CHAPTER 20
INVENTORY MANAGEMENT, JUST-IN-TIME,
AND SIMPLIFIED COSTING METHODS

20-1 Cost of goods sold (in retail organizations) or direct materials costs (in organizations with a manufacturing function) as a percentage of sales frequently exceeds net income as a percentage of sales by many orders of magnitude. In the Kroger grocery store example cited in the text, cost of goods sold to sales is 76.8%, and net income to sales is 0.1%. Thus, a 10% reduction in the ratio of cost of goods sold to sales (76.8 to 69.1% equal to 7.7%) without any other changes can result in a 7800% increase in net income to sales (0.1% plus 7.7% equal to 7.8%).

20-2 Six cost categories important in managing goods for sale in a retail organization are the following:
1. purchasing costs;
2. ordering costs;
3. carrying costs;
4. stockout costs;
5. costs of quality; and
6. shrinkage costs

20-3 Five assumptions made when using the simplest version of the EOQ model are:
1. The same quantity is ordered at each reorder point.
2. Demand, ordering costs, carrying costs, and the purchase-order lead time are certain.
3. Purchasing cost per unit is unaffected by the quantity ordered.
4. No stockouts occur.
5. Costs of quality and shrinkage costs are considered only to the extent that these costs affect ordering costs or carrying costs.

20-4 Costs included in the carrying costs of inventory are incremental costs for such items as insurance, rent, obsolescence, spoilage, and breakage plus the opportunity cost of capital (or required return on investment).

20-5 Examples of opportunity costs relevant to the EOQ decision model but typically not recorded in accounting systems are the following:
1. the return forgone by investing capital in inventory;
2. lost contribution margin on existing sales when a stockout occurs; and
3. lost contribution margin on potential future sales that will not be made to disgruntled customers.

20-6 The steps in computing the costs of a prediction error when using the EOQ decision model are:

Step 1: Compute the monetary outcome from the best action that could be taken, given the actual amount of the cost input.

Step 2: Compute the monetary outcome from the best action based on the incorrect amount of the predicted cost input.

Step 3: Compute the difference between the monetary outcomes from Steps 1 and 2.
Goal congruence issues arise when there is an inconsistency between the EOQ decision model and the model used for evaluating the performance of the person implementing the model. For example, if opportunity costs are ignored in performance evaluation, the manager may be induced to purchase in a quantity larger than the EOQ model indicates is optimal.

Just-in-time (JIT) purchasing is the purchase of materials (or goods) so that they are delivered just as needed for production (or sales). Benefits include lower inventory holdings (reduced warehouse space required and less money tied up in inventory) and less risk of inventory obsolescence and spoilage.

Factors causing reductions in the cost to place purchase orders of materials are:
- Companies are establishing long-run purchasing agreements that define price and quality terms over an extended period.
- Companies are using electronic links, such as the Internet, to place purchase orders.
- Companies are increasing the use of purchase-order cards.

Disagree. Choosing the supplier who offers the lowest price will not necessarily result in the lowest total purchase cost to the buyer. This is because the price or purchase cost of the goods is only one—and perhaps, most obvious—element of cost associated with purchasing and managing inventories. Other relevant cost items are ordering costs, carrying costs, stockout costs, quality costs, and shrinkage costs. A low-cost supplier may well impose conditions on the buyer—such as poor quality, or frequent stockouts, or excessively high inventories—that result in high total costs of purchase. Buyers must examine all the elements of costs relevant to inventory management, not just the purchase price.

Supply-chain analysis describes the flow of goods, services, and information from the initial sources of materials and services to the delivery of products to consumers, regardless of whether those activities occur in the same company or in other companies. Sharing of information across companies enables a reduction in inventory levels at all stages, fewer stockouts at the retail level, reduced manufacture of product not subsequently demanded by retailers, and a reduction in expedited manufacturing orders.

Just-in-time (JIT) production is a “demand-pull” manufacturing system that has the following features:
- Organize production in manufacturing cells,
- Hire and retain workers who are multi-skilled,
- Aggressively pursue total quality management (TQM) to eliminate defects,
- Place emphasis on reducing both setup time and manufacturing cycle time, and
- Carefully select suppliers who are capable of delivering quality materials in a timely manner.

Traditional normal and standard costing systems use sequential tracking, in which journal entries are recorded in the same order as actual purchases and progress in production, typically at four different trigger points in the process.

Backflush costing omits recording some of the journal entries relating to the cycle from purchase of direct materials to sale of finished goods, i.e., it has fewer trigger points at which journal entries are made. When journal entries for one or more stages in the cycle 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.

20-14 Versions of backflush costing differ in the number and placement of trigger points at which journal entries are made in the accounting system:

<table>
<thead>
<tr>
<th>Number of Journal Entry Trigger Points</th>
<th>Location in Cycle Where Journal Entries Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 1 3 Stage A.</td>
<td>Purchase of direct materials and incurring of conversion costs</td>
</tr>
<tr>
<td></td>
<td>Stage C. Completion of good finished units of product</td>
</tr>
<tr>
<td></td>
<td>Stage D. Sale of finished goods</td>
</tr>
<tr>
<td>Version 2 2 Stage A.</td>
<td>Purchase of direct materials and incurring of conversion costs</td>
</tr>
<tr>
<td></td>
<td>Stage D. Sale of finished goods</td>
</tr>
<tr>
<td>Version 3 2 Stage C.</td>
<td>Completion of good finished units of product</td>
</tr>
<tr>
<td></td>
<td>Stage D. Sale of finished goods</td>
</tr>
</tbody>
</table>

20-15 Traditional accounting systems cost individual products, and separate product costs from selling, general, and administrative costs. Lean accounting costs the entire value stream instead of individual products. Rework costs, unused capacity costs, and common costs that cannot be reasonably assigned to value streams are excluded from value stream costs. In addition, many lean accounting systems expense material costs the period they are purchased, rather than storing them on the balance sheet until the products using the material are sold.

20-16 (20 min.) Economic order quantity for retailer.

