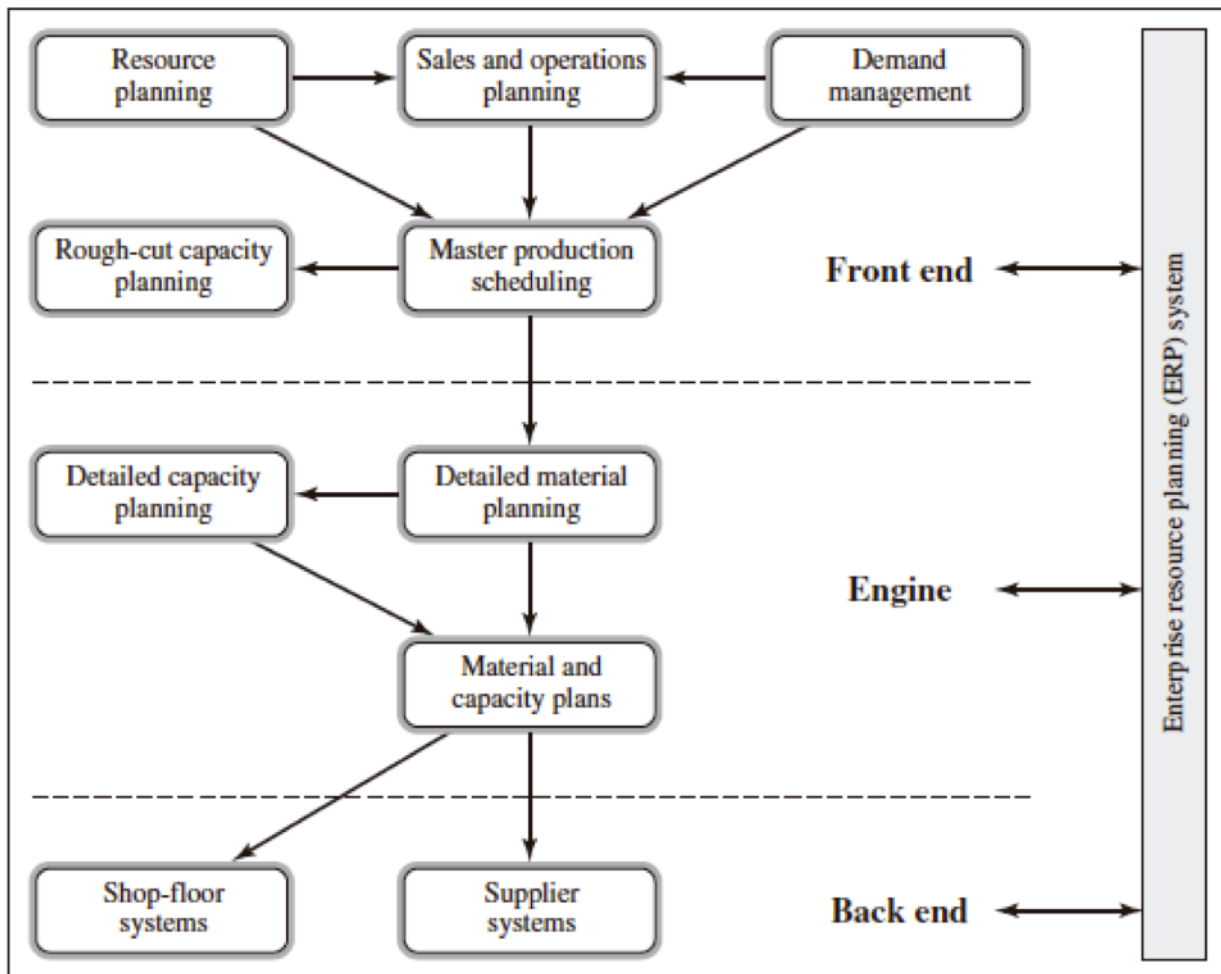
inventory levels, and reorder points to ensure that the right materials are available when needed, minimizing stockouts and excessive inventory.

4. Production Scheduling

Production scheduling involves allocating resources, determining production sequences, and setting timelines for individual production orders. It considers factors such as machine availability, labor capacity, and order priorities. Effective production scheduling optimizes resource utilization and minimizes production bottlenecks.

5. Shop Floor Control

Shop floor control focuses on real-time monitoring and control of production activities on the shop floor. It involves tracking progress, managing work orders, coordinating tasks, and resolving any issues that arise during production.



4. Discuss the MRP I & II process with a help of flow chart.

Material Requirements Planning

Definition: The Material Requirements Planning or MRP is a subset of the Inventory Control System. **It determines the exact quantity of dependent demand items required for production as specified in the Master Production Schedule (MPS).**

Besides, it facilitates: –

- Inventory Tracking
- Production Scheduling
- Manufacturing and Delivery

Objectives

Manufacturers conduct Material Requirements Planning with the following objectives:

1. **Material Availability:** Through MRP, managers ensure the availability of the materials/sub-assembly items.
2. **Time and Delivery:** It helps in identifying the time required to obtain and deliver the materials.
3. **Low Inventory:** It aims to maintain the minimum level of Inventory.
4. **Planning:** MRP's prime objective is planning manufacturing-related activities of the unit.
5. **Scheduling:** Another important aspect of MRP is scheduling. It helps optimize delivery schedules to deliver the right amount of Inventory when needed.
6. **Prioritize:** It helps prioritise the material queue to arrange materials as and when required.

Components

Following are the components of the Material Requirements Planning system:

- Master Production Schedule (MPS)
- Economic Order Quantity (EOQ)
- Items Master File
- Bills of Materials (BOM)
- Inventory on-shelve

Requirements for Material Requirements Planning

The following information must be available before initiating the MRP process:

1. The **breakdown** of the composition of the **end product**.
2. The **expected lead time** of the materials at different processes.
3. Schedule of **demand and delivery** of the end-products.
4. Information about the **current in-hand stock** of the items.

Process

Now, let's understand the generalized step-by-step process of conducting MRP.



Step 1: Estimation of Net Requirements to meet demand

The process begins with identifying the number of units required to meet the demand. Thereby disintegrating the end product into multiple individual items. In addition, acquire the list of required materials from the BOM. And converting the gross requirements specified in MPS into net requirements.

Step 2: Evaluate existing Inventory against demand

After assessing the net requirement check, the existing Inventory against the demand received. For this purpose, you can use the following formula:

Total number of units needed – Available stock

After that, allocate necessary raw materials to the items as per the requirement.

Step 3: Scheduling Production

The next step is to schedule the production to produce the required quantity. It includes the allotment of the number of workers needed to carry out production. Also, it determines the time and date for the delivery of the demanded products.

MRP involves two-way scheduling, i.e. Forward or Backward Scheduling.

- **Backwards scheduling:**

It begins with ascertaining the on-shelf date of the product. And the scheduling takes place in the backward direction.

- **Forward Scheduling:**

In this, scheduling is based on the starting date of the manufacturing process.

Step 4: Monitoring and Review

The last step is keeping track of the complete process. In addition, taking necessary corrective measures as and when required.

Inputs and Output for Material Requirements Planning

Inputs

MRP retrieve data from the sources given below. These sources are known as Inputs for MRP. **However, the inputs are the same whether we conduct MRP manually or electronically.**

- Master Production Schedule (MPS)
- Bills of Materials (BOM)
- Inventory Status
- Lead-Time data
- Lot-sizing Rule

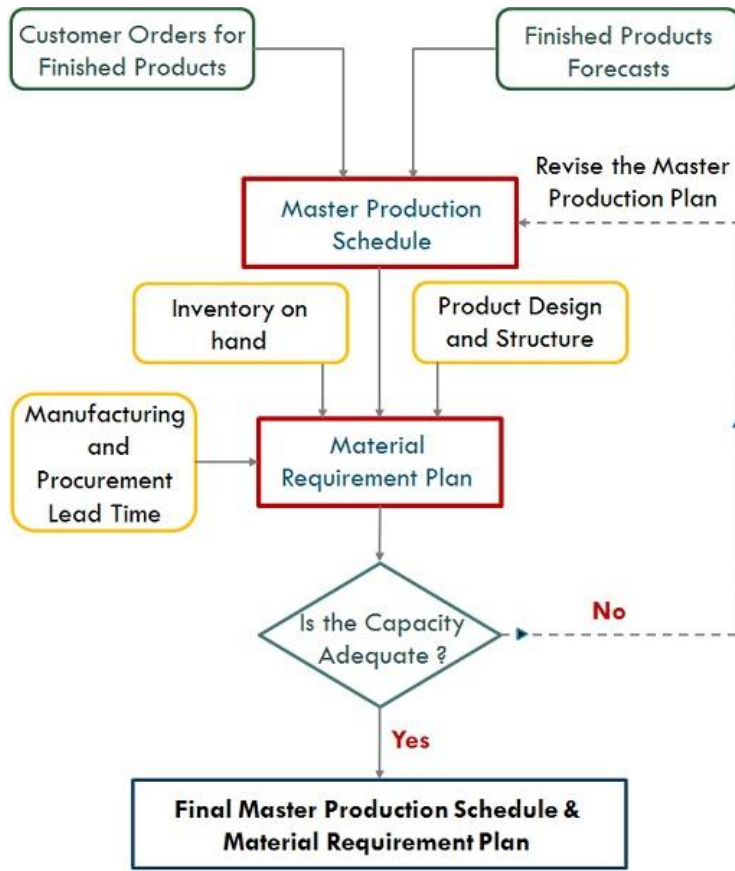
Note: In the case of the software, the files containing the above information must be uploaded as Inputs.

Outputs

After processing the above inputs, MRP generates the following outputs:

1. Work Order
2. Procurement Notice
3. Performance Reports
 - About Costs
 - Material Usage
 - Lead-time Analysis
4. Inventory Level and Forecasts
5. Deviation from the Original Schedule

Material Requirement Planning Flow Chart



Importance

MRP is one of the essential techniques of Production & Operations Management. As it deals with the availability and on-time delivery of the right materials.

Besides, it benefits the manufacturing units in the following ways:

- It helps in **minimizing** the associated **costs**.
- Estimates and **track the net material requirements** in specific intervals.
- Facilitates the ascertainment of the **EOQ and lot sizes**.
- It is one of the key determinants of **future capacity requirements**.
- An active player in **Inventory and Materials Management**.
- Helps in accomplishing the **delivery commitments** previously made.
- Provides insights about the purchase and procurement of the materials.

Challenges

There are certain challenges or limitations that manufacturer faces when applying MRP. Some of these limitations are furnished below:

1. The accuracy of results highly depends on the **reliability of the inputs**.
2. It **requires expertise** to operate the MRP software.

3. It is **less flexible** in nature. As it does not consider any uncertain capacity changes.
4. The information about Lead time is provided manually, which can be inaccurate. In addition, the MRP software keeps it constant for all the materials.
5. Processing time is considerably high as it deals with the **massive volume of data**.
6. Based on the assumption that other processes are working as expected.
7. The systems linked with MRP may not respond quickly.
8. It excludes the capacity requirements, which are of concern during production.
9. The software is **complex and costly**.

MRP II

MRP II is an abbreviation for Manufacturing Resource Planning II. **We can call it an extension of Material Requirements Planning.** The reason is that it has overcome the challenges faced by MRP.

In contrast to MRP, it also considers the facility's capacity during resource planning.

Lot Sizing in MRP

Lot Size or Order Size is the total number of units produced in one go. It helps **minimize the set-up and holding costs** while ascertaining net requirements. The lot-sizing method can either be based on Period or Quantity. Some methods for its determination are listed below:

- Economic Order Quantity (EOQ)
- Minimum Cost per Period (MCP)
- Period Order Quantity (POQ)
- Least Unit Cost (LUC)

Besides, there are specific rules for Lot-sizing as well:

- Fixed Period Requirements
- Lot for Lot
- Fixed Order Quantity
- Economic Lot Sizing
- Part Period Balancing

5. Describe the benefits of implementing MRP-II. Explain the evolution of ERP.

Manufacturing Resource Planning

Manufacturing resource planning, also known as MRP II, is a method for the effective planning of a manufacturer's resources. MRP II is composed of several linked functions, such as business planning, sales and operations planning, capacity requirements planning, and all related support systems. The output from these MRP II functions can be integrated into financial reports, such as the business plan, purchase commitment report, shipping budget, and inventory projections. It has the capability of specifically addressing operational planning and financial planning, and has simulation capability that allows its users to conduct sensitivity analyses (answering "what if" questions). The earliest form of manufacturing resource planning was known as material requirements planning (MRP). This system was vastly improved upon until it no longer resembled the original version. The newer version was so fundamentally different from MRP, that a new term seemed appropriate. Oliver Wight coined the acronym MRP II for manufacturing resource planning. In order to best understand MRP II, one must have a basic understanding of MRP, so we will begin with a look at MRP and then expand into MRP II.

