

12

PERFORMANCE EVALUATION AND DECENTRALIZATION

DISCUSSION QUESTIONS

1. In centralized decision making, decisions are made at the very top level, and lower-level managers are responsible for implementing these decisions. For decentralized decision making, decisions are made and implemented by lower-level managers.
2. Decentralization is the delegation of decision-making authority to lower levels.