1. \[ D = 10,000 \text{ jerseys per year}, \ P = $200, \ C = $7 \text{ per jersey per year} \]

\[
\text{EOQ} = \sqrt{\frac{2 \times D \times P}{C}} = \sqrt{\frac{2 \times 10,000 \times$200}{7}} = 755.93 \equiv 756 \text{ jerseys}
\]

2. Number of orders per year = \[ \frac{D}{\text{EOQ}} = \frac{10,000}{756} = 13.22 \equiv 14 \text{ orders} \]

3. Demand each working day = \[ \frac{D}{\text{Number of working days}} = \frac{10,000}{365} = 27.40 \text{ jerseys per day} \]

Purchase lead time = 7 days

Reorder point = 27.40 \times 7

= 191.80 \equiv 192 \text{ jerseys}
20-17 (20 min.)  **Economic order quantity, effect of parameter changes (continuation of 20-16).**

1. **D = 10,000 jerseys per year, P = $30, C = $7 per jersey per year**

   \[
   EOQ = \sqrt{\frac{2DP}{C}} = \sqrt{\frac{2 \times 10,000 \times $30}{7}} = 292.77 \text{ jerseys} \approx 293 \text{ jerseys}
   \]

   The sizable reduction in ordering cost (from $200 to $30 per purchase order) has reduced the EOQ from 756 to 293.

2. The AT proposal has both upsides and downsides. The upside is potentially higher sales. FB customers may purchase more online than if they have to physically visit a store. FB would also have lower administrative costs and lower inventory holding costs with the proposal.

   The downside is that AT could capture FB’s customers. Repeat customers to the AT web site need not be classified as FB customers. FB would have to establish enforceable rules to make sure it captures ongoing revenues from customers it directs to the AP web site.

   There is insufficient information to determine whether FB should accept AT’s proposal. Much depends on whether FB views AT as a credible, “honest” partner.

20-18 (15 min.)  **EOQ for a retailer.**

1. **D = 26,400 yards per year, P = $165, C = 20\% \times $9 = $1.80 per yard per year**

   \[
   EOQ = \sqrt{\frac{2DP}{C}} = \sqrt{\frac{2 \times 26,400 \times $165}{$1.80}} = 2,200 \text{ yards}
   \]

2. **Number of orders per year:**

   \[
   \frac{D}{EOQ} = \frac{26,400}{2,200} = 12 \text{ orders per year}
   \]

3. **Demand each working day**

   \[
   \frac{D}{\text{Number of working days}} = \frac{26,400}{250} = 105.60 \text{ yards per day}
   \]

   \[
   = 528 \text{ yards per week (105.60 \times 5 days per week)}
   \]

   Purchasing lead time = 2 weeks

   Reorder point = 528 yards per week \times 2 \text{ weeks} = 1,056 \text{ yards}
1. Relevant carrying costs per part per year:
   - Required annual return on investment $15\% \times $60 = $9
   - Relevant insurance, materials handling, breakage, etc. costs per year $6
   - Relevant carrying costs per part per year $15

   With D = 18,000 parts per year; P = $150; C = $15 per part per year, EOQ for manufacturer is:
   \[ EOQ = \sqrt{\frac{2DP}{C}} = \sqrt{\frac{2 \times 18,000 \times $150}{15}} = 600 \text{ units} \]

2. Relevant annual ordering costs
   \[ = \left( \frac{D}{Q} \times P \right) \]
   \[ = \left( \frac{18,000}{600} \times $150 \right) \]
   \[ = $4,500 \]
   where Q = 600 units, the EOQ.

3. At the EOQ, total relevant ordering costs and total relevant carrying costs will be exactly equal. Therefore, total relevant carrying costs at the EOQ = $4,500 (from requirement 2). We can also confirm this with a direct calculation:
   \[ \text{Relevant annual carrying costs} = \left( \frac{Q}{2} \times C \right) \]
   \[ = \left( \frac{600}{2} \times $15 \right) \]
   \[ = $4,500 \]
   where Q = 600 units, the EOQ.

4. Purchase order lead time is half a month.
   Monthly demand is 18,000 units ÷ 12 months = 1,500 units per month.
   Demand in half a month is \( \frac{1}{2} \times 1,500 \) units or 750 units.
   Lakeland should reorder when the inventory of rotor blades falls to 750 units.
20-20  (20 min.)  Sensitivity of EOQ to changes in relevant ordering and carrying costs.

1. A straightforward approach to the requirement is to construct the following table for EOQ at relevant carrying and ordering costs. Annual demand is 10,000 units. The formula for the EOQ model is:

   \[ \text{EOQ} = \sqrt{\frac{2DP}{C}} \]

   and for Relevant Total Costs (RTC) = \( \frac{DP}{Q} + \frac{QC}{2} \)

   where  
   \( D \) = demand in units per year  
   \( P \) = relevant ordering costs per purchase order  
   \( C \) = relevant carrying costs of one unit in stock for the time period used for \( D \) (one year in this problem).

<table>
<thead>
<tr>
<th>Relevant Carrying Costs per Unit per Year (C)</th>
<th>Relevant Ordering Costs per Purchase Order (P)</th>
<th>EOQ (Q)</th>
<th>RTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10</td>
<td>$400</td>
<td>895</td>
<td>$8,944</td>
</tr>
<tr>
<td>$20</td>
<td>$200</td>
<td>447</td>
<td>$8,944</td>
</tr>
<tr>
<td>$40</td>
<td>$100</td>
<td>224</td>
<td>$8,944</td>
</tr>
</tbody>
</table>

2. For a given demand level, as relevant carrying costs increase and relevant ordering costs decrease, EOQ becomes smaller. The change in EOQ results in relevant total costs (RTC) being the same across all three cases. That is, the EOQ offsets the effect on total costs of the increase in carrying costs and the decrease in ordering costs.