Benefits of MRP II

- MRP II helps to standardize business processes by offering automated methods for many areas of the business. Standardization leads to easily repeated processes and a platform for improving those processes.
 - An increase in direct labor productivity in all areas of the company.
 - The efficiency will increase in the interaction between the various functions because of the common data bases and improved version of the information flow in the organization.
 - The implementation of the different engineering changes at different levels will be swift and effective than before.
 - With manufacturing resource planning the company can shift their focus from the crisis management to process control due to the ease of process provided by the system.
 - More accurate inventory records in the systems.
 - A company that implements MRP II for the first time is due to facing a problem in controlling the increase in selling transactions, manufacturing and purchasing associated with growth. The improvement in the way work gets done allows the company to be more competitive.
 - From the manufacturing point of view: there is better control of inventories and improved scheduling in the MRP II system than in MRP.
 - From the financial and costing functions: There will be a reduction in the amount of working capital for inventory.
- Limitations of MRP II**
Problem in Implementation. In case of MRP II, there is a problem of

Implementation as system requires information to be accurate. In case low quantity information is applied either in the bill of material module or the inventory segment, this will result in automated planning processes errors.

- The planning modules use the concept of lead times or order lot sizes. So, in case there is differentiation regarding the actual lot sizes produced or bought and the lead times then the planning software won't generate plans that go with what is actually happening which may cause costly reimplementation and implementation failure.

Operational Drawbacks

- MRPII systems are difficult, time consuming, and costly to implement.
- Many businesses encounter resistance from employees when they try to implement MRPII.
- A huge training and education are needed to employees to operate the systems and these tasks leads to increase costs to the company.

Evolution of Enterprise Resource Planning

Enterprise resource planning (ERP) has evolved as a strategic tool, an outcome of over four decades. This is because of continuous improvements done to the then available techniques to manage business more efficiently and also with developments and inventions in information technology field.

1 Pre-Material Requirement Planning (MRP) stage

Prior to 1960s businesses generally relied on traditional ways of managing inventories to ensure smooth functioning of the organizations. These theories are popularly known as 'Classical Inventory Management or Scientific Inventory Control Methods'. Most popularly used among them were Economic Order Quantity (EOQ); Bill of Material (BOM) etc. However, these systems had very limited scope.

ERP system has evolved from the Material Planning System of 1980's. There are various phases through which this evolution process has gone through. The various phases of development of resource planning system in relation to time and evolution of concept of ERP.

Stages of ERP Evolution

Figure 1.1

Stages of ERP Evolution



2. Material Requirement Planning (MRP)

MRP was the fundamental concept of production management and control in the mid-1970s and considered as the first stage in evolution of ERP. Assembly operations involving thousands of parts such as automobile manufacture led to large inventories. The need to bring down the large inventory levels associated with these industries led to the early MRP systems that planned the order releases. Such planned order releases ensured proper time phrasing and accurate planning of the sub-assembly items, taking into account complex sub-assembly to assembly relationships characterized by the Bill of Materials.

3 Manufacturing Resources Planning II (MRP- II)

A natural evolution from the first generation MRP systems was the manufacturing planning systems MRP II that addressed the entire manufacturing function and not just a single task within the manufacturing function. MRP II went beyond computations of the materials requirement to include loading and scheduling. MRP II systems could determine whether a given schedule of production was feasible, not merely from material availability but also from other resource point of view.

Typically, the resources considered from MRP II systems would include production facilities, machine capacities and precedence sequences. The increased functionality enabled MRP II systems provided a way to run the system in a loop. First it was used to check the feasibility of a production schedule taking into

account the constraints; second to adjust the loading of the resources, if possible, to meet the production schedules; third to plan the materials using the traditional MRP II systems. Both MRP system and MRP II systems were fairly successful in industry. Due to the power of information systems-databases, algorithms and their integration, organizations did find real support for efficiently managing the manufacturing function in the eighties.

4 Enterprise Resource Planning (ERP)

The nineties saw unprecedented global competition, customer focus and shortened product life cycles. To respond to these demands corporations had to move towards agile (quick moving) manufacturing of products, continuous improvements of process and business process reengineering. This called for integration of manufacturing with other functional areas including accounting, marketing, finance and human resource development.

Activity-based costing would not be possible without the integration of manufacturing and accounting. Mass customization of manufacturing needed integration of marketing and manufacturing. Flexible manufacturing with people empowerment necessitated integration of manufacturing with the HRD function. In a sense the 1990s truly called integration of all the functions of management. ERP systems are such integrated information systems build to meet the information and decision needs of an enterprise spanning all the functions of management⁴.

5 Extended ERP (E-ERP)

Further developments in the enterprise resource planning system concept have led to evolution of extended ERP (E- ERP) or web - enabled ERP. With globalization on one hand and massive development in the internet technology on the other, need for web based IT solution was felt. Thus E- ERP is development in the field of ERP which involves the technology of Internet and World Wide Web (WWW) to facilitate the functions of an organization around the web.

6 Enterprise Resource Planning II (ERP- II)

ERP II is the advanced step of E-ERP. It is the software package which has strengthened the original ERP package by included capabilities like customer relationship management, knowledge management, workflow management and human resource management. It is a web friendly application and thus addresses the issue of multiple office locations.

7 ERP – A Manufacturing Perspective

ERP systems evolved out of MRP and MRP II systems. MRP systems addressed the single task of materials requirements planning. MRP II extended the scope to the entire manufacturing function. The manufacturing industry traditionally had a better climate to use computers. First of all the manufacturing community being

dominated by engineers had no computer phobia. Second the extensive use of Computer Aided Drafting (CAD), Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) had prepared the manufacturing function to use computers well, in fact exceptionally well. In fact manufacturing engineers contributed significantly to the theoretical computer science by way of contributions in the areas of graphics, computational geometry, significant visualization, feature recognition etc.

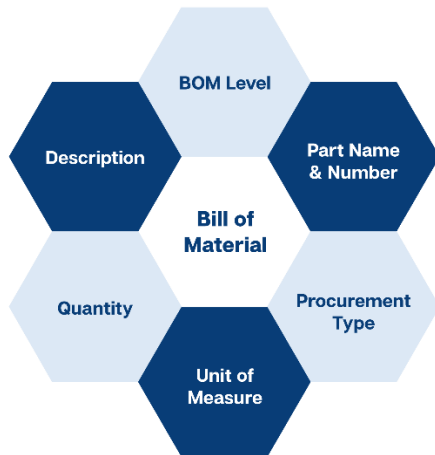
UNIT-II

13 MARKS:

1. Discuss the uses of BOM and explain its structure with an example.

Discuss the process of capacity requirement planning

A bill of materials (BOM) is an extensive list of [raw materials](#), components, and instructions required to construct, manufacture, or repair a product or service. A bill of materials usually appears in a hierarchical format, with the highest level displaying the finished product and the bottom level showing individual components and materials.



Benefits of having a BOM

Having a BOM eliminates doubt from the factory floor and everyone is on the same page. It also has the following benefits:

- **Calculate** total costs of the manufacturing a product
- **Plan** for raw materials, workstations, and employees
- **Maintain** consistent standards for a product across the factory

Now that we've established the importance of a BOM, let's cover some more topics around it.

Different types of BOMs

While a BOM is a standard document, there are a few different types applicable to different scenarios. The differences come due to factors like differences in input materials, the nature of the final product to be manufactured, etc.

Single level BOM or simple BOM

Just the way it sounds, a single level BOM contains only one level of raw materials which will be directly used to manufacture the final product. It is used in production lines where the inputs are already processed raw materials/subassemblies or the manufactured item is simpler i.e., not composed of multiple groups of units. For example, you weave yarn, stitch, and cut it to create towels—this requires only a single level BOM.

Configurable BOM

Generally, it's a good practice to not edit BOMs once used to manufacture an item. But in some industries, different parts may be used with different batches of products. Examples of such industries include servers, PCs, cars and other automobiles, smartphones with different hardware and software based on regions, etc.

Such industries need a lot of flexibility in the way they configure their BOMs. Items may be added, removed, or replaced frequently.

Multilevel BOM

Remember I said BOMs are hierarchical in nature? This brings us to a concept called multilevel BOMs. Manufacturing more complex products involves creating the sub-assemblies before combining them to piece the finished product. Consider you're manufacturing a refrigerator for example. After sourcing the raw materials, the subassemblies will be created first. In this case, the raw materials could be biometal, fuse, timer, cooling coil, condenser, pipes, and so on. The subassemblies like the compressor unit and power unit themselves will have their own BOMs and manufacturing process.

This means the refrigerator's BOM will consist of:

1. BOMs of subassemblies (like compressor unit) as raw materials
2. These subassemblies could also contain subassemblies of their own (compressor)
3. The subassembly parent-child nesting could go on depending on the components and complexity of your product
4. ...And possibly some other direct raw materials.

This is known as a multilevel BOM or indented BOM. There is a top-down, parent-child relationship between the different hierarchies in a multilevel BOM.

Here's a visual representation of a multilevel BOM in ERPNext:

As you can see, the cooling unit is a subassembly that contains a cooling controller unit and other components. Similarly, there are other sub-assemblies for the power unit, gas unit, etc.

Software bill of materials

A software BOM is simply a list of packages or components in a software package. It's similar to a regular bill of materials with the exception that the raw materials or subassemblies in a software BOM are software components required to deliver the final solution. Software solution providers may combine both open source and licensed products as parts to the end solution. Although BOMs are more prevalent in the supply chain and manufacturing industry, getting a software BOM from the supplier with all relevant

software versions and details helps ensure that the correct solution is delivered with the latest version.

Capacity requirements planning is the process of determining if the company's production capacity meets the production goals. It can also be referred to as CRP or capacity planning. This CRP system first analyses the company's planned manufacturing schedule. Later, this method examines if the production schedule has the capability to meet the capacity in real.

Steps of Capacity Requirements Planning

An important point to note here is that capacity planning depends on the accuracy of the data that is used for the planning process. If the company is still relying on spreadsheets or other disparate systems for data, the information they garner may not be accurate or updated. These data will not be of much use during the planning process.

When determining capacity requirements planning, the following steps must be followed—

1. Examine current capacity

In this step, various aspects have to be considered. Information should be collected regarding time studies. Further, live data should be collected regarding equipment capabilities. Other aspects like the number of hours and available shifts, absenteeism and supply chain variables such as vendor performance, lead times and inventory data should be analysed.

2. Create a robust demand plan

The development of a demand plan is crucial for capacity planning. Relying on supply chain management software will help in acquiring accurate data as it will allow aggregate demand planning, based on production time to calculate work centre capacity, find out bottlenecks in advance, analyse the what-if scenarios, master scheduling and others.

3. Decide on capacity modification requirements

The first two steps give you a clear understanding of capacity and demand. This step allows you to make adjustments in determining demand. Decide if additional shifts or overtime is needed. Analyse if certain production aspects have to be outsourced. So if you find the demand to be consistent, consider purchasing additional equipment.

2. What is back scheduling? Discuss the difference between forward and backward Scheduling.

Backward scheduling is an alternative for manufacturers who make-to-order, while forward scheduling is often utilized by manufacturers who make-to-stock (as well as those who make-to-stock in accordance with a sales projection). Learn more about Make-to-order Vs Make-to-Stock [here](#).

Forward scheduling

Forward scheduling allows businesses to plan and make deliveries at the earliest time by allocating tasks when the required resources are available, and completing them as quickly as possible.

While scheduling tasks forward, you line them according to the start date and then let it flow for the subsequent days. Overall, it's a process that prioritizes making deliveries quicker and convenient.

Order of Planning for Forward Scheduling



Let's say that you are a manufacturer. Your customer places an order for an item with a delivery date that is seven days away and the lead time for production is four days. As soon as you receive the manufacturing order, you start the production process and have it ready three days before it is due. Here, you use the resources as early as possible and hold the products in inventory until you can dispatch them.

What is backward scheduling?

