Inventory Management, Just-in-Time, and Backflush Costing
Inventory Management in Retail Organizations

- Inventory Management is
  - planning
  - coordinating
  - controlling
  activities related to the flow of inventory
    - into,
    - through
    - out of
  an organization
Costs Associated with Goods for Sale

- Managing inventories to increase net income requires effectively managing costs that fall into these five categories:

1. Purchasing Costs
2. Ordering Costs
3. Carrying Costs
4. Stockout Costs
5. Quality Costs
Management of Inventory Costs

- **Purchasing Costs**
  - the cost of goods acquired from suppliers, including freight

- **Ordering Costs**
  - the costs of preparing and issuing purchase orders
  - receiving and inspecting the items included in the orders
  - matching invoices received, purchase orders, and delivery records to make payments

- **Carrying Costs**
  - the costs that arise while holding inventory of goods for sale. This includes the opportunity cost of the investment tied up in inventory, and costs associated with storage
Management of Inventory Costs

- **Stockout Costs**
  - the costs that result when a company runs out of a particular item for which there is customer demand (stockout) and the company must act quickly to meet the demand or suffer the costs of not meeting it

- **Quality Costs**
  - the costs that result when features and characteristics of a product or service are not in conformance with customer specifications
  - these costs include:
    1. Prevention
    2. Appraisal
    3. Internal Failure
    4. External Failure
The First Step in Managing Goods for Sale

- The first decision in managing goods for sale is how much to order of a given product.
- Economic Order Quantity (EOQ) is a decision model that calculates the optimal quantity of inventory to order under a given set of assumptions.
Basic EOQ Assumptions

- There are only ordering and carrying costs
- The same quantity is ordered at each reorder point
- Demand, purchase-order lead time, ordering costs, and carrying costs are known with certainty
- Purchasing costs per unit are unaffected by the quantity ordered
- No stockouts occur
- EOQ ignores purchasing costs, stockout costs, and quality costs
EOQ Basic Formulas

\[ RTC = \frac{D}{Q} P + \frac{Q}{2} C \quad \text{EOQ} = \sqrt{\frac{2DP}{C}} \]

- D = Demand in units for specified period
- P = Relevant ordering costs per purchase order
- C = Relevant carrying costs of one unit in stock for the time period used for D
- Q = Quantity ordered
Ordering Points

- The second decision in managing goods for sale is when to order a given product
- Reorder Point
  - the quantity level of inventory on hand that triggers a new purchase order

Reorder Point = \( \text{Number of units sold per unit of time} \times \text{Purchase-order lead time} \)
Inventory Management and Safety Stock

- Safety Stock is inventory held at all times regardless of the quantity of inventory ordered using the EOQ model.
- Safety stock is a buffer against unexpected increases in demand, uncertainty about lead time, and unavailability of stock from suppliers.
- Frequency distribution based on prior demand levels:

<table>
<thead>
<tr>
<th>Total demand per period</th>
<th>2,500 units</th>
<th>3,000 units</th>
<th>3,500 units</th>
<th>4,000 units</th>
<th>4,500 units</th>
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</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.1</td>
<td>0.35</td>
<td>0.3</td>
<td>0.2</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Estimating Inventory-Related Relevant Costs

- Carrying Costs
  - Relevant inventory carrying costs consist of relevant *incremental costs* and the *relevant opportunity cost of capital*
  - Relevant Incremental Costs:
    - those costs of the purchasing firm that change with the quantity of inventory held
  - Relevant opportunity costs of capital
    - the return forgone by investing capital in inventory rather than elsewhere. This cost equals the required rate of return multiplied by the unit costs that vary with the number of units purchased and are incurred at the time the units are received
Just-in-Time Purchasing

- Just-in-Time (JIT) Purchasing is the purchase of materials or goods so they are delivered just as needed for production or sales.
- JIT is popular because carrying costs are actually much greater than estimated because warehousing, handling, shrinkage, and investment costs have not been correctly estimated.
- JIT reduces the cost of placing a purchase order because:
  - Long-term purchasing agreements define price and quality terms. Individual purchase orders covered by those agreements require no additional negotiation regarding price or quality.
  - Companies are using electronic links to place purchase orders at a small fraction of the costs of traditional methods (phone or mail).
JIT Purchasing and Supply-Chain Analysis