3. If Alpha estimates \( C = $10 \) per unit per year and \( P = $400 \) per order, then from requirement 1,

   \( \text{EOQ} = 224 \text{ units and Relevant Total Cost (RTC)} = $8,944 \)

   For \( \text{EOQ} = 224 \) units, \( C = $20 \) per unit per year and \( P = $200 \) per order,

   Relevant total costs (RTC) = \( \frac{DP}{Q} + \frac{QC}{2} \)

   \[ = \frac{10,000 \times $200}{224} + \frac{224 \times $20}{2} \]

   \[ = $8,929 + $2,240 = $11,169 \]

   The prediction error equals $11,169 – $8,944 = $2,225 which is 25% ($2,225 ÷ $8,944) of the relevant total cost had there been no prediction error. The error in prediction results is a significantly higher cost but is still limited, given that the estimate of the carrying cost was half the actual amount and the estimate of the ordering cost was twice the actual amount. The square root function dampens the effect of the errors.
20-21  (15 min.)  **Inventory management and the balanced scorecard.**

1. The incremental increase in operating profits from employee cross-training (ignoring the cost of the training) is:

   Increased revenue from higher customer satisfaction ($5,000,000 \times 2\% \times 5) \quad $500,000
   Reduced inventory-related costs \quad \textbf{100,000}
   Incremental increase in operating profits (ignoring training costs) \quad \textbf{$600,000}$

2. At a cost of $600,000, DSC will be indifferent between current expenditures and increasing employee cross-training by 5%. Consequently, the most DSC would be willing to pay for this cross-training is the $600,000 benefit received.

3. Besides increasing short-term operating profits, additional employee cross-training can improve employee satisfaction because their jobs can have more variety, potentially leading to unanticipated productivity improvements and lower employee turnover. Multi-skilled employees can also understand the production process better and can suggest potential improvements. Each of these may lead to additional cost reductions.
20-22 (20 min.) JIT production, relevant benefits, relevant costs.

1. Solution Exhibit 20-22 presents the annual net benefit of $315,000 to Champion Hardware Company of implementing a JIT production system.

2. Other nonfinancial and qualitative factors that Champion should consider in deciding whether it should implement a JIT system include:
   a. The possibility of developing and implementing a detailed system for integrating the sequential operations of the manufacturing process. Direct materials must arrive when needed for each subassembly so that the production process functions smoothly.
   b. The ability to design products that use standardized parts and reduce manufacturing time.
   c. The ease of obtaining reliable vendors who can deliver quality direct materials on time with minimum lead time.
   d. Willingness of suppliers to deliver smaller and more frequent orders.
   e. The confidence of being able to deliver quality products on time. Failure to do so would result in customer dissatisfaction.
   f. The skill levels of workers to perform multiple tasks such as minor repairs, maintenance, quality testing and inspection.

SOLUTION EXHIBIT 20-22
Annual Relevant Costs of Current Production System and JIT Production System for Champion Hardware Company

<table>
<thead>
<tr>
<th>Relevant Items</th>
<th>Relevant Costs under Current Production System</th>
<th>Relevant Costs under JIT Production System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual tooling costs</td>
<td>–</td>
<td>$100,000</td>
</tr>
<tr>
<td>Required return on investment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15% per year × $1,000,000 of average inventory per year</td>
<td>$150,000</td>
<td></td>
</tr>
<tr>
<td>15% per year × $200,000a of average inventory per year</td>
<td></td>
<td>$30,000</td>
</tr>
<tr>
<td>Insurance, space, materials handling, and setup costs</td>
<td>300,000</td>
<td>225,000b</td>
</tr>
<tr>
<td>Rework costs</td>
<td>200,000</td>
<td>140,000c</td>
</tr>
<tr>
<td>Incremental revenues from higher selling prices</td>
<td>–</td>
<td>(160,000)d</td>
</tr>
<tr>
<td>Total net incremental costs</td>
<td>$650,000</td>
<td>$335,000</td>
</tr>
<tr>
<td>Annual difference in favor of JIT production</td>
<td></td>
<td>$315,000</td>
</tr>
</tbody>
</table>

\[a \quad $1,000,000 \times (1 - 0.80) = $200,000\]
\[b \quad $300,000 \times (1 - 0.25) = $225,000\]
\[c \quad $200,000 \times (1 - 0.30) = $140,000\]
\[d \quad $4 \times 40,000 \text{ units} = $160,000\]
3. Personal observation by production line workers and managers is more effective in JIT plants than in traditional plants. A JIT plant’s production process layout is streamlined. Operations are not obscured by piles of inventory or rework. As a result, such plants are easier to evaluate by personal observation than cluttered plants where the flow of production is not logically laid out.

Besides personal observation, nonfinancial performance measures are the dominant methods of control. Nonfinancial performance measures provide most timely and easy to understand measures of plant performance. Examples of nonfinancial performance measures of time, inventory, and quality include:

- Manufacturing lead time
- Units produced per hour
- Machine setup time ÷ manufacturing time
- Number of defective units ÷ number of units completed

In addition to personal observation and nonfinancial performance measures, financial performance measures are also used. Examples of financial performance measures include:

- Cost of rework
- Ordering costs
- Stockout costs
- Inventory turnover (cost of goods sold ÷ average inventory)

The success of a JIT system depends on the speed of information flows from customers to manufacturers to suppliers. The Enterprise Resource Planning (ERP) system has a single database, and gives lower-level managers, workers, customers, and suppliers access to operating information. This benefit, accompanied by tight coordination across business functions, enables the ERP system to rapidly transmit information in response to changes in supply and demand so that manufacturing and distribution plans may be revised accordingly.
20-23 (30 min.) **Backflush costing and JIT production.**

1. 
   (a) Record purchases of direct materials
       Materials and In-Process Inventory Control 2,754,000
       Accounts Payable Control 2,754,000
   (b) Record conversion costs incurred
       Conversion Costs Control 723,600
       Various Accounts (such as Wages Payable Control) 723,600
   (c) Record cost of good finished units completed
       Finished Goods Control\(^a\) 3,484,000
       Materials and In-Process Inventory Control\(^a\) 2,733,600
       Conversion Costs Allocated\(^a\) 750,400
   (d) Record cost of finished goods sold
       Cost of Goods Sold\(^b\) 3,432,000
       Finished Goods Control 3,432,000