Backward scheduling is another planning strategy where orders are scheduled based on customer-preferred delivery dates and times. This strategy is also called Just-In-Time (JIT) manufacturing. When your customer places an order with a specific deadline, your team should ensure that it is fulfilled to meet that deadline by planning backwards from the delivery date.

Backward scheduling answers a crucial question, "When should a business start its production at the latest, so that it fulfills the order on time?" Businesses work backward by allocating resources to the order and then determining the latest possible time to start manufacturing.

Order of Planning for Backward Scheduling



We will use the same example. Your customer places an order with a delivery date that is seven days away, and the lead time is four days. Then to meet the demands of backward scheduling, you start manufacturing latest by the third day.

3. What is flow manufacturing? Discuss its characteristics in detail.

Describe the advantages of bar-coding system.

Flow production is the manufacture of a product by a series of operations, each article going on to a succeeding operation as soon as possible. The manufacturing process is broken into separate operations. The product completed at one operation is automatically passed on to the next till its completion.

Characteristics:

The mass or flow production possesses the following characteristics.

- The units flow from one operation point to another throughout the whole process.
- There will be one type of machine for each process.
- The products, tools, materials and methods are standardized.
- Production is done in anticipation of demand.
- Production volume is usually high.
- Machine set ups remain unchanged for a considerable long period.
- Any fault in flow of production is immediately corrected otherwise it will stop the whole production process.

Application of Flow Production:

- There must be continuity in demand for the product.
- The products, materials and equipments must be standardized because the flow of line is inflexible.
- The operations should be well defined.
- It should be possible to maintain certain quality standards.
- It should be possible to find time taken at each operation so that flow of work is standardized.
- The process of stages of production should be continuous. Advantages of mass production:

Advantages of Flow Production

A properly planned flow production method, results in the following advantages:

- The product is standardized and any deviation in quality etc. is detected at the spot.
- There will be accuracy in product design and quality.
- It will help in reducing direct labor cost.
- There will be no need of work-in-progress because products will automatically pass on from operation to operation.
- Since flow of work is simplified, there will be lesser need for control.
- A weakness in any operation comes to the notice immediately.
- There may not be any need of keeping work-in-progress, hence storage cost is reduced.

4. Explain the various stages of manufacturing resource planning with suitable diagram.

Manufacturing Resource Planning (MRP II) is an integrated information system used by businesses. Manufacturing Resource Planning (MRP II) evolved from early Materials Requirement Planning (MRP) systems by including the integration of additional data, such as employee and financial needs. The system is designed to centralize, integrate, and process information for effective decision making in scheduling, design engineering, inventory management, and cost control in manufacturing.

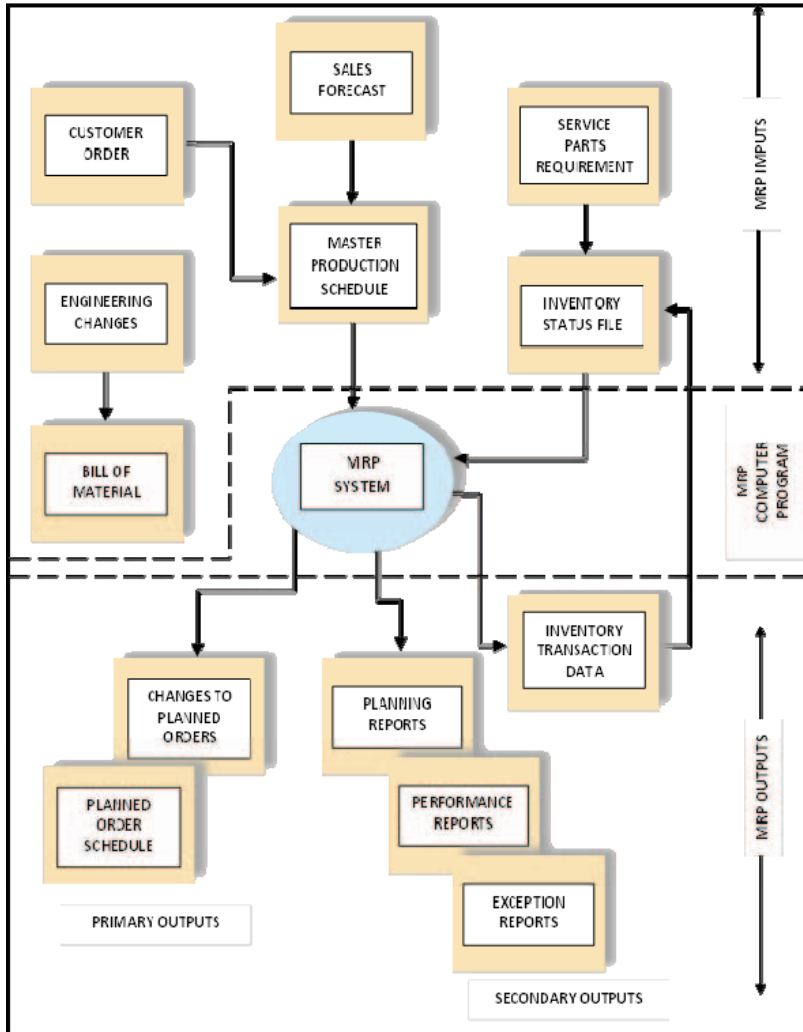


Figure 1. Overall View of the Inputs to a Standard Material Requirements Program and the Reports

An MRP II would include the previous three, along with the following four functionalities:

- Machine capacity scheduling
- Quality assurance
- General accounting systems
- Demand forecasting

Steps Involved in MRP:

There are four major steps involved in the MRP process. They are as follows:

1. Identifying the Requirement to Meet Demands

The first step of the MRP process is identifying the requirements and the customer demand. This starts with inputting customer orders and sales forecasts.

Using the bill of materials that are required for production, MRP can then disassemble the demand into individual components and raw materials that are needed to complete the production. This is all while accounting for any required subassemblies.

2. Allocating Resources and Checking Inventory

You can utilize the MRP to check the demand against your available inventory. You can then allocate the needed resources accordingly. The MRP allows you to see what items you currently have in stock, and where they are. This is a vital tool if you have inventory that spans across multiple locations.

3. Scheduling Production

The system can determine how much labor and time are required to complete each step of each part of a build. It can also figure out when they need to happen so that there are no delays in production.

4. Highlighting Issues and Making Recommendations

The final step of an MRP is its ability to link raw materials to customer orders and work orders. This means it can automatically alert the user when any items are delayed and make recommendations for existing orders.

5. What are the advantages of scheduling orders? Explain various Production Control Activities.

Production scheduling offers numerous benefits to businesses in various industries. Some of the key advantages of implementing effective production scheduling are:

1. Optimal Resource Utilization: Production scheduling ensures that resources such as labour, machinery, and materials are efficiently allocated and utilized. By planning and coordinating production activities, businesses can minimize idle time, reduce bottlenecks, and maximize the utilization of available resources.

2. Improved Efficiency and Productivity: Effective scheduling helps streamline the production process, eliminating unnecessary downtime and delays. It enables businesses to identify and eliminate inefficiencies, optimize workflow, and increase overall productivity. By identifying and addressing production constraints, scheduling allows for smoother operations and increased output.

3. Minimized Inventory Costs: Proper production scheduling helps in managing inventory levels more effectively. By aligning production with demand forecasts,

businesses can avoid overproduction or underproduction, thereby minimizing inventory holding costs, reducing the risk of stockouts, and optimizing inventory turnover.

4. Enhanced Customer Satisfaction:Efficient production scheduling enables businesses to meet customer demands more effectively and reliably. By ensuring timely delivery of products, businesses can improve customer satisfaction, strengthen customer relationships, and gain a competitive advantage in the market.

5. Reduced Lead Times:With well-planned production scheduling, businesses can minimize lead times—the time it takes for an order to be processed and delivered. By optimizing production processes, sequencing tasks, and eliminating unnecessary waiting periods, businesses can reduce lead times, enabling faster order fulfilment and improved customer service.

6. Flexibility and Adaptability:Production scheduling allows businesses to respond quickly to changing customer demands, market conditions, and unexpected disruptions. By having a structured scheduling system in place, businesses can adjust production plans, reassign resources, and accommodate rush orders or changes in production requirements more efficiently.

7. Cost Reduction:Effective production scheduling helps in identifying and eliminating inefficiencies, reducing downtime, and optimizing resource utilization. These factors contribute to cost reduction by minimizing production costs, labour expenses, and equipment idle time, leading to improved profitability.

8. Improved Decision-Making:By having a clear overview of the production process, scheduling enables better decision-making. It provides valuable insights into capacity planning, resource allocation, and production bottlenecks, allowing businesses to make informed decisions, optimize operations, and allocate resources strategically.

9. Better Communication and Collaboration:Production scheduling facilitates better communication and collaboration among different departments within a company. It ensures that all stakeholders are aware of the production plan, timelines, and resource requirements, promoting coordination and synergy among teams involved in the production process.

10. Continuous Improvement:By implementing production scheduling, businesses can track and measure key performance indicators (KPIs) related to production efficiency, throughput, and resource utilization. This data allows for ongoing analysis and identification of areas for improvement, fostering a culture of continuous improvement within the organization.

Activities of the production control system

Manufacturing is a broad term, as there are many different fields and types of products that are manufactured. Production control systems are diversifying to keep up and be specialized in the

variety of manufacturing fields and products being manufactured. A general production management system has the following functions:

Production planning

This function plans the production period, production quantity, production cost, etc. for product production. Many production management systems are equipped with a production scheduler, and users can create planning charts that are easy to understand – they can be visually appealing with color coding on calendars and Gantt charts. These planning charts can be shared across multiple departments, such as manufacturing sites and offices, and can also be used for production instructions, progress management, and process management.

Material management

To proceed with production according to a production plan, the correct materials must be available for each planned process. Material management is a function that manages these necessary materials. Within a production management system, it is possible to calculate the type and quantity of materials needed for production by linking that information with the production plan and creating a purchase plan to meet the deadline for use. Other functions related to material management include production number management, material arrangement chart, and requirements calculation.

Procurement management

Procurement management executes the purchase plan calculated by material management. This includes placing orders with suppliers, acceptance inspections at the time of receipt, paying manufacturing sites, and managing all purchases and payments.

Manufacturing management

Manufacturing management issues specific work instructions based on the production plan and manages work progress. There are also production management systems that allow users to enter and manage daily reports. By setting attributes and ability values for each machine, device, and worker used, organizations can see how much load was applied after the actual work was performed.

Inventory control

Inventory control supports inventory-related receipts and deliveries, inventory checks, and lot management. By managing inventory for everything from raw materials to work-in-progress and finished products, a production management system makes it possible to conduct follow-up investigations if and when defects occur. In addition, for products for which first-in, first-out is important, organizations can ensure first-in, first-out by managing each lot.

Sales management

A production management system can manage not only production but also sales. With a production management system in place, it's possible to manage the issuance of quotations, orders, and shipments, and some can calculate sales, statistics of sales volume, and demand forecasting. Some are capable of managing accounts receivable and issuing invoices.

UNIT-III

13 MARKS:

1. Discuss the concept of Inventory control systems. Describe the concept of newsvendor model with the help of an example.

An inventory control system is a system that encompasses all aspects of managing a company's inventories; purchasing, shipping, receiving, tracking, warehousing and storage, turnover, and reordering. In different firms the activities associated with each of these areas may not be strictly contained within separate subsystems, but these functions must be performed in sequence in order to have a well-run inventory control system.

Importance of Inventory Control:

The aim of holding inventories is to allow the firm to separate the process of purchasing, manufacturing, and marketing of its primary products. Inventories are a component of the firm's working capital and as such represent a current account.

(i) Reducing Risk of Production Shortages:

Firms mostly manufacture goods with hundreds of components. The entire production operation can be halted if any of these are missing. To avoid the shortage of raw material the firm can maintain larger inventories.

(ii) Reducing Order Cost:

When a firm places an order, it incurs certain expenses. Different forms have to be completed. Approvals have to be obtained, and goods that arrive must be accepted, inspected and counted. These costs will vary with the number of orders placed. Smaller the inventories lesser the capital needed to carry inventories.

(iii) Minimise the Blockage of Financial Resources:

The importance of inventory control is to minimise the blockage of financial resources. It reduces the unnecessary tying up of capital in excess inventories. It also improves the liquidity position of the firm.

(iv) Avoiding Lost Sales:

Most firms would lose business without goods on hand. Generally, a firm must be prepared to deliver goods on demand. By ensuring timely availability of adequate supply of goods, inventory control helps the firm as well as consumers.