- Supply chain describes the flow of goods, services, and information from the initial sources of materials and services to the delivery of products to consumers (both inside and outside the firm)
- Supply chain members share information and plan/coordinate activities
- Supplier evaluations are critical to JIT purchasing implementation
Materials Requirements Planning (MRP)

- a “push-through” system that manufactures finished goods for inventory on the basis of demand forecasts

MRP uses three information sources to determine the necessary outputs at each stage of production:

- Demand forecasts of final products
- A bill of materials detailing the materials, components, and subassemblies for each final product
- The quantities of materials, components, and product inventories to determine the necessary outputs at each stage of production
Materials Requirements Planning (MRP)

- Takes into account lead time to purchase materials and to manufacture components and finished products
- Sets a master production schedule specifying quantities and timing of each item to be produced
- The output of each department is pushed through the production line whether it is needed or not
- “Push Through” may result in an accumulation of inventory
Inventory Management and JIT Production

- JIT (Lean) Production – is a “demand-pull” manufacturing system that manufactures each component in a production line as soon as and only when needed by the next step in the production line.
- Demand triggers each step of the production process, starting with customer demand for a finished product and working backward.
- Demand pulls an order through the production line.
- JIT Production Goals:
  - Meet customer demand in a timely basis.
  - With high quality products.
  - At the lowest possible cost.
JIT Production Features

- Production is organized in manufacturing cells, a grouping of all the different types of equipment used to make a given product
- Workers are hired and trained to be multi-skilled (cross-trained)
- Defects are aggressively eliminated
- Setup time is reduced
- Suppliers are selected on the basis of their ability to deliver quality materials in a timely manner
Other Benefits of JIT Production

- Lower overhead costs
- Lower inventory levels
- Heightened emphasis on improving quality by eliminating the specific causes of rework, scrap, and waste
- Shorter manufacturing lead times
JIT and Enterprise Resource Planning Systems (ERP)

- JIT success hinges on the speed of information flows from customers to manufacturers to suppliers
- ERP is a system with a single database that collects data and feeds them into software applications supporting all of a firm’s business activities
- ERP gives managers, workers, customers, and suppliers access to operating information
- ERP can be expensive, large, and unwieldy
Performance Measures and Control in JIT

- Financial performance measures such as inventory turnover ratio
- Nonfinancial performance measures of time, inventory, and quality such as:
  - Manufacturing lead times
  - Units produced per hour
  - Days of inventory on hand
  - Setup time as a % of total manufacturing time
  - Number of defective units as a % of total units produced
Backflush Costing

- Backflush Costing omits recording some or all of the journal entries relating to the stages from the purchase of direct materials to the sale of finished goods
  - Since some stages are omitted, the journal entries for a subsequent stage use normal or standard costs to work backward to “flush out” the costs in the cycle for which journal entries were not made
- Contrast to traditional normal and standard costing systems using sequential tracking: recording journal entries at each trigger point in the production process
Special Considerations in Backflush Costing

- Backflush costing does not necessarily comply with GAAP
  - However, inventory levels may be immaterial, negating the necessity for compliance
- Backflush costing does not leave a good audit trail – the ability of the accounting system to pinpoint the uses of resources at each step of the production process
True or False

- Just-in-time systems are similar to materials requirement planning systems in that both systems are demand-pull systems.
- Sharing inventory data throughout the supply chain leads to more "rush" orders occurring.
- A firm using a backflush costing system will record fewer journal entries.
- A firm using a backflush costing system will tend to use actual costs rather than standard costs.
Pick your Choice

- An example of an ordering cost is:
  - purchase price
  - spoilage
  - freight costs
  - inspecting goods received

- Loss of customer sales due to being out of the product the customer wants is an example of a(n)
  - purchasing cost.
  - carrying cost.
  - stockout cost.
  - quality cost.