\(^a\)26,800 \times \$(102 + 28) = 3,484,000; 26,800 \times \$102 = 2,733,600; 26,800 \times \$28 = 750,400

\(^b\)26,400 \times \$(102 + 28) = 3,432,000

2. 

\[
\begin{array}{c|c|c|c|c}
& \text{Materials and In-Process} & \text{Conversion Costs Allocated} & \text{Cost of Goods Sold} \\
& \text{Inventory Control} & \text{Conversion Costs Control} & \\
\hline
\text{(a) 2,754,000} & \text{(c) 2,733,600} & \text{(e) 3,484,000} & \text{(d) 3,432,000} \\
\text{Bal. 20,400} & \text{(c) 750,400} & \text{Bal. 52,000} & \\
\end{array}
\]

3. Under an ideal JIT production system, there would be zero inventories at the end of each day. Entry (c) would be \$3,432,000 finished goods production, not \$3,484,000. Also, there would be no inventory of direct materials instead of \$2,754,000 – \$2,733,600 = \$20,400.
20-24 (20 min.) Backflush costing, two trigger points, materials purchase and sale (continuation of 20-23).

1. 
   (a) Record purchases of direct materials
   
   Inventory Control  2,754,000  
   Accounts Payable Control  2,754,000  
   
   (b) Record conversion costs incurred
   
   Conversion Costs Control  723,600  
   Various Accounts (such as Wages Payable Control)  723,600  
   
   (c) Record cost of good finished units completed
   
   No entry  
   
   (d) Record cost of finished goods sold
   
   Cost of Goods Solda  3,432,000  
   Inventory Controla  2,692,800  
   Conversion Costs Allocateda  739,200  
   
   (e) Record underallocated or over-allocated conversion costs
   
   Conversion Costs Allocated  739,200  
   Costs of Goods Sold  15,600  
   Conversion Costs Control  723,600  

   a26,400 × ($102 + $28) = $3,432,000; 26,400 × $102 = $2,692,800; 26,400 × $28 = $739,200

2.
20-25 (20 min.)  **Backflush costing, two trigger points, completion of production and sale (continuation of 20-23).**

1.  
   (a). Record purchases of direct materials
   No Entry
   
   (b) Record conversion costs incurred
   Conversion Costs Control
   Various Accounts (such as Wages Payable Control)  723,600
   
   (c) Record cost of good finished units completed
   Finished Goods Control\(^a\)  3,484,000
   Accounts Payable Control\(^a\)  2,733,600
   Conversion Costs Allocated\(^a\)  750,400
   
   (d) Record cost of finished goods sold
   Cost of Goods Sold\(^b\)  3,432,000
   Finished Goods Control  3,432,000
   
   (e) Record underallocated or over-allocated conversion costs
   Conversion Costs Allocated  750,400
   Costs of Goods Sold  26,800
   Conversion Costs Control  723,600

\(^a\)26,800 \times ($102 + $28) = $3,484,000; 26,800 \times $102 = $2,733,600; 26,800 \times $28 = $750,400

\(^b\)26,400 \times ($102 + $28) = $3,432,000

2.  

```
    Direct Materials
       \{  
       |  Finished Goods Control
       |  \( \rightarrow (a) 3,484,000 \)
       |  Bal. 52,000
       |  \( \rightarrow (d) 3,432,800 \)
       |  Cost of Goods Sold
       |  \( \rightarrow (d) 3,432,000 \)
       |  \( (e) 26,800 \)
       |  Conversion Costs Allocated
       |  \( \rightarrow (e) 750,400 \)
       |  \( (d) 750,400 \)
       |  Conversion Costs Control
       |  \( (b) 723,600 \)
       |  \( (e) 723,600 \)
    Conversion Costs
```
20-26 (30 min.) Effect of different order quantities on ordering costs and carrying costs, EOQ.

1. The economic order quantity is 1,900 packages. It is the order quantity at which carrying costs equal ordering costs and total relevant ordering and carrying costs are minimized.

We can also confirm this from direct calculation. Using \( D = 380,000; \ P = \$57 \) and \( C = \$12 \)

\[
EOQ = \sqrt{\frac{2 \times 380,000 \times \$57}{\$12}} = 1,900 \text{ packages}
\]

It is interesting to note that Soothing Meadow faces a situation where total relevant ordering and carrying costs do not vary very much even though order quantities vary greatly from 760 packages to 4,750 packages. The square root in the EOQ model dampens the effect of the variations in order quantity by making the incorrect numbers smaller.

2. When the ordering cost per purchase order is reduced to \( \$30 \):

\[
EOQ = \sqrt{\frac{2 \times 380,000 \times \$30}{\$12}} = 1,378.4 \text{ packages (or } 1,378 \text{ packages)}
\]

The EOQ drops from 1,900 packages to 1,378 packages when Soothing Meadow’s ordering cost per purchase order decreases from \( \$57 \) to \( \$30 \).

And the new relevant costs of ordering inventory \( = \left( \frac{D}{Q} \times P \right) = \left( \frac{380,000}{1,378} \times \$30 \right) = \$8,272 \)

and the new relevant costs or carrying inventory \( = \left( \frac{Q}{2} \times C \right) = \left( \frac{1,378}{2} \times \$12 \right) = \$8,268 \)

The total new relevant costs of ordering and carrying inventory \( = \$8,272 + \$8,268 = \$16,540 \). The slight difference in relevant ordering costs (\$8,272) and relevant carrying costs (\$8,268) is because of rounding down the number of packages from 1,378.4 in the EOQ formula to 1,378.