(v) Achieving Efficient Production Scheduling:

The manufacturing process can occur in sufficiently long production runs and with preplanned schedules to achieve efficiencies and economies. By maintaining reasonable level of inventory production scheduling becomes easier for the management.

(vi) Gaining Quantity Discounts:

While making bulk purchases many suppliers will reduce the price of supplies and component supplies will reduce the price of supplies and component parts. The large orders may allow the firm to achieve discounts on regular basis. These discounts in turn reduce the cost of goods and increase the profits.

(vii) Taking the Advantage of Price Fluctuations:

When the prices of the raw materials are low the firm makes purchases in economic lots and maintains continuity of operations. By reducing the cost of raw materials and procuring high prices for its goods the firm maximises profit. This with the help of inventory control the firm takes advantage of price fluctuations.

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 into 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 consists of approximately 50 per cent of all the items of inventory but only about 2 per cent of the firm's rupee investment.

The common procedure for categorisation of items into 'A', 'B' and 'C':

- (i) The categorisation can be made by comparing the cumulative percentage of items with the cumulative percentage of usage value.
- (ii) All the items are to be ranked in the descending order of their annual usage value.
- (iii) The cumulative percentage of items to the total number of items is also marked in another column.
- (iv) The cumulative totals of annual usage values of these items along with their percentages to the total annual usage value are to be noted along-side.

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.

Limitation of ABC Analysis:

(i) The system analyses the items according to their value not according to their importance in the production process.

(ii) The analysis to be effective needs to be constantly undertaken and periodically reviewed by management.

(iii) Generally, hundreds of items fall in category 'C' as a result a lot of time is spent on managing inventory.

(b) Budgetary Control System:

Budgetary control is a tool of management used to plan, carry-out and control the operations of business. It establishes pre-determined objectives and provide the basis for measuring performance against these objectives. Under this system the number of units of the materials to produce a finished product and the level of inventory to be maintained and the quantities to be purchased during the period are all pre-determined.

(c) Minimum-Maximum System:

This is one of the oldest methods used in most of the business for controlling inventories. It is essential that proper control should be exercised on the level of the inventory to be maintained. Efficient management of inventory demands that both over and under investment in stock be avoided.

If higher levels of inventories are maintained stock level will be influenced by obsolescence, change in fashion and improvements in technicalities. Too much capital tied up in inventories results in the lower rate of return and the possibility of substantial loss from decline in market value.

Too small a quantity is likely to reduce the value of the business and proper servicing of the customers. According to this, a maximum level of inventory based upon the demand and the minimum level to prevent out of stock conditions for each item of stock are established. An order is placed when the minimum level is reached which will bring the quantity to the maximum level.

(d) The Economic Order Quantity Approach:

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:

(i) Constant or uniform demand.

- (ii) Independent orders.
- (iii) Instantaneous delivery.
- (iv) Constant ordering costs.
- (v) Constant carrying costs.
- (vi) Constant unit price.

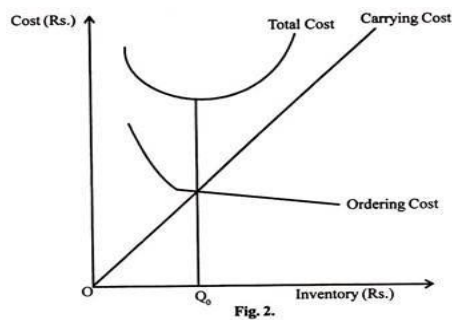
Finding Economic Order Quantity:

The EOQ model assumes that the finished goods are sold at a constant rate overtime. The important decision in inventory management is to balance the cost of holding inventories with the cost of placing inventory replenishment orders. When the holding costs and ordering costs are balanced, the inventory costs are minimised and resulting order quantity is called the economic order quantity.

Total inventory cost = Ordering cost + Carrying cost

Total ordering cost = Number of orders x Cost per order

= $Rs. U/Q \times F$



News vendor model

The news vendor model helps you decide how many units to produce or buy when demand is uncertain taking into consideration the cost of having too much and the cost of having too little.

News vendor model implementation steps

1. Gather economic inputs:

- a) selling price,
- b) production/procurement cost,
- c) salvage value of inventory

2. Generate a demand model to represent demand

a) Use empirical demand distribution

b) Choose a standard distribution function: the normal distribution and the Poisson distribution – for discrete items

3. Choose an aim:

a) maximize the objective of expected profit

b) satisfy a fill rate constraint.

4. Choose a quantity to order.

Assumptions

1. Products are separable
2. Planning is done for a single period
3. Demand is random
4. Deliveries are made in advance of demand
5. Costs of overage or underage are linear

2. Explain the EOQ and EBQ Models for uniform and variable demand with and without shortage. When is each model used in a firm?

The economic order quantity (EOQ) refers to the ideal order quantity a company should purchase in order to minimize its inventory costs, such as holding costs, shortage costs, and order costs. EOQ is necessarily used in inventory management, which is the oversight of the ordering, storing, and use of a company's inventory. Inventory management is tasked with calculating the number of units a company should add to its inventory with each batch order to reduce the total costs of its inventory.

Economic Batch Quantity (EBQ), also known as Optimum Batch Quantity (OBQ) is a measure used to determine the quantity of units that can be produced at the minimum average costs in a given batch or product run. EBQ is basically a refinement of the economic order quantity (EOQ) model to take into account circumstances in which the goods are produced in batches.^{[1][2]} The goal of calculating EBQ is that the product is produced in the required quantity and required quality at the lowest cost

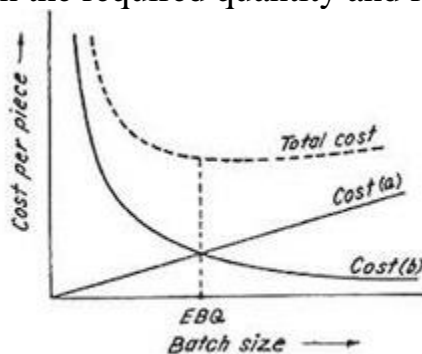


Fig. 7.15. Economic Batch Quantity (EBQ).

Some assumptions have been made for calculating economic batch quantity. They are:

- Demand is known and constant within a certain period of time
- Unit cost of the inventory item is constant
- Production time is known and constant
- Setup cost is constant and does not change

Factors affecting the Economic Batch Size

Given below are the factors that affect the economic batch size:

- Usage Rate

The rate at which production is done should match with the rate at which these parts are used and assembled in the line.

- Manufacturing cost

The higher the batch size, its per unit cost will be lower. Set-up costs like machine, paperwork will be lower. But the carrying costs like- handling of goods, storage will increase with the increase in batch size.

- Cost of Obsolescence

The higher the size of the lot, higher will be the possibility of deterioration or obsolescence. Deterioration is related to the shelf life. Whereas change in technology or no-demand or even outdated products are related to obsolescence.

Economic Order Quantity vs Economic Batch Quantity

- Multiple terms are used in relation to optimum quantity production like Economic Batch Quantity, Economic Order Quantity or Economic Manufacturing Quantity. People often get confused as to which term is relevant.

- Economic Order Quantity (EOQ) is used to calculate the optimum size when goods, parts and finished goods have to be delivered to an external supplier or outsourced when an order is placed. However, Economic Batch Quantity (EBQ) is used to find out the batch size for a production run when manufacturing is internal.
- As said by [Charles T. Horngren](#)- “EBQ is an inventory-related equation that determines the optimum order quantity that a company should hold in its inventory given a set cost of production, demand rate, and other variables.”
- Both EOQ and EBQ are similar in the sense that we calculate the size of the optimum quantity. Economic Batch Quantity is an example of a technique used to control costs of materials as well as cost of production.
- In Economic Batch Quantity, 2 basic laws are applied. One is the Law of Economies of Scale and the other one is the Law of Increasing Returns. It is common sense, that when we produce more the overall costs decrease and profits increase.

Importance of Economic Batch Quantity

Determination of Economic Batch Quantity has [its own merits](#). Some of them are given below.

It makes sure that the goods produced meet the level of demand of goods in the market.

1. It will also help to maintain and reduce the quantity of output in [inventory](#).
2. It also helps to minimize the machine set-up/get-up time.
3. The size of the optimum lot also helps to reduce the machine costs.
4. It will also minimize the clerical costs.
5. It also gives manufacturing units the advantage of economies of scale.

Formula of Economic Batch Quantity

The formula to calculate the Economic Batch Quantity is:

$$\text{Economic Batch Quantity (EBQ)} = \frac{2AO}{C}$$

Where,

A= Annual Demand

C= Carrying Cost, it includes storage costs, obsolescence of inventory, interest costs and depreciation.

O= Ordering or the setting up cost, it includes the cost of installing and setting up machinery for manufacturing.

3. List out the need and objectives of inventory management. How is it critical in maintaining correct level of stocks in a firm?

The objectives of inventory management are as follows:

1. To ensure a continuous supply of materials and stock so that production should not suffer at the time of customer's demand.
2. To avoid both overstocking and under-stocking of inventory.
3. To maintain the availability of materials whenever and wherever required in enough quantity.
4. To maintain minimum working capital as required for operational and sales activities.
5. To optimize various costs indulged with inventories like purchase cost, carrying a cost, storage cost, etc.
6. To keep material cost under control as they contribute to reducing the cost of production.
7. To eliminate duplication in ordering stocks.
8. To minimize loss through deterioration, pilferage, wastages, and damages.
9. To ensure everlasting inventory control so that materials shown in stock ledgers should be physically lying in the warehouse.
10. To ensure the quality of goods at reasonable prices.
11. To facilitate furnishing of data for short and long-term planning with a controlled inventory.
12. To supply the required material continuously.

- 13.To maintain a systematic record of inventory.
- 14.To make stability in price.

The Need of inventory management

It can be essential for individuals working in product-based industries to understand the importance of inventory management, as the process is typically central to business operations. It often requires individuals to have a thorough understanding of a company's customer base, the market, and its physical and financial resources.

Here are several other reasons inventory management is important:

Increases market competitiveness

Consistently having enough inventory and a wide range of product options in stock when customers want them can help ensure that customers return. This can lead to higher profits, which can allow businesses to compete more effectively in local and global markets. When a business is more competitive, it can often lower prices for customers.

Builds company or brand reputation

Customers rely on businesses to meet their needs. When customers can trust a specific company to have what they require consistently, it typically improves that company's reputation. Happy customers not only return more often, but they typically tell others about their positive experiences.

Generates customer loyalty

Customers often develop a relationship with a business or brand when it consistently meets their expectations. Loyal customers usually rely on a specific brand and search for it actively. This can be beneficial for a brand that hopes to introduce new products.

Improves customer service

Having enough inventory in stock can make it easier for customers to return or exchange items without having to wait. Companies that have a wide range of inventory are typically better equipped to meet customer needs. For example, if a company carries products in different sizes, colours, and price ranges, it's more likely to have inventory in stock to help customers quickly.

Lowers customer costs

When a company can maximize its resources and manage inventory costs effectively, it can often afford to pass these savings onto its customers. An example of this is lower pricing for the same quality product found elsewhere. Lower prices can often make a company more competitive.

Improves productivity

An organized and up-to-date inventory database can often save employees time. This might improve their overall productivity. For example, when an inventory

management system lists a product's availability, its location, and other pertinent information, it can save employees time by not having to search for it.

Optimizes product fulfilment

Having a good supply of in-stock inventory can allow a business to process and ship orders faster. For customers, this can be a significant benefit that can often encourage them to become loyal, repeat customers. Reliable service delivery is an essential aspect of maintaining customer satisfaction.

Raises product awareness

Effective inventory management can help a business monitor market trends and adjust its product offerings accordingly without interrupting customer purchasing flow. For example, if customers consistently buy more black hats than pink ones, a company can order more black hats. This can reduce the likelihood of understocking this item and overstocking others.

Enhances demand forecasting

When a business maintains accurate inventory data, it can better determine future product requirements. For example, this can often help with such events as seasonal upticks, like Christmas sales, promotional events, or yearly sales. Accurate inventory forecasting is typically vital to successful inventory management and customer satisfaction.

Organizes multiple inventories

For large companies like retail chains that have several locations, having a universal accounting of all inventory can typically help improve customer relations, organize inventory more efficiently, and reduce costs. For example, employees can help a customer find items in other locations quickly when they're not available in one store. This saves employees and customers time looking for an item, which also reduces the employer's costs and can improve customer relations.

