INVENTORY CONTROL AND TYPES OF INVENTORY

DR. BHAWANA YADAV
ASSISTANT PROFESSOR
MBA

Production Choices

- **Make-to-stock**
  - Number of units of each product are kept on hand at all times
  - Quick delivery to customers upon receipt of an order
  - When delivery response time is a key competitive factor
  - Limited number of products manufactured repeatedly
  - An idea what customers will want
  - Allows to schedule production in advance
- **Make-to-order**
  - Only produce items after they have been ordered
  - Production system must respond quickly
  - Products have high degree of customization
  - Shelf life of products is short
- **Assemble-to-order**
  - Customers have influence on the design
  - They can select various options from predesigned subassemblies

The Role of Inventory

- Inventory consists of physical items moving through the production system
- Originates with shipment of raw material and parts from the supplier
- Ends with delivery of the finished products to the customer
- Costs of storing inventory accounts for a substantial proportion of manufacturing cost
  - Often 20% or more
- Optimal level of inventory
  - Allows production operations to continue smoothly
- A common control measure is **Inventory Turnover**

Inventory Turnover

- The ratio of annual cost of goods sold to average inventory investment.
- It indicates how many times a year the inventory is sold.
- Higher the ratio, the better, because it implies more efficient use of resources.
- Higher the profit margin and longer the manufacturing lead time, the lower the inventory turns.
- Example: Supermarkets (low profit margins) have a fairly high turnover rate

Inventory Definitions and Decisions

- **Batch or order size, Q**
  - Batch size is the number of units released to the shop floor to be produced
- **Reorder point, r**
  - Specifies the timing for placing a new order
- **Inventory Position**

  Inventory Position = Inventory On Hand + On Order – Backorders
- **Units on order**
  - Have been ordered but not yet arrived
- **Backorders**
  - Items promised to customers but not yet shipped
  - New units are shipped out to cancel backorders

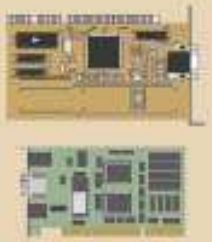
Types of Inventory

- **Raw Materials**
  - Essential to the production process
  - Often kept in large quantities on site
- **Finished Goods**
  - Completed products awaiting shipment to customers
- **Work-in-Process (WIP)**
  - Batches of semi finished products currently in production
  - Batches of parts from time of release until finished goods status
- **Pipeline**
  - Goods in transit between facilities
  - Raw materials being delivered to the plant
  - Finished goods being shipped to warehouse or customer

Types of Inventory

Raw materials

Components



Work-in-process (WIP)

Finished goods

Distribution inventory

Maintenance, repair & operating supplies (MRO)

Justification of Inventory

- Inventory will always exist
- Competitive pressure to supply common products quicker than they can be produced imply finished goods inventory must be kept near the customer
- Price breaks are common when large quantities of material and parts are purchased
- We may store inventory in periods of low demand and consume them in periods of large demand to smooth production rate (seasonal demand)
- Speculation

Inventory Costs and Tradeoffs

- Holding inventory is costly
- In constructing economic models for choosing the optimal levels of inventory, trade of the costs caused by:
  1. Ordering or set up of machines
  2. Investing and storing the goods
  3. Shortages (not having inventory available when needed)

Ordering Costs

- A fixed ordering cost can be associated with each replenishment when parts are ordered from suppliers
  - Identifying the need to order
  - Execute the order
  - Prepare the paperwork
  - Place the order
  - Delivery cost fixed component
  - Receiving inspection
  - Transportation to place of use
  - Storage

Setup Costs

- For parts produced in-house, we must:
  - Check status of raw material
  - Possibly place an order
  - Create route sheets with instructions for each stage of the production process
  - Store routing data in a database
  - Check routing data for compatibility with shop status and engineering changes
  - Make routing instructions with raw material
  - Deliver to production workers
  - Machine set up