3. As summarized below, the new Mona Lisa web-based ordering system, by lowering the EOQ to 1,378 packages, will lower the carrying and ordering costs by \$6,260. Soothing Meadow will spend \$2,150 to train its purchasing assistants on the new system. Overall, Soothing Meadow will still save \$4,110 in the first year alone.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (units) (D)</td>
<td>380,000</td>
<td>380,000</td>
<td>380,000</td>
<td>380,000</td>
<td>380,000</td>
</tr>
<tr>
<td>Cost per purchase order (P)</td>
<td>$57.00</td>
<td>$57.00</td>
<td>$57.00</td>
<td>$57.00</td>
<td>$57.00</td>
</tr>
<tr>
<td>Annual carrying cost per package (C)</td>
<td>$12.00</td>
<td>$12.00</td>
<td>$12.00</td>
<td>$12.00</td>
<td>$12.00</td>
</tr>
<tr>
<td>Order quantity per purchase order (units) (Q)</td>
<td>760</td>
<td>1,000</td>
<td>1,900</td>
<td>3,800</td>
<td>4,750</td>
</tr>
<tr>
<td>Number of purchase orders per year (( \frac{D}{Q} ))</td>
<td>500</td>
<td>380</td>
<td>200</td>
<td>100</td>
<td>80</td>
</tr>
<tr>
<td>Annual ordering costs (( \frac{D}{Q} \times P ))</td>
<td>$28,500</td>
<td>$21,660</td>
<td>$11,400</td>
<td>$5,700</td>
<td>$4,560</td>
</tr>
<tr>
<td>Annual carrying costs (( \frac{QC}{2} ))</td>
<td>$4,560</td>
<td>$6,000</td>
<td>$11,400</td>
<td>$22,800</td>
<td>$28,500</td>
</tr>
<tr>
<td>Total relevant costs of ordering and carrying inventory</td>
<td>$33,060</td>
<td>$27,660</td>
<td>$22,800</td>
<td>$28,500</td>
<td>$33,060</td>
</tr>
</tbody>
</table>

Total relevant costs at EOQ (from Requirement 2) \( \$16,540 \)
Annual cost benefit over old system (\( \$22,800 – \$16,540 \)) \( \$6,260 \)
Training costs \( \$2,150 \)
Net benefit in first year alone \( \$4,110 \)
20-27 (30 min.) **EOQ, uncertainty, safety stock, reorder point.**

1. \[
\text{EOQ} = \sqrt{\frac{2 \times \text{DP}}{C}} = \sqrt{\frac{2 \times 120,000 \times \$250}{\$2.40}}
\]

   = 5,000 pairs of shoes

2. \[
\begin{align*}
\text{Weekly demand} & = \frac{\text{Monthly demand}}{4} \\
& = \frac{10,000}{4} = 2,500 \text{ pairs of shoes per week} \\
\text{Purchasing lead time} & = 1 \text{ week} \\
\text{Reorder point} & = 2,500 \text{ pairs of shoes per week} \times 1 \text{ week} = 2,500 \text{ pairs of shoes}
\end{align*}
\]

3. Solution Exhibit 20-27 presents the safety stock computations for Warehouse OR2 when the reorder point excluding safety stock is 2,500 pairs of shoes. The exhibit shows that annual relevant total stockout and carrying costs are the lowest ($1,080) when a safety stock of 250 pairs of shoes is maintained. Therefore, Warehouse OR2 should hold a safety stock of 250 pairs. As a result, Reorder point with safety stock = 2,500 pairs + 250 pairs = 2,750 pairs. Reorder quantity is unaffected by the holding of safety stock and remains the same as calculated in requirement 1.

   Reorder quantity = 5,000 pairs

   Warehouse OR2 should order 5,000 pairs of shoes each time its inventory of shoes falls to 2,750 pairs.

**SOLUTION EXHIBIT 20-27**

Computation of Safety Stock for Warehouse OR2 When Reorder Point is 2,500 Units

<table>
<thead>
<tr>
<th>Safety Stock Level in Units</th>
<th>Demand Levels Resulting in Stockouts</th>
<th>Stockout in Units a</th>
<th>Probability of Stockouts</th>
<th>Relevant Stockout Costs b</th>
<th>Number of Orders per Year c</th>
<th>Expected Stockout Costs d</th>
<th>Relevant Carrying Costs e</th>
<th>Relevant Total Costs f</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2,750</td>
<td>250</td>
<td>0.20</td>
<td>$500</td>
<td>24</td>
<td>$2,400</td>
<td></td>
<td>$3,360</td>
</tr>
<tr>
<td>3,000</td>
<td>500</td>
<td>0.04</td>
<td>1,000</td>
<td></td>
<td>24</td>
<td>960</td>
<td></td>
<td>$3,360</td>
</tr>
<tr>
<td>250</td>
<td>3,000</td>
<td>250</td>
<td>0.04</td>
<td>500</td>
<td>24</td>
<td>$480</td>
<td>$600</td>
<td>$1,080</td>
</tr>
<tr>
<td>500</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>$0</td>
<td>$1,200</td>
</tr>
</tbody>
</table>

a Demand level resulting in stockouts – Inventory available during lead time (excluding safety stock), 2,500 units – Safety stock.

b Stockout in units × Relevant stockout costs of $2.00 per unit.

c Annual demand, 120,000 ÷ 5,000 EOQ = 24 orders per year.

d Probability of stockout × Relevant stockout costs × Number of orders per year.

e Safety stock × Annual relevant carrying costs of $2.40 per unit (assumes that safety stock is on hand at all times and that there is no overstocking caused by decreases in expected usage).

f At a safety stock level of 500 units, no stockout will occur and, hence, expected stockout costs = $0.
MRP, EOQ, and JIT.

1. Under a MRP system:

   Annual cost of producing and carrying J-Pods in inventory
   \[
   = \text{Variable production cost} + \text{Setup cost} + \text{Carrying cost}
   \]
   \[
   = \$54 \times 48,000 + (\$10,000 \times 12 \text{ months}) + [\$17 \times (4,000 \div 2)]
   \]
   \[
   = \$2,592,000 + \$120,000 + \$34,000 = \$2,746,000
   \]

2. Using an EOQ model to determine batch size:

   \[
   \text{EOQ} = \sqrt{\frac{2 \times \text{DP}}{\text{C}}} = \sqrt{\frac{2 \times 48,000 \times \$10,000}{\$17}}
   \]
   \[
   = 7,515 \text{ J-Pods per batch}
   \]

   Production of 48,000 per year divided by a batch size of 7,515 would imply J-Pods would be produced in 6.4 batches per year. Rounding this up to the nearest whole number yields 7 batches per year, which means a production size of 48,000 ÷ 7 or 6,857 J-Pods per batch.