4. Explain the advantages and disadvantages of quantity discount model and probabilistic inventory model.

A quantity discount is an incentive offered to a buyer that results in a decreased cost per unit of goods or materials when purchased in greater numbers. A quantity discount is often offered by sellers to entice customers to purchase in larger quantities.

Advantages and Disadvantages of Quantity Discounts

Advantages

- Quantity discounting can be fruitful. The principal benefit is to increase total sales volume in order to realize economies of scale.
- Quantity discounts boost units per transaction (UPT).

- The resulting increased sales volume can lead to economies of scale in the form of purchasing goods and materials in bulk at a quantity discount from suppliers, and the ability to combine incidental per-order costs, such as shipping and packaging, into one sale.
- These economies of scale have the potential to reduce per-unit costs to the seller.
- Quantity discounting can also come in handy when a seller is keen to lower its inventory.
- Taking such action can be particularly useful when the product in question risks going out of fashion or becoming obsolete, due to a technological breakthrough.

Disadvantages

- There are several caveats to this strategy, though.
- The main drawback of quantity discounts is that the discount squeezes profit per unit, also known as the marginal profit, unless sufficient economies of scale are realized to at least offset the discount offer.

Probabilistic inventory methods

Probabilistic inventory models consisting of probabilistic supply and demand are more suitable in most circumstances. Two methods are used based on the frequency of order placement for procuring inventory stock, these are single period and multi-period inventory systems.

- The term single period term refers to the situation where the inventory stock is perishable, and orders are typically only made once. Generally, for one time ordering of seasonal products or where demand exists only for the period in which it is ordered. For example, a newspaper sold today will not be sold at the same price tomorrow nor will summer clothing items be likely to sell during the winter season
- An incremental analysis is used to determine the optimal order quantity for a single period inventory with probabilistic demand. Assessing how much to order by comparing the cost or loss of ordering one additional unit with the cost or loss of not ordering that one additional unit

With the multi-period method orders are placed multiple times over an entire production cycle and are further classified as continuous review or periodic review inventory.

- Continuous review inventory is reviewed constantly and when inventory stock drops to a certain predetermined par or reorder level, a fixed quantity is

ordered. Continuous review is commonly used for high volume, valuable or important stock items

- Periodic review inventory is examined at periodic intervals in predetermined timeframes, irrespective of the levels to which inventory levels drop. At this time an order is then placed to bring inventory up to the maximum level, the method is largely used for moderate volume items

In plain terms, the probabilistic model of inventory control is based on or adapted to a theory of probability which involves or is subject to chance variation. Multiple possible outcomes exist, each having varying degrees of certainty or uncertainty of its occurrence.

5. Describe the objectives and control techniques of policy decision with suitable examples.

Policy decision-making is the process of creating guidelines or policies that shape how an organization or government operates. These policies serve as a roadmap, helping them make consistent and fair choices.

Policy Decisions Guide Operations Decisions

While many of us make decisions moment-to-moment according to choose or unacknowledged purposes, the most effective think carefully about their long-term goals. They define our purposes. These might include a desire to live more an environmentally responsible life, to create our own company, to raise children who are socially and environmentally responsible, to provide emergency services to war-torn countries. These are policy decisions. They state our purposes.

Objectives:

The objective is to move forward with the best action available at the moment.

Objections must be based on reasons why a policy will affect one's ability to implement the decision: A proposal that makes our work more difficult and will decrease our effectiveness. A decision to adopt an action that conflicts with the group's purpose. An objection must address the purpose of the group and our own ability to work toward it.

Consent is required within the group putting the policy into effect. Not everyone must consent to all decisions.

Policy Decision Techniques and Tools

Up to this point, we've merely mentioned the need for research in coming up with alternatives for management decision-making. The following is a list of techniques and tools a manager can use to explore different options to land upon a chosen decision:

Marginal Analysis

Marginal analysis helps organizations allocate resources to increase profitability and benefits and reduce costs. An example from indeed.com is if a company has the budget to hire an employee, a marginal analysis may show that hiring that person provides a net marginal benefit because the ability to produce more products outweighs the increase in labor costs.

SWOT Diagram

This tool helps a manager study a situation in four quadrants:

- **Strengths:** Where does the organization excel compared to its competition? Consider the internal and external strengths.
- **Weaknesses:** What could the organization improve?
- **Opportunities:** How can the organization leverage its strengths to create new avenues for success? How could addressing a specific weakness provide a unique opportunity?
- **Threats:** Determine what obstacles prevent the organization from achieving its goals.

Decision Matrix

A decision matrix can provide clarity when dealing with different choices and variables. It is like a pros/cons list, but decision-makers can place a level of importance on each factor. According to Dashboards, to build a decision matrix:

- List your decision alternatives as rows
- List relevant factors as columns
- Establish a consistent scale to assess the value of each combination of alternatives and factors
- Determine how important each factor is in choosing a final decision and assign weights accordingly
- Multiply your original ratings by the weighted rankings
- Add up the factors under each decision alternative
- The highest-scoring option wins

UNIT-IV

13 MARKS:

- 1. Discuss the factors affecting supplier selection. Describe the forward buying with examples.**

The suppliers you select can impact your business in numerous ways, from the quality of your products to your bottom line. Therefore, it's crucial to consider several key factors when selecting suppliers to ensure that you're making the right choice. In this article, we will explore eight critical factors to consider when selecting suppliers.

Some of the factors relevant for the selection of a vendor are:

1. Quality:

The term quality stands for ability and willingness of the supplier to meet the specifications of the buyer.

At no cost, the quality should be sacrificed for low price.

2. Price:

Normally quality does not always go side by side with price but we must try to find out those suppliers who make better than average product at an average price. However, sub-standard and poor-quality purchases should not be made at the cost of a low price.

3. Quick Delivery:

The lead time i.e., time to get supplies, should be less so that there is a quick delivery of goods. Generally, the best suppliers are the busiest and in order to get goods from them, one has to wait for a long time. However, quick delivery reduces the amount of forward planning and increases the flexibility.

4. Service:

It is very important factor in selecting the vendor. It includes the provision of expert advice to the buyer before and after the sale of materials and other items. Good service helps in maintaining good relations between the supplier and the buyer. The speed and effectiveness of arrangements to service and repair equipment is very important to certain machines.

5. Assurance of supply:

Only those suppliers should be preferred who assure supplies of raw materials and other components. Thus, suppliers who suffer recurring shortages should be used with great care as it can adversely affect our production schedule.

6. Size of the supplier:

Some authorities recommended that orders of small size should be placed with a small company whereas the orders of large size should go to large companies. However, this correlation can't be always applied. A small supplier would generally work very hard to perform a large order, if given a chance.

7. Number of suppliers:

Should we place all order with one supplier or use two or more suppliers?

The use of a single supplier has the following advantages:

- (a) In times of shortage, the supplier will give preference to the needs of the customer.
- (b) A single supplier can also offer the best price with assured supplies.

On the other hand, two or more suppliers may be beneficial in times of shortage. Large companies generally buy from two or more suppliers getting the twin benefit of low price and service.

8. Local suppliers:

Sometimes, a buyer may be compelled to buy certain requirements locally on account of the following reasons.

- a) Community relations between the company and public may force the buyer to buy locally. For example, the supplier to a hospital or charitable trust by the local businessman would help in raising the funds for such organisations.
- b) Local buying is generally justified when small quantities of materials are purchased.
- c) There is a feeling of closer co-operation between the vendor and the buyer.
- d) The delivery is quickly made.

- e) Urgent orders can be met promptly.
- f) Disputes, if any, can be easily resolved.

9. Miscellaneous Considerations:

The following points should also be taken into account at the time of selection of suppliers:

(a) In order to maintain complete objectivity, the buyer must keep himself free from unethical influences. Favour to friends should be avoided. Similarly commercial bribery such as gifts etc has no place in selecting vendors.

(b) Dishonest vendors must be rejected forever.

Forward buying in the simplest form is buying more goods than needed. The best example is retailer, who buys higher amount of commodity in order to store it and sell in further time. Forward buying is usually associated with price and non-price competition. Producers try to compete with each other by means of lowering prices for established period of time. It is good occasion for cheap purchase, what is used by another company's supply chain management. Also every of us - maybe not aware of it - is part of this scheme, e.g. buying more food on supermarket's promotions.

Disadvantages

Forward buying is criticised for generating needless costs. Sometimes it is compared to be addictive like a drug. Manufacturers want to quickly boost their revenue, so they decrease prices and flood the market with their goods. Afterwards they discover, that together with returning normal prices their gains disappear. Downstream supply chain is clogged up with inventory. When market stabilizes, producers are keen to make another low-price period in order to undo their losses. This causes arising of cycles, what leads to long-term debilitating effects for production and distribution branches.

Forward buying increments company's costs. Manufacturers which want to offer low price sale must gather wares. This generates expenditures on warehouses. Distributors, who want to take advantage of discounts have to pay for storing commodity excess. In fact they increase revenue because of small purchase expense, but this is only short-term profit. In some cases keeping fixed prices whole time would be more profitable for producers as well as a distributors because of avoiding inventory spendings. A lot of storehouses exist only as buffer essential for forward buying phenomenon (Foti C., 2000, p. 7).

Optimization

Many researchers tried and still tries to answer **how to make the forward buying really beneficial**. At the first look it seems to be trivial and feasible with just simple mathematics. In fact, estimating optimal amount of goods to buy during concrete trade promotion is more complicated and demands taking into account multiple aspects, e.g (Rose R., 2010, p. 1):

- already possessed and ordered stock quantity
- payment conditions
- possible expenditures on shipment and special handling
- estimation of storage costs
- buyer's interest costs and ability of capital acquire
- demand prognosis
- date of making the transaction

It is hard to thoroughly analyse all these factors, so some simplifications can be made. Of course as consequence estimation of profitability will be more risky. For many retailers decision of forward buying is large investment and can result in serious problems with financial liquidity, including bankruptcy.

Forward buying as reducing loss

Sometimes forward buying is treated not as occasion to multiply revenues, but as possibility to decrease risk of price fluctuations. It is very distinct in particular in brands which require raw materials for production. **As example:** in second quarter of 2012 the Coca-Cola company profit reduced by 0.4% in spite of 3% raise in income. This situation is an effect of sugar and corn syrup price increases. Numerous proactive entrepreneurs attempt to adjust their strategy to costs fluctuation. Forward buying of raw commodity and gathering stock when prices are favorable is part of reasonable company financial policy (Manikas A., 2016, p. 1).

Examples of Forward buying

- Retailers buying goods in bulk at a discounted rate from suppliers to sell at a higher price in the future. This is a common practice in supermarkets, where they buy more goods than they need in order to get a lower price.
- Manufacturers buying raw materials in larger quantities in order to get a better price. This is a common practice in the manufacturing industry, where companies buy materials in bulk in order to get a better price.
- Investors buying stocks, bonds, and other financial instruments in anticipation of future increases in price. This is a common practice among investors, who buy stocks and other financial instruments in order to make a profit when the price of the asset increases.
- Consumers buying goods in bulk to save money. This is a common practice among consumers, who buy goods in bulk in order to save

money. This is typically done when buying items like groceries and household items.

Other approaches related to Forward buying

- **Forward buying as a strategic decision for a company:** Companies often use forward buying as a strategic decision in order to secure the supply of goods at a certain price. This could involve securing a certain price for a certain period of time, or buying in bulk in order to gain discounts or other advantages.
- **Forward buying as a way to take advantage of market fluctuations:** Companies can take advantage of the natural fluctuations in the market to their advantage. This could involve buying goods at a lower price when the demand is low and then selling them at a higher price when the demand is high. This can help to maximize a company's profits.
- **Forward buying as a way to hedge against risk:** Companies can use forward buying as a way to manage their own risk. For example, they can buy goods in bulk when prices are low, in order to protect themselves against an increase in prices.

In conclusion, forward buying can be a useful tool for companies to manage their own risks, take advantage of market fluctuations, and make strategic decisions. It can be a great way to maximize profits and secure the supply of goods at a certain price.

2. **Explain the various price forecasting methods in materials management.** As a manufacturer, one of your main goals is balancing the right amount of product in stock. With too little, you run at inopportune times, which causes customers to purchase elsewhere. With too much, you pay unnecessarily high costs for inventory management.