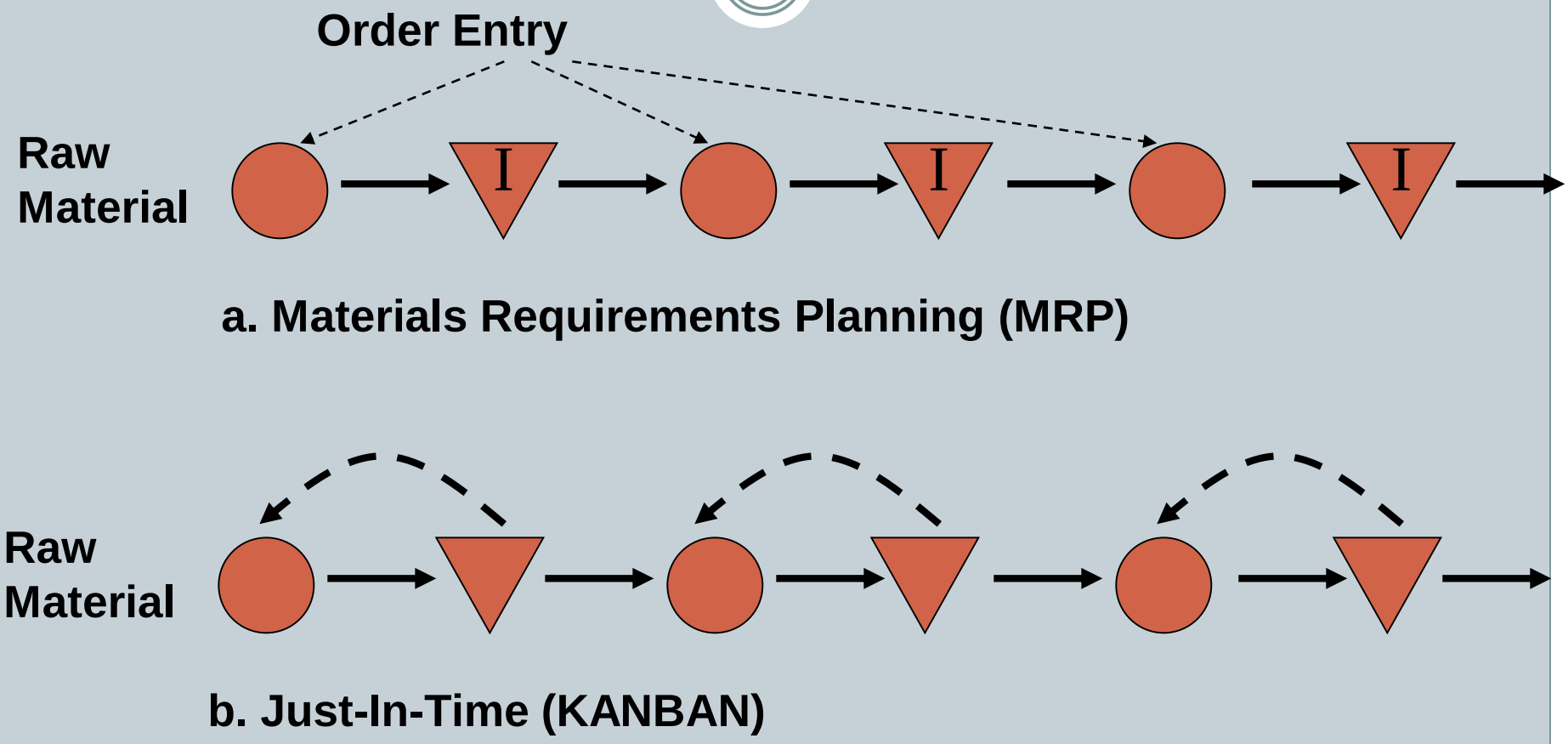
Inventory Carrying Costs

- Carrying inventory incurs a variety of costs
  - Space heated and cooled
  - Move inventory occasionally because it blocks access to other goods
  - Construct and maintain information system to track location
  - Pay taxes based on value
  - Insurance costs
  - Some will be lost, damaged, or perished
  - Cost of capital invested in inventory