   Annual Cost of producing and carrying J-Pods in inventory
   \[
   = \text{Variable production cost} + \text{Setup cost} + \text{Carrying cost}
   \]
   \[
   = \$54 \times 48,000 + (\$10,000 \times 7) + [\$17 \times (6,857 \div 2)]
   \]
   \[
   = \$2,592,000 + \$70,000 + \$58,285 = \$2,720,285
   \]

   The costs of producing and carrying J-Pods in inventory decrease but not by a lot. The square root in the EOQ formula reduces the effect of errors in computing optimal batch size.

3. Under a JIT system

   Annual Cost of producing and carrying J-Pods in inventory
   \[
   = \text{Variable production cost} + \text{Setup cost} + \text{Carrying cost}
   \]
   \[
   = \$54 \times 48,000 + (\$500 \times 80) + [\$17 \times (600 \div 2)]
   \]
   \[
   = \$2,592,000 + \$40,000 + \$5,100 = \$2,637,100
   \]

   a Production of 48,000 per year divided by a batch size of 600 would imply 80 setups per year.

4. The JIT model resulted in the lowest costs because set up and carrying costs were lower than for the EOQ model. The EOQ model also limits production to almost once every two months. This would not allow managers to react quickly to changing market demand or economic conditions. The JIT model provides management with much more flexibility. JIT systems might also lead managers to improve processes, reduce costs and increase quality.
Effect of management evaluation criteria on EOQ model.

1. \[ \text{EOQ} = \sqrt{\frac{2 \times \text{DP}}{\text{C}}} = \sqrt{\frac{2 \times 500,000 \times 800}{50}} = 4,000 \text{ computers} \]

2. Number of orders per year = \( \frac{\text{D}}{\text{EOQ}} = \frac{500,000}{4,000} = 125 \text{ orders} \)

   Total relevant ordering costs = \( \left( \frac{\text{D}}{\text{EOQ}} \right) \times \text{P} \times \left( \frac{500,000}{4,000} \right) \times 800 = 100,000 \)

   Total relevant carrying costs = \( \left( \frac{\text{EOQ}}{2} \times \text{C} \right) \times \left( \frac{4,000}{2} \times 50 \right) = 100,000 \)

   Relevant total costs = $100,000 + $100,000 = $200,000

3. \[ \text{EOQ} = \sqrt{\frac{2 \times \text{DP}}{\text{C}}} = \sqrt{\frac{2 \times 500,000 \times 800}{30}} = 5,164 \text{ computers} \]

   Total relevant ordering costs = \( \left( \frac{\text{D}}{\text{EOQ}} \right) \times \text{P} \times \left( \frac{500,000}{5,164} \right) \times 800 = 77,459 \)

   Total relevant carrying costs = \( \left( \frac{\text{EOQ}}{2} \times \text{C} \right) \times \left( \frac{5,164}{2} \times 50 \right) = 129,100 \)

   Relevant total costs = $77,459 + $129,100 = $206,559

4. Since managers will choose to order 5,164 computers instead of 4,000, the cost to the company will be $6,559 ($206,559 – $200,000) higher than it would be if managers were evaluated based upon all carrying costs. The EOQ quantity and relevant total costs are higher if the company ignores holding costs when evaluating managers, but only by about 3% ($6,559 \div $200,000). The square root in the EOQ model reduces the sensitivity of the ordering decision to errors in parameter estimates.

   Computers 4 U probably does not include the opportunity costs of carrying inventory because it is not tracked by the financial accounting system. The company could change the evaluation model to include a cost of investment in inventory. Even though this would involve an additional calculation, it would encourage managers to make optimal decisions, more congruent with the goal of reducing total inventory costs.
20-30 (30 min.) JIT purchasing, relevant benefits, relevant costs.

1. Solution Exhibit 20-30 presents the $37,500 cash savings that would result if Margro Corporation adopted the just-in-time inventory system in 2011.

2. Conditions that should exist in order for a company to successfully adopt just-in-time purchasing include the following:

   • Top management must be committed and provide the necessary leadership support to ensure a company-wide, coordinated effort.

   • A detailed system for integrating the sequential operations of the manufacturing process needs to be developed and implemented. Direct materials must arrive when needed for each subassembly so that the production process functions smoothly.

   • Accurate sales forecasts must be available for effective finished goods planning and production scheduling.

   • Products should be designed to maximize use of standardized parts to reduce manufacturing time and costs.

   • Reliable vendors who can deliver quality direct materials on time with minimum lead time must be obtained.
### SOLUTION EXHIBIT 20-30
Annual Relevant Costs of Current Purchasing Policy and JIT Purchasing Policy for Margro Corporation

<table>
<thead>
<tr>
<th>Relevant Costs under Current Purchasing Policy</th>
<th>Relevant Costs under JIT Purchasing Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required return on investment</td>
<td></td>
</tr>
<tr>
<td>20% per year × $600,000 of average inventory per year</td>
<td>$120,000</td>
</tr>
<tr>
<td>20% per year × $0 inventory per year</td>
<td>$0</td>
</tr>
<tr>
<td>Annual insurance and property tax costs</td>
<td>14,000</td>
</tr>
<tr>
<td>Warehouse rent</td>
<td>60,000</td>
</tr>
<tr>
<td>Overtime costs</td>
<td></td>
</tr>
<tr>
<td>No overtime</td>
<td>0</td>
</tr>
<tr>
<td>Overtime premium</td>
<td>40,000</td>
</tr>
<tr>
<td>Stockout costs</td>
<td></td>
</tr>
<tr>
<td>No stockouts</td>
<td>0</td>
</tr>
<tr>
<td>$6.50(^b) contribution margin per unit × 20,000 units</td>
<td>130,000</td>
</tr>
<tr>
<td>Total incremental costs</td>
<td>$194,000</td>
</tr>
<tr>
<td>Difference in favor of JIT purchasing</td>
<td>$37,500</td>
</tr>
</tbody>
</table>

\(^a\)$(13,500) = Warehouse rental revenues, \([(75\% \times 12,000) \times $1.50]\).