To find a reliable middle ground, you need to implement supply, demand, and price forecasting practices:

- **Supply forecasting** analyzes data about your suppliers, including their supply of complete products, parts, or raw materials, and uses it to project how much they will have available.
- **Demand forecasting** analyzes the amount of product that your customers are likely to purchase during a specific week, month, or quarter.
- **Price forecasting** analyzes the data related to supply and demand to determine how each factor will affect prices.

Ultimately, implementing the proper methods for price forecasting can be one of the most accurate and reliable ways to determine future revenue.

The Top Three Types of Price Forecasting Methods

There are three primary methods of forecasting in financial analysis that are used to predict future revenues, expenses, and capital costs for a business: straight-line, moving average, and regression analysis.

Straight-Line Method

The straight-line method is one of the simplest and easiest-to-follow forecasting methods. This method measures constant growth rate by analyzing historical data to predict future revenue growth.

Here is an example of straight-line forecasting:

- A procurement team for a manufacturing company assumes that paper and pulp prices increase by 5% for the next five years based on historical performance.
- An analyst takes the previous year's revenue and multiplies it by the growth rate to forecast revenue.
- The forecasted earnings are multiplied by 5% until you arrive at the final year in your determined timeline.

Not only is this method easy to use, but it also tends to have a high accuracy rating for a broader predictive field.

Discover potential untapped savings Strategic Resource Management can bring to your business. Our manufacturing procurement experts can help you save ... BIG. Schedule a no-obligation discussion today to learn more.

Moving Average

Moving averages is a smoothing technique that analyzes a set of data to establish an estimate of future values and prices.

Typically, analysts look at moving averages for three-month and five-month periods:

- A three-month moving average is calculated by taking the revenue average of the current and past two months.
- Similarly, a five-month moving average forecasts revenue of the current and previous four months.

Translating this information to a line chart shows the difference between actual and moving average forecasted revenue values. With enough historical data, analysts can better understand pricing patterns during certain times of the year, which allows a procurement department to make more informed purchasing decisions.

Regression Analysis

Regression analysis establishes relationships between two or more independent inputs with a dependent output by using a statistical process and a sample of relevant observations.

Say you want to determine the price quote by a supplier for routes of a transportation network. In this example:

- The price quote is your **dependent variable**.
- Distance traveled, fuel cost, and maintenance costs are your **independent variables**.

With this analysis, you can:

- Better understand the logic behind the supplier's pricing.
- Identify where to concentrate on creating an optimal negotiation situation.
- Predict the costs of new independent variables.
- Determine changes to future budgets.

3. Explain the procedure involved in selecting suppliers.

Step 1: Determine Supplier Requirements:

Clearly defining your organization's requirements is the first step in the supplier selection process. This entails identifying the precise goods or services required, as well as the quality requirements, deadlines for delivery, expected prices, and any other factors that are crucial for your company. To obtain thorough input, it is crucial to involve pertinent stakeholders from many departments.

Step 2: Supplier Evaluation Criteria:

Following the establishment of the requirements, a set of evaluation criteria must be created in order to evaluate possible suppliers. These requirements could include things like a supplier's financial stability, quality certifications, manufacturing capacity, past performance, location, ethical standards, and cultural fit with your organization. Each criterion needs to be given a weight based on how important it is to your company.

Step 3: Supplier Identification:

You can begin with locating possible suppliers after determining the assessment criteria. This can be accomplished through a variety of techniques, including supplier databases, trade exhibits, web directories, market research, and industry referrals. To ensure a broad group of providers, it is crucial to cast a wide net.

Step 4: Supplier Pre-qualification:

Before conducting a detailed evaluation, it is advisable to pre-qualify suppliers based on their initial fit with your requirements. This can be done through a preliminary assessment of their capabilities, financial stability, and compliance with regulatory and legal requirements. Suppliers who do not meet the minimum criteria can be eliminated at this stage, saving time and effort.

Step 5: Request for Proposal (RFP):

The next step involves sending a formal Request for Proposal (RFP) to the shortlisted suppliers. The RFP should provide detailed information about your organization, requirements, evaluation criteria, and expectations. It should also request relevant information from suppliers, including their capabilities, pricing structure, delivery schedules, quality control measures, and references. The RFP allows suppliers to showcase their strengths and helps you gather comprehensive information for evaluation.

Step 6: Supplier Evaluation:

Once the responses to the RFP are received, a thorough evaluation of each supplier is necessary. This evaluation involves reviewing the submitted proposals, conducting site visits, interviewing supplier representatives, and verifying references. It is essential to assess each supplier against the established evaluation criteria and compare their capabilities, offerings, and value proposition.

Step 7: Supplier Selection:

Based on the evaluation, a shortlist of suppliers who best meet your requirements should be created. The final selection should consider factors such as quality, reliability, price competitiveness, delivery capabilities, financial stability, and the supplier's ability to collaborate effectively. It is important to involve key stakeholders in the decision-making process to ensure alignment with organizational goals and objectives.

Step 8: Negotiation and Contracting:

Once the preferred supplier(s) are identified, negotiations can commence. This involves discussing pricing, terms and conditions, service level agreements, intellectual property rights, and any other relevant contractual aspects. It is crucial to establish clear communication channels, dispute resolution mechanisms, and performance monitoring mechanisms within the contract to ensure a mutually beneficial relationship.

Step 9: Utilizing a Scorecard to rate your suppliers

A supplier scorecard is a structured evaluation tool that uses predefined criteria and metrics to objectively assess and compare suppliers. It enables data-driven decision-making in supplier selection and management, promoting transparency and continuous improvement in the supply chain.

Step 10: Supplier Performance Monitoring:

After the contract is signed, supplier performance monitoring becomes vital. Regular performance evaluations should be conducted, including key performance indicators (KPIs) and service level agreements (SLAs). This helps ensure that the supplier continues to meet expectations and provides an opportunity to address any issues or concerns promptly.

4. Describe the steps involved in purchasing process in an organization.

The purchasing process enables an organization to evaluate these business-to-business transactions for efficiency. By understanding this purchasing process, businesses can carefully track their spending and potentially save on costs.

Steps in the purchasing process

Below are the steps of a typical purchasing process:

1. Identify the need

The purchasing process begins when the business recognizes that they have a need for a product, tool or service that will enhance their operations. Team members can help identify needs as they complete their daily work by notifying their supervisors of any challenges they encounter. Once the organization identifies a need, they can begin the purchasing process.

2. Specify the requirement

During this stage, leaders investigate the need further and come up with a plan for exactly what they require. For example, a frequent shortage of printer paper becomes the need for weekly deliveries of 500 sheets of inkjet printer paper to ensure a continuous supply.

The person who identified the need often works with other team members and management to come up with the right solution to the problem, especially when concerning a larger purchase. For example, the employee who identified the need for more printer paper may have the power to specify the requirement on their own, while the need for new computer systems throughout the entire office likely requires input from others.

3. Find and choose a supplier

Find potential suppliers who can provide the specific product or service you want to purchase. You can conduct your own research online or contact those in your professional network to ask for recommendations. If shipping costs are a factor in your purchase, look for businesses in your local area.

During this stage, it is a good idea to consider several suppliers and compare them against one another. When necessary, contact the supplier and request a quote or proposal from them. As you are considering suppliers, consider factors such as cost, reliability and delivery time.

4. Negotiate costs

In many situations, it is possible to negotiate costs with a supplier, especially when placing high-priced orders or orders you expect to recur regularly. Contact the supplier you are considering and ask if they are open to negotiating the price.

Suppliers may negotiate if it means they can secure a large or long-term contract for their business.

5. Get order approval

Before your business can initiate the transaction, you may need to get approval for the order. This could include working with upper management and the accounting department to ensure there are enough available funds within the budget for the purchase. In some scenarios, the business may also need to establish a line of credit with the supplier. If you haven't already, explain to management why this purchase is necessary and how you achieved a reasonable price from the supplier.

6. Place the order

Once both sides agree to the transaction, you can formally place the order. Have both sides agree to the specific details, such as price, delivery times, fees and installations. Get everything in writing and have representatives from both organizations sign it. Then keep a copy of this agreement in your files for future reference.

7. Receive and approve the order

When the order arrives, check for any issues with the product or anything the supplier failed to deliver on. Timeliness is key because if there are any problems, the supplier should address them before you release the rest of the payment.

8. Review supplier performance

Whether you work with a supplier on a onetime transaction or set up recurring transactions, make it a regular practice to review your suppliers' deliveries for quality and timeliness. A record of these reviews can help you identify and track any issues that might arise later in your contract. Continue relationships with suppliers who continue to meet your business' needs.

5. How does a firm forecast demand and price of materials for purchase?

Demand forecasting is the process of estimating future demand for a product or service, which then informs businesses about the estimated product or service quantity that consumers may want to purchase over a period of time. Accurate forecasting is important for businesses to plan production in order to meet customer demand.

6 types of demand forecasting

There are several methods of demand forecasting. Your forecast may differ based on the demand forecasting models you use. Best practice is to do multiple demand forecasts.

Passive demand forecasting

Passive demand forecasting is the simplest type. In this model, you use sales data from the past to predict the future. You should use data from the same season to project sales in the future, so you compare apples to apples. This is particularly true if your business has seasonal fluctuations.

The passive forecasting model works well if you have solid sales data to build on. In addition, this is a good model for businesses that aim for stability rather than growth. It's an approach that assumes that this year's sales will be approximately the same as last year's sales.

Passive demand forecasting is easier than other types because it doesn't require you to use statistical methods or study economic trends.

2. Active demand forecasting

If your business is in a growth phase or if you're just starting out, active demand forecasting is a good choice to help you make informed decisions. An active forecasting model takes into consideration your market research, marketing campaigns, and expansion plans.

Active projections will often consider external factors. Considerations can include the economic outlook, growth projections for your market sector, and projected cost savings from supply chain efficiencies. Startups that have less historical data to draw on will need to base their assumptions on external data.

3. Short-term projections

Short-term demand forecasting looks just at the next three to 12 months. This is useful for managing your just-in-time supply chain. Looking at short-term demand allows you to adjust your projections based on real-time sales data. It helps you respond quickly to changes in customer demand.

If you run a product lineup that changes frequently, understanding short-term demand is important. For most businesses, however, a short-term forecast is just one piece of a larger puzzle. You'll probably want to look further out with medium- or long-term demand forecasting.

4. Long-term projections

Your long-term forecast will make projections one to four years into the future. This forecasting model focuses on shaping your business growth trajectory. While your long-term planning will be based partly on sales data and market research, it is also aspirational.

Think of a long-term demand forecast as a roadmap. Using this forecasting technique, you can plan out your marketing, capital investments, and supply chain operations. That will help you to prepare for future demand. Being ready for your business growth is crucial to making that growth happen.

5. External macro forecasting

External macro forecasting incorporates trends in the broader economy. This projection looks at how those trends will affect your goals on a macro-level. An

external macro demand forecast can also give you direction for how to meet those goals.

Your company may be more invested in stability than expansion. However, a consideration of external market forces is still essential to your sales projections. External macro forecasts can also touch on the availability of raw materials and other factors that will directly affect your supply chain.

6. Internal business forecasting

One of the limiting factors for your business growth is internal capacity. If you project that customer demand will double, does your enterprise have the capacity to meet that demand? Internal business demand forecasts review your operations.

The internal business forecasting type will uncover limitations that might slow your growth. It can also highlight untapped areas of opportunity within the organization. This forecasting model factors in your business financing, cash on hand, profit margins, supply chain operations, and personnel.

Internal business demand forecasting is a helpful tool for making realistic projections. It can also point you toward areas where you need to build capacity in order to meet expansion goals.

5 demand forecasting methods

There are many different ways to create forecasts. Here are five of the top demand forecasting methods.

1. Trend projection

Trend projection uses your past sales data to project your future sales. It is the simplest and most straightforward demand forecasting method.

It's important to adjust future projections to account for historical anomalies. For example, perhaps you had a sudden spike in demand last year. However, it happened after your product was featured on a popular television show, so it is unlikely to repeat.

2. Market research

Market research demand forecasting is based on data from customer surveys. It requires time and effort to send out surveys and tabulate data, but it's worth it. This method can provide valuable insights you can't get from internal sales data. You can do this research on an ongoing basis or during an intensive research period. Market research can give you a better picture of your typical customer.

3. Sales force composite

The sales force composite demand forecasting method puts your sales team in the driver's seat. It uses feedback from the sales group to forecast customer demand.