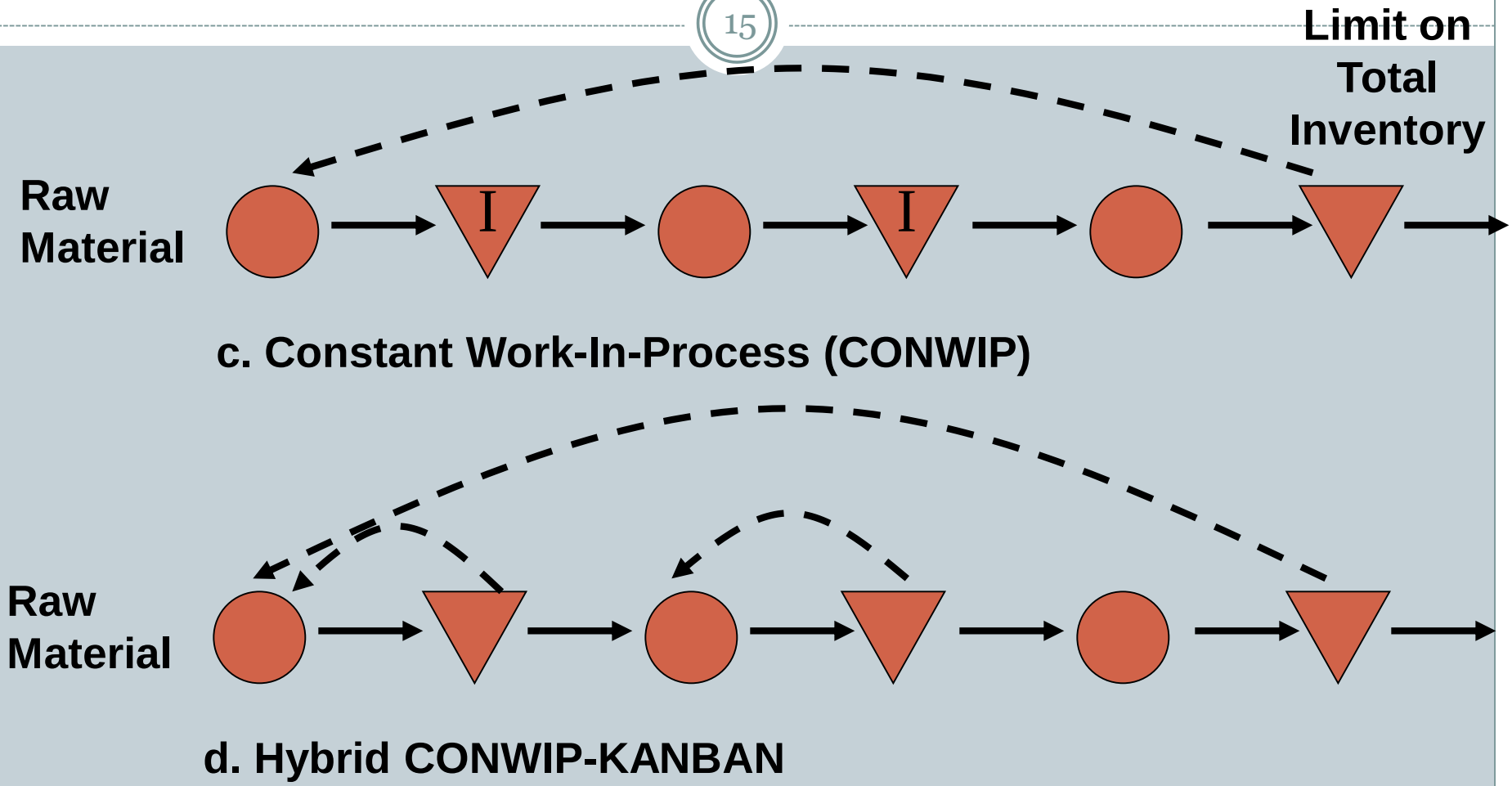
Shortage Costs

- When customer demands an out of stock item
  - May decide to wait for delivery - backorders
  - May cancel the order – lost sales
  - May look elsewhere next time – lost customer
  - May pay expedite charges
- Within the plant, if material is unavailable to start production
  - Work center may lack work
  - Schedule may have to be modified
  - Completion of products may be delayed
  - Result in late deliveries or lost sales

Information Flow for Various Production Systems



Information Flow for Various Production Systems



Inventory is Needed to Support Production

- Recent years claim a goal of *zero inventory*
  - But some is necessary to meet needs
  - Economically practical to maintain some WIP to facilitate production scheduling
  - Variability in processing time and job arrival rates
- Inventory should not be used to cover problems
  - Wasteful practice all too common
  - Prevents the system from improving
  - Defects not detected until later
- Lean companies
  - Operate with reliable processes, quick changeovers, low inventories, small space, low scrap and rework, closer communication

Inventory Management

- How much to order of each material when orders are placed with either outside suppliers or production departments within organizations
- When to place the orders

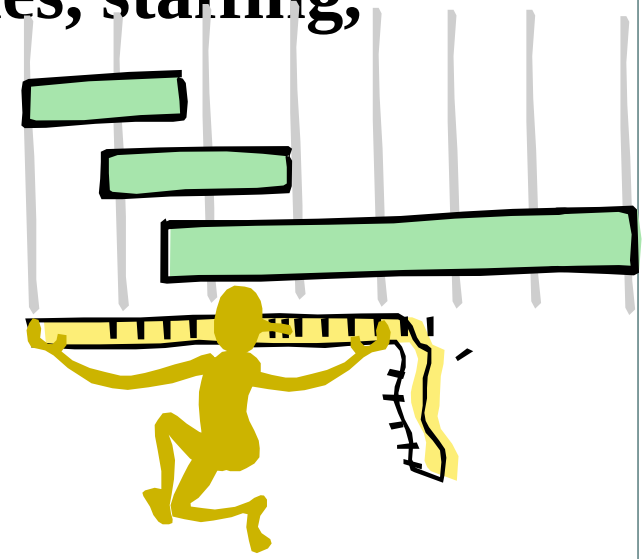
The overall objective of inventory management is to achieve satisfactory levels of customer service while keeping inventory costs within reasonable bounds by answering these two questions .

Material Requirement Planning

- Objective: **Determine all purchase and production components needed to satisfy the aggregate/disaggregate plan.**
- Issues:
  - ***Bill of Materials***: Determines components, quantities and lead times.
  - ***Inventory Management***: Must be coordinated with inventory.

Sequencing and Scheduling

- Objective: **develop a plan to guide the release of work into the system and coordination with needed resources (e.g., machines, staffing, materials).**



- Methods:
  - ***Sequencing***:
    - Gives order of releases but not times.
  - ***Scheduling***:
    - Gives detailed release times.