\(^b\)Calculation of unit contribution margin

<table>
<thead>
<tr>
<th>Selling price</th>
<th>$12.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable costs per unit:</td>
<td></td>
</tr>
<tr>
<td>Variable manufacturing cost per unit $4,050,000 ÷ 900,000 units</td>
<td>$4.50</td>
</tr>
<tr>
<td>Variable marketing and distribution cost per unit $900,000 ÷ 900,000 units</td>
<td>$1.00</td>
</tr>
<tr>
<td>Total variable costs per unit</td>
<td>5.50</td>
</tr>
<tr>
<td>Contribution margin per unit</td>
<td>$6.50</td>
</tr>
</tbody>
</table>

Note that the incremental costs of $40,000 in overtime premiums to make the additional 15,000 units are less than the contribution margin from losing these sales equal to $97,500 ($6.50 × 15,000). Margro would rather incur overtime than lose 15,000 units of sales.
Supply chain effects on total relevant inventory costs.

1. The relevant costs of purchasing from Maji and Induk are:

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Maji</th>
<th>Induk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10,000 boards × $93 per board</td>
<td>$930,000</td>
<td></td>
</tr>
<tr>
<td>10,000 boards × $90 per board</td>
<td></td>
<td>900,000</td>
</tr>
<tr>
<td>Ordering costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 orders × $10 per order</td>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td>50 orders × $8 per order</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10,000 boards × 5% × $5 per board</td>
<td>2,500</td>
<td>12,500</td>
</tr>
<tr>
<td>10,000 boards × 25% × $5 per board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required annual return on investment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 boards × $93 per board × 10%</td>
<td>930</td>
<td>900</td>
</tr>
<tr>
<td>100 boards × $90 per board × 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stockout costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 boards × $5 per board</td>
<td>500</td>
<td>2,400</td>
</tr>
<tr>
<td>300 boards × $8 per board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 boards × $25 per board</td>
<td>1,250</td>
<td>12,500</td>
</tr>
<tr>
<td>500 boards × $25 per board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other carrying costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 boards × $2.50 per board per year</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>100 boards × $2.50 per board per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cost</td>
<td><strong>$935,930</strong></td>
<td><strong>$928,950</strong></td>
</tr>
</tbody>
</table>

2. While Induk will save Cow Spot $6,980 ($935,930 − $928,950), Cow Spot may still choose to use Maji for the following reasons:
   a. The savings are less than 1% of the total cost of the mother boards.
   b. With ten times the number of returns, Induk will probably have a negative effect on Cow Spot’s reputation.
   c. With Induk’s higher stockouts, Cow Spot’s reputation for availability and on time delivery will be effected.
   d. The increased number of inspections may necessitate the hiring of additional personnel and the need for additional factory space and equipment.
20-32 (20 min.) Blackflush costing and JIT production.

1. 
   (a) Record purchases of direct materials 
       Materials and In-Process Inventory Control 546,000
       Accounts Payable Control 546,000
   (b) Record conversion costs incurred 
       Conversion Costs Control 399,000
       Various Accounts (such as Wages Payable Control) 399,000
   (c) Record cost of good finished units completed 
       Finished Goods Control\(^a\) 900,000
       Materials and In-Process Inventory Control\(^a\) 520,000
       Conversion Costs Allocated\(^a\) 380,000
   (d) Record cost of finished goods sold 
       Cost of Goods Sold\(^b\) 855,000
       Finished Goods Control 855,000

\(^a\)20,000 \times ($26 + $19) = $900,000; 20,000 \times $26 = $520,000; 20,000 \times $19 = $380,000

\(^b\)19,000 \times ($26 + $19) = $855,000

2. 

<table>
<thead>
<tr>
<th>Direct Materials</th>
<th>Conversion Costs Allocated</th>
<th>Cost of Goods Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Materials and In-Process Inventory Control</td>
<td>Finished Goods Control</td>
</tr>
<tr>
<td></td>
<td>(a) 546,000</td>
<td>(c) 520,000</td>
</tr>
<tr>
<td></td>
<td>Bal. 26,000</td>
<td>(c) 900,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bal. 45,000</td>
</tr>
<tr>
<td>Conversion Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conversion Costs Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) 399,000</td>
<td></td>
</tr>
</tbody>
</table>

20-20
20-33 (20 min.)  **Backflush, two trigger points, materials purchase and sale**  
(continuation of 20-32).

1.  
   (a) Record purchases of direct materials  
       Inventory Control  
       Accounts Payable Control  
       546,000  
       546,000  
   (b) Record conversion costs incurred  
       Conversion Costs Control  
       Various Accounts (such as Wages Payable Control)  
       399,000  
       399,000  
   (c) Record cost of good finished units completed  
       No entry  
   (d) Record cost of finished goods sold  
       Cost of Goods Sold\(^a\)  
       Inventory Control\(^a\)  
       Conversion Costs Allocated\(^a\)  
       855,000  
       494,000  
       361,000  
   (e) Record underallocated or overallocated conversion costs  
       Conversion Costs Allocated  
       Cost of Goods Sold  
       Conversion Costs Control  
       361,000  
       38,000  
       399,000  

\(^a\)19,000 \times ($26 + $19) = $855,000; 19,000 \times $26 = $494,000; 19,000 \times $19 = $361,000

2.  

```
20-21
```
20-34  (20 min.) Backflush, two trigger points, completion of production and sale (continuation of 20-32).

1.  
   (a) Record purchases of direct materials No Entry
   (b) Record conversion costs incurred Conversion Costs Control 399,000 Various Accounts (such as Wages Payable Control) 399,000
   (c) Record cost of good finished units completed Finished Goods Control$ 900,000 Accounts Payable Control$ 520,000 Conversion Costs Allocated$ 380,000
   (d) Record cost of finished goods sold Cost of Goods Sold 855,000 Finished Goods Control 855,000
   (e) Record underallocated or overallocated conversion costs Conversion Costs Allocated 380,000 Cost of Goods Sold 19,000

   $20,000 × ($26 + $19) = $900,000; 20,000 × $26 = $520,000; 20,000 × $19 = $380,000
   $19,000 × ($26 + $19) = $855,000

2.  