Your salespeople have the closest contact with your customers. They hear feedback and take requests.

4. Delphi method

The Delphi method, or Delphi technique, is one of the qualitative methods of demand forecasting that leverages expert opinions on your market forecast. This method requires engaging outside experts and a skilled facilitator.

5. Econometric

The econometric method requires some number crunching. This quantitative type of forecasting combines sales data with information on outside forces that affect demand. Then you create a mathematical formula to predict future customer demand.

UNIT-V

13 MARKS:

1. Explain the importance of scrap –value analysis in warehouse management.

Scrap value is the market price that can be obtained for the individual components of an asset. This value is derived when the owner of an asset is deciding whether to incur costs to maintain it or to stop maintaining it, tear it down, and sell the parts. The scrap value of an item can vary substantially over time, based on the supply of and demand for it.

Impacts of Scrap Values

- A corporation can suffer if the salvage value is set too high or too low.
- Depreciation would be underestimated if the threshold was set too high.
- Net income would be exaggerated.
- On the balance sheet, total fixed assets and retained earnings would be inflated.

If it is set too low, depreciation will be exaggerated.

- Net income would be considerably exaggerated.
- On the balance sheet, total fixed assets and retained earnings would be understated.
- The debt-to-equity ratio and loan collateral values would be lower.
- This could lead to issues obtaining future funding or a breach of loan covenants requiring the company to maintain specific minimum debt ratio levels.

Scrap inventory needs to be recorded for several reasons:

Cost reduction — Scrap inventory can be sold to scrap dealers or recycling companies, generating revenue that can offset some costs associated with production. By recording the value of scrap inventory, a business can accurately track the cost of goods sold and reduce the amount of waste generated, thereby reducing costs.

Financial reporting — Accurately recording scrap inventory is crucial for financial reporting. It helps to provide a more accurate picture of a company's financial position and can help with forecasting and decision-making.

Inventory management — By tracking scrap inventory, a business can better manage its inventory levels, reduce waste, and ensure that it has sufficient supplies on hand to meet demand and avoid stockouts. This can help to improve production efficiency and reduce costs.

Environmental compliance — Properly disposing of scrap inventory is important for environmental compliance. Some types of scrap inventory may contain hazardous materials that require special handling and disposal procedures to prevent environmental damage. By properly tracking and disposing of scrap inventory, a business can ensure that it is meeting all relevant environmental regulations.

Overall, recording scrap inventory is important for financial, operational, and environmental reasons, and can help businesses to improve their efficiency and profitability.

Types of scrap inventory

Inventory scrap can come in various forms, each with its unique characteristics and challenges. Here are some common ways that can create scrap items in inventory:

Manufacturing scrap — This type of scrap inventory is generated during the manufacturing process. It includes any raw materials or partially completed products that cannot be used due to defects, errors, or inefficiencies in the production process. For example, metal sheets that are cut up and the remaining excess is too small to use be used anywhere.

Damaged goods — These products have been damaged during storage, handling, or transportation. This can occur due to mishandling, accidents, or environmental factors such as exposure to extreme temperatures or humidity. Damaged goods may be unsellable or require repair before being sold.

Expired goods — Perishable goods such as food and medicines have a limited shelf life and can expire if not sold or consumed within a certain time frame. Expired perishable goods cannot be sold or used and must be disposed of.

Obsolete inventory — These are products or materials that are no longer in demand or valuable. This can occur due to technological changes, market trends, or customer preferences. Obsolete inventory ties up valuable storage space inflating carrying costs and can be a financial burden for a company.

Defective products — Defective products are flawed or non-functional and do not meet quality standards. Faulty products may be returned by customers, leading to loss of revenue and reputation damage. They may also be caught during quality control inspections and rejected before they are shipped to customers.

2. Describe the stores accounting and stock verification process and the reasons for failure of stock verification

Stores Accounting Systems

Stores accounting is important from the point of view of estimating the cost of the product for pricing decisions. The costing of material has to be done both for the materials consumed in the production and estimating the value of materials held in stock.

For the purpose of costing the receipt of materials, the factors that should be included are material price, freight charges, insurance, duties, taxes, packaging charges etc. The prices quoted and accepted in purchase order may often be stated in various ways such as net prices, prices with discount terms, free on board, cost, insurance, freight, etc. All these factors should be appropriately accounted while costing for the incoming materials.

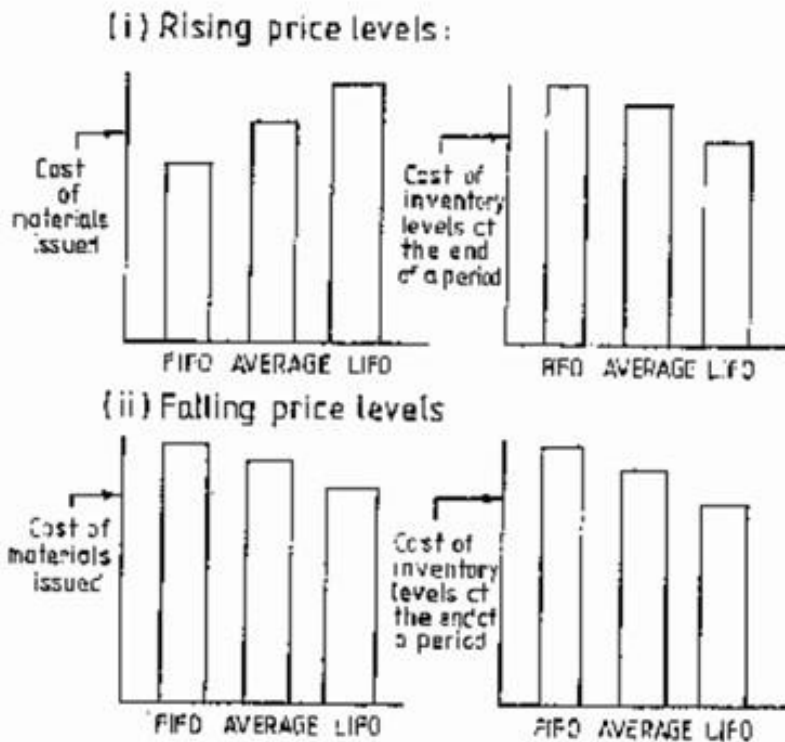
Another important accounting is to be done for the issue to production and of the stocks held at the end of accounting period. Let us discuss some of the important and frequently used system for this purpose:

FIFO System: This system known as First in First Out System is based on the assumption that the oldest stock is depleted first. Therefore, at the time of issue the rate pertaining to that will be applied. There is no 'profit' or 'loss' in the pricing arrangements. The value of the stocks held on hand is the money that has been paid for that amount of stock at latest price levels. In case of too many changes in price levels the FIFO System becomes unwieldy. Another limitation of this system is that it fails to provide a satisfactory answer to costing-returns from stores.

LIFO System: This system known as 'Last in First Out' System is based on the assumption that the most recent receipts are issued first. As the latest prices are charged in this system, it leads to lower reported profits in the periods of rising prices and this offers savings in taxes. In case of wide fluctuations in prices this system tends to immunize unrealized gains or losses in inventory. It has almost the same limitations as that of FIFO System.

Average Cost System: This is based on the assumption that issues to production department are equally made from different shipments in stock, i.e. an average cost of shipment in stores is charged. It stabilizes the cost figures. The average is to be calculated by dividing the total cost with the number of items and is to be updated with every new purchase.

Figure V: Comparison of stores Accounting Systems



Market Value System: This is also known as replacement rate costing, in which the materials issued are charged the prevailing market rates. This system underestimates the stock on hand in the case of price increase, whereas it overestimates the stock on hand in the case of price decrease. This may in turn lead to writing off huge amount to make it realistic. Moreover, a continuous monitoring of the market rates for all materials makes the system cumbersome.

Standard Cost System: In this system a detailed analysis of market price and trends is carried out to determine a standard rate for a fixed period, say six months or so. This standard rate is charged to materials issued during this period irrespective of the actual rate. After the period is over the standard rate is reviewed and updated.

This system reflects the efficient use of materials as the fluctuation in rates is not considered in accounting. Moreover, it adds to clerical efficiency as the fresh rates are not to be obtained every time. However, similar to Market Value Approach, this also leads to underestimating or overestimating stocks on hand in case of rising and falling prices respectively.

System of Costing the Closing Stock: The general guideline for this purpose is to use market price or stock at cost, whichever is less.: The cost of closing stock is governed mainly by price units, obsolescence and deterioration. In rare cases the stock may appreciate with time. Appropriate formulae to account for these factors should be developed keeping in view the past experience.

Stock Verification Systems

Some discrepancies between the actual and the book balances of inventories are bound to occur despite the diligent store keeping. The process of stock verification is carried out for following purposes:

- To reconcile the store records and documents for their accuracy and usefulness,
- Identification of areas deserving tighter document control,
- To back-up the balance sheet stock figures, and
- To minimize the pilferage and fraudulent practices

Most companies keep an “inventory short and over” account to absorb such discrepancies, which is eventually closed into the manufacturing overheads account.

Reasons for failure of stock verification

Surpluses:

Surpluses arise for the following three reasons:

- (a) Where materials are not issued from the bins, but the entry of issues is posted.
- (b) Where the number of materials issued is less than the quantity for which entry (issue) is made.
- (c) Where no issues are made but only issue entry is made in the stock record.

Shortages:

Shortage may occur for the following six reasons:

- (a) Excess physical issue than the actual issue entries posted.
- (b) Issues made but corresponding entries not made in issue column.
- (c) Excess quantity issued than the quantity for which entries are made in the issue column.
- (d) Issue of materials without requisition.
- (e) Misappropriation.
- (f) Defective instruments.

3. Why is store layout important? Describe the factors to keep in mind while deciding on the store layout.

To design an innovative retail environment, a brand often relies on store layout and floor planning. Layout is an important strategy for retail success. Retailers use layout to influence customers' behavior by designing the store's flow, merchandise placement and ambiance. Layouts are also helpful in estimating revenue per square foot as well as assessing the strengths and weakness of a firm's merchandising mix.

Benefits of store layout:

1. Determine and influence consumer's shopping pattern

It is a proven fact that how a store is designed has a huge impact on customer's shopping behavior. The longer a customer spends time in a store, the more they are likely to purchase. Hence retailers utilize every opportunity available to increase purchase time. For example, most retailers position necessities such as milk, bread, and eggs towards the back of the store in an attempt to force customers to navigate through other merchandise to get them. Not just that the placement of elevators, arrangement of fixtures and even the placement of departments can affect a store's traffic.

2. Optimize available retail space

Considering the limited amount of space available to a retail store, optimizing every inch of it is beyond critical for the success of any brick-and-mortar store. With the right store design and floor layout retailers can be assured that optimum space is allocated to each brand based on its selling potential and customer demand. So, if a specific area is lacking in sales, the retailer can rearrange merchandise to meet sales goals. For example, a high price mobile phone will be merchandised alongside low-priced accessories. Here, the high-priced items will be allotted more space while low priced items will be stacked on a fixture next to these to increase the sale of both items.

3. Create a positive store atmosphere

Every retailer wants customers to feel comfortable and at ease while shopping so that they reflect the same sentiments to the items they intend to buy. A store layout can directly impact the emotions invoked in a shopping experience. Even a store with great interiors can ruin shopping experience of customers if they do not focus on the right layout.

The interior retail store layout has two important components:

- **Store Design:** The use of strategic floor plans and space management, including furniture, displays, fixtures, lighting, and signage. Website designers and user experience (UX) researchers use space management

techniques and web design principles to optimize e-commerce websites. We'll further discuss a variety of popular retail floor plans later in this article.

- **Customer Flow:** This is the pattern of behavior and way that a customer navigates through a store. Understanding customer flow and the common patterns that emerge when customers interact with merchandise based on the store layout is critical to retail management strategy. Physical retailers are able to track this using analytics software and data from in-store video and the wifi signal from smartphones. While the exterior retail store layout includes exterior store design and customer flow,

it also includes the following factors:

- Geographic location of the retail store (real estate)
- Size of the building and length of the walkways accessible from the entrance and exit
- Use of furniture and exterior space for people to gather and interact
- Style of architecture of the retail building
- Color of paint and choice of exterior building materials
- Design of the physical entrance and exterior window displays
- Consider the traffic flow & shopper behavior
- Understand your store's product range & category roles
- Use smart product placement for maximum exposure of aisles

4. List out and briefly describe the various elements of stores management.

Store management involves operating and monitoring all aspects of a retail or wholesale store. This means working with employees, suppliers and customers. Effectively managing a store can boost sales and improve the customer experience. This role involves many retail elements, including inventory, sales and marketing.

3 Components of Store Management

Fulfilling all of the obligations pertaining to the management process can enhance a retail operation's overall success and profitability. The 3 core components of productive store management include-

1. Supporting and Encouraging Staff

According to reports by the National Retail Federation, the retail industry's average turnover rate is above 60 percent. Store managers have an important role in supporting and motivating staff to enhance employee retention. For example, providing incentives or communicating with retail employees can promote a

positive

environment.

Recruiting and Hiring

One way to minimize employee turnover is by hiring dependable candidates whose skill sets align with the job description and who will fit in well with the company's culture.

During the recruitment process, managers should indicate clear expectations for the role and ask candidates questions that provide insight into how they work under pressure.

Onboarding

Managers should conduct thorough training to ensure their new hire's transition into the position is seamless. Comprehensive onboarding should include training on how to use the point-of-sale (POS) system and tips on increasing sales. To monitor an employee's onboarding progress, managers should set performance goals and milestones for new hires to meet.

Managing

Although a new employee may be fully onboarded, managers should still interact with them to make sure they are meeting their goals and making progress. It is also important that management teams listen to their store staff, encourage new ideas, and address any challenges that may arise. This is important because managers must keep store employees motivated to ensure that they work hard and productively.

2. Proactively Controlling Inventory

For a retail business to flourish and operate smoothly, inventory must be kept at optimal levels at all times. By properly controlling stock levels, [businesses](#) will minimize their risk of profit deficit. For instance, stock-outs can lead to loss of potential sales and customer loyalty, as shoppers seek competitors to purchase the products they need. On the other hand, overstocking store inventory causes carrying costs to rise since unsold products will take up storage space.

Conduct Physical Inventory Counts

Retail managers should implement regular cycle counts to track inventory on a routine basis. Cycle counting is an inventory auditing technique where a small portion of the inventory is counted on a specific day. By conducting cycle counts, management can quickly monitor their inventory and identify popular items that may need to be restocked.

Prevent Theft

Theft can occur externally by customers or internally by employees. Implementing loss prevention practices can help businesses detect any shrinkage and allow them

to have more visibility into their day-to-day inventory.

Work with Staff

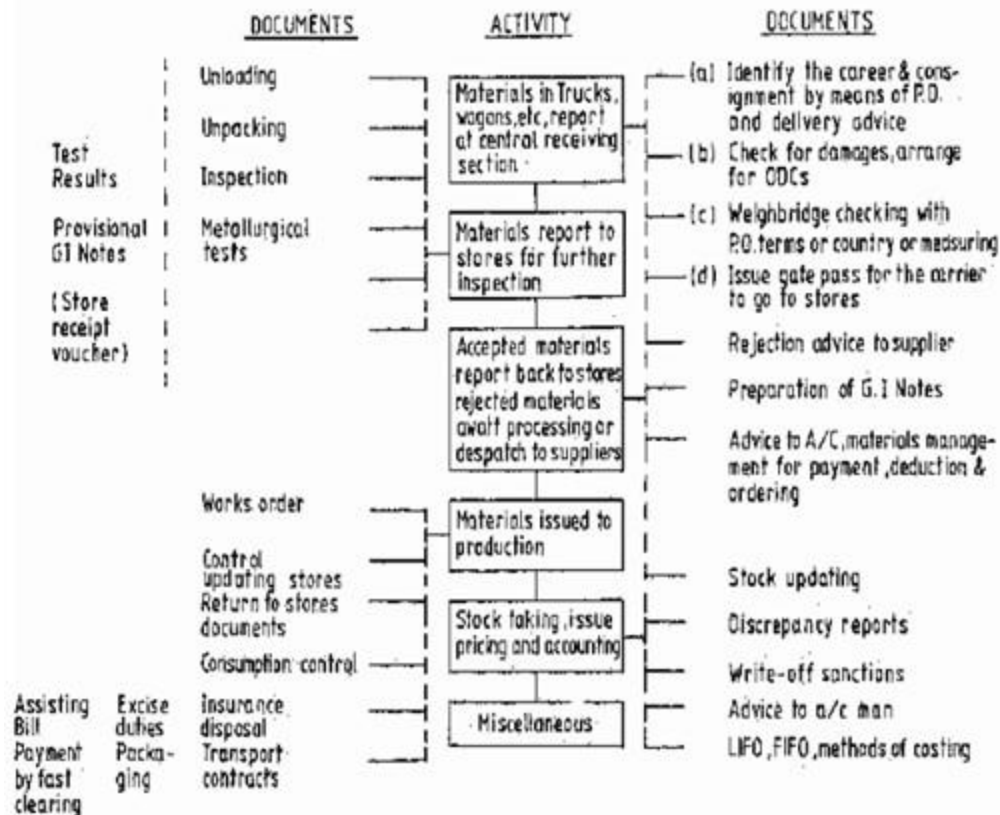
Store managers should delegate tasks and work with staff to control stock. By communicating the importance of inventory and providing related training, businesses will have extra help with making sure stock is properly maintained.

3. Implementing Management Tools

Store management can be streamlined with the latest digital tools and software. For example, retailers can implement cloud POS systems that have advanced features, such as real-time reporting. These solutions can also be integrated with other software, such as inventory management and forecasting. This is important because executive teams will be able to produce data reports, track their inventory, and oversee their financial performance.

5. Explain the systems and procedures used in stores management. Why is it essential to have a standardized stores management procedure?

The systems and procedures in stores can be broadly studied under four heads, viz. identification system, receipt system, storage system and issue system. The overall system of store functioning along with the major input-output documents at each state is shown in Figure I. A substantial amount of information is required, at every stage, for checking, controlling and feedback purposes. The stores systems have been discussed with reference to the physical system as well as the recording or information system.



Identification System

The stores management is concerned with the design and control of the systems utilized in conducting the. Store activities A large number of materials are being handled by typical stores. Thus the development of an unambiguous and efficient identification system is the first responsibility confronting a store's manager so as to facilitate clear internal communication.

The physical description of each item is usually lengthy and imprecise to be taken for the purposes of identification in day-to-day operations. Moreover, it cannot be operated on mechanical or electronic computing devices, the use of which is increasing every day in automating the clerical operations of the stores. One kind of identification of the parts can be done with the supplier's part numbers. But each supplier has got his own codification system and it will be cumbersome to operate on these numbers for the identification of different parts.

Thus the need to develop a proper identification system to coordinate the activities of purchasing inventory control and stores departments with possible integration with the operations of design engineering, production and cost accounting can hardly be overemphasized. The use of codification of parts can be done in any one of the following. ways:

Arbitrary approach: The inventory items are given an arbitrary number in the sequence in which these are added in the stores account. Clearly, each item gets a discrete number but there is no systematic relationship to the numbers assigned to related items.

The symbolic approach: This is a very systematic approach to the design of codification system. The codes assigned to different parts may be numeric or mnemonic (alpha numeric). A numerical system assigns a six to ten digit code number to each item to develop the classification from broader to specific categories. This is illustrated with the help of following example:

The code number of an item is 152 43 25; the explanation is as follows:

First digit	1	General-class
Next two digits	52	Generic class
Next two digits	43	Subclass
Last two digits	25	Specific item numbers

This code is based on the assumption that there are maximum 10 general classes, 100 generic classes, 100 sub-classes in each generic class and 100 specific items in each sub class. If it is more than this limit in any of the categories, one more digit is to be added for that category. The general classification of the parts may be done as follows:

Code	General Class
1	Raw materials
2	Purchased parts
3	Manufactured parts
4	Work in process
5	Spares.

This mnemonic or alphanumeric system combines the numeric and alphabetic notations. This makes the visual identification easier because they are more descriptive and often shorter. Atypical example is.

R	Ba.	RS	21
↓	↓	↓	↓
Raw material	Bars	Round, steel	Specific number of size

As the number of good alphabetical symbols is limited the system may not work with larger number of items.

The use of engineering drawing number: The number in the engineering drawing at times is used as an identification number in the stores. This has the advantage of better internal communication as this number is used by other departments. But it has the major limitation that it can be only for manufactured items; for bought out items a separate system is to be devised. Further, it has the non-sequencing disadvantage of arbitrary system.

Receipt System

The stores department receives the stores both from outside suppliers and internal divisions and accordingly there are separate receipt systems. The system of receipt starts much before the physical receipt of the materials in the stores. It starts with the placement of purchase order by the purchasing department, a copy of which is sent to stores. This is maintained in chronological order, so as to give an idea at any time about the volume of receipt, and helps in the planning of receipt, unloading, unpacking and other related activities. Further, the supplies while dispatching the Stores Management goods normally send an advice note to the stores.

Final G.I. Note

Material Part No :—		Serial Number :—
Description :—		
P.O. Reference :—		
Carrier details	Supplier details	Inspection report
Truck / wagon R/R: Consignment note	Supplier code Supplier name	Test Results Conclusions
Quantity received	_____	Damage/Shortage :—
Quantity accepted	_____	Shortage claim ref :—
Quantity rejected	_____	
Sd/- Central Receiving Section Date :	Sd/- Inspection Department Date :	Sd/- Stores Department Date :
Copies to:		
Accounts	:	Attention bills / Insurance & claims
Indentor	:	For information
Materials	:	For updating and expediting
Management Dept.	:	
Stores	:	For stock records and reference

In case of materials received from internal divisions or returned from user departments transfer notes or 'Return to Stores documents' are used. In some cases, Stores Department also handles the scraps. Usually scrap cards are prepared to indicate the nature and weight of the scrap:

Storage System

A Physical System: The design of proper shortage system is very important for easy location, proper identification, and speedy issue to the consuming department. The commonly followed systems for physically controlling stores materials are: closed stores system, open stores system and random access stores system. A single firm can follow a combination of these systems depending upon the nature of production operation and the use of materials.

Closed Stores System: In such a system all materials are physically stored in a closed or controlled area, usually kept in physical control by locking. Only stores personnel are permitted to enter the stores area. Entry and exit of the material from the area is permissible only with the accompaniment of authorizing document. Maximum physical security and tight accounting control of inventory material are ensured by such a storage system.

Open Stores System: In this system no separate store room exists. The material is stored as close to the point of use as is physically possible. Such a system finds applicability in the highly repetitive, mass production type of systems exhibiting a continuous and predictable demand, e.g. automobile assembly plant. The storage facilities are arranged at each work station as per requirement and availability of space. The storage facilities are open and worker has direct access to it; no authorization document is needed.

Random Access Stores System: This is a typical kind of closed stores system in which no material has a fixed location, All materials are stored at random locations throughout the store room. However, similar types and sizes of storage equipment are grouped together. When an item enters the stores, it is stocked at the first available storage location for that particular group, and when it leaves the storage, location becomes empty for any other item of the same group.

B Store Records System: Development of appropriate recording system for stores is important to provide right information regarding the physical inventory and accounting of the transaction. Two records are usually kept of materials and other goods received, issued or transferred, namely, on Bin (or Stock) Cards and in the Store Ledger.

Bin Cards: For each kind of material, a separate record is kept on Bin Card which shows details of quantities of each type of material received, issued and on hand each day. A typical Bin Card is shown in Figure III. The Storekeeper maintains the Bin Cards up-to-date and usually in duplicate. One card is attached to each bin on shelf containing the material and record remains with the storekeeper for reference. Some firms use the KARDEX System in which a Kardex is prepared and updated. Bin cards are also used as a check on the stock Ledger accounts in the material accounting division.

Figure III: Bin or Stock Card

BIN CARD				
Bin No.....		Maximum Quantity.....		
Material		Ordering Level		
Code No		Minimum Quantity.....		
Stores Ledger Folio.....				
Date	Quantity Received	Quantity Issued	Balance	Remarks

Stores Ledger: It is identical with bin card except that here money values are shown. The store ledger may be maintained by a separate material accounting department. The entries regarding the materials ordered, received and issued are made from the purchase order, receiving section report and the material requisitions respectively.

Issue System

This is the last stage in the stores system. Issues can be of two kinds, i.e., issues to consuming departments, and issues to outside supplies for processing. In both the cases there are certain common requirements. The control of issues is regulated by production programmers. Based on the programme and the bill of materials work orders are prepared, listing for each material quantity to be issued and the corresponding quantity of the component to be manufactured