   Direct Materials
   \[\text{Conversion Costs Allocated} \]
   \[\text{Bal. 45,000}\]
   \[\text{Conversion Costs Control} \]
   \[\text{(b) 399,000} \]
   \[\text{(e) 399,000} \]
   \[\text{Conversion Costs Allocated} \]
   \[\text{(e) 380,000} \]
   \[\text{(c) 380,000} \]

   \[\text{Finished Goods Control} \]
   \[\text{(c) 900,000} \]
   \[\text{(d) 855,000} \]

   \[\text{Cost of Goods Sold} \]
   \[\text{(d) 855,000} \]
   \[\text{(e) 19,000}\]
20-35 (20 min.) **Lean accounting.**

1. The cost object in lean accounting is the value stream, not the individual product. FSD has identified two distinct value streams: Mechanical Devices and Electronic Devices. All direct costs are traced to the value streams. However, not all plant-level overhead costs are allocated to the value streams when computing operating income. Value streams are only charged for the percentage of space they actually use, only 90% of the $200,000 plant facility costs are charged to the two value streams. The remaining 10%, or $20,000, is not used to compute value stream profits, nor are other corporate-level overhead costs.

2. Operating income under lean accounting are the following (in thousands of dollars):

<table>
<thead>
<tr>
<th></th>
<th>Mechanical Devices</th>
<th>Electronic Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales ($700 + $500; $900 + $450)</td>
<td>$1,200</td>
<td>$1,350</td>
</tr>
<tr>
<td>Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct materials purchased ($210 + $120; $250 + $90)</td>
<td>330</td>
<td>340</td>
</tr>
<tr>
<td>Direct manufacturing labor ($150 + $75; $200 + $60)</td>
<td>225</td>
<td>260</td>
</tr>
<tr>
<td>Equipment costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>($90 + $120; $200 + $95)</td>
<td>210</td>
<td>295</td>
</tr>
<tr>
<td>Design and marketing costs ($95 + $50; $105 + $42)</td>
<td>145</td>
<td>147</td>
</tr>
<tr>
<td>Plant facility costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>($200,000 × 40%)</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>($200,000 × 50%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value stream operating income</td>
<td>$210</td>
<td>$208</td>
</tr>
</tbody>
</table>

In addition to the differences discussed in Requirement 1, FSD’s lean accounting system accounts for direct materials as expenses in the period the materials are purchased. The following factors explain the differences between traditional operating income and lean accounting income for the two value streams (in thousands of dollars):

<table>
<thead>
<tr>
<th></th>
<th>Mechanical Devices</th>
<th>Electronic Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional operating income ($100 + $105; $45 + $140)</td>
<td>$205</td>
<td>$185</td>
</tr>
<tr>
<td>Additional cost of direct materials purchased over direct materials used ($330 − $200 − $100; $340 − $250 − $75)</td>
<td>(30)</td>
<td>(15)</td>
</tr>
<tr>
<td>Decrease in allocated plant-level overhead ($50 + $40 − $80; $80 + $30 − $100)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Add back allocated corporate overhead costs ($15 + $10; $20 + $8)</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Value stream operating income</td>
<td>$210</td>
<td>$208</td>
</tr>
</tbody>
</table>
1. Solution Exhibit 20-37 presents the annual net benefit of $105,000 to Parson Container Corporation of implementing a JIT production system.

2. As part of the IMA’s Standards of Ethical Professional Practice, Sue Winston, the company controller has an obligation under the competence standard to “provide decision support information and recommendations that are accurate, clear, concise and timely”. Therefore, Sue must provide the cost benefit analysis to Parson’s senior management in a timely fashion, even if it could result in layoffs for some employees. The credibility standard also requires Sue to disclose any relevant information that could expect to influence an intended user’s decision. This would indicate that Sue has an ethical obligation to disclose the potential cost/benefits of the new JIT system to management.

3. It is understandable that Jim Ingram the company’s operations manager would be concerned about potential layoffs in his department and the resulting morale issues. However, recommendations could include 1) fully engage the production staff in the upcoming changes to minimize negative morale issues 2) retrain existing staff to manage the new JIT production and purchasing system, so as to avoid as many potential layoffs, as possible 3) relocate existing staff to other production and or administrative positions wherever possible to minimize layoffs. As for Jim’s other concerns, the new system will be costly to implement and maintain and there is a likelihood for additional stockouts, but the financial benefits clearly outweigh the costs.

**SOLUTION EXHIBIT 20-37**

Annual Relevant Costs and Benefits of new JIT Production System for Parson Container Corporation

<table>
<thead>
<tr>
<th>Relevant Items</th>
<th>Relevant Benefits under JIT Production System</th>
<th>Relevant Costs under JIT Production System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual additional costs for JIT system</td>
<td></td>
<td>$220,000</td>
</tr>
<tr>
<td>implementation and management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional expected stockout costs</td>
<td></td>
<td>$125,000</td>
</tr>
<tr>
<td>10,000 × 5% × $250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required return on investment:</td>
<td></td>
<td>$150,000</td>
</tr>
<tr>
<td>10% per year × $2,000,000 × 75% of average inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance, and warehousing costs</td>
<td></td>
<td>$210,000</td>
</tr>
<tr>
<td>60% per year × $350,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction in payroll expense for current inventory</td>
<td></td>
<td>90,000</td>
</tr>
<tr>
<td>management staff 15% per year × $600,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental revenues from higher selling prices</td>
<td></td>
<td>$450,000</td>
</tr>
<tr>
<td>Total net incremental benefits/costs</td>
<td></td>
<td>$345,000</td>
</tr>
<tr>
<td>Annual difference in favor of JIT production</td>
<td>$105,000</td>
<td></td>
</tr>
</tbody>
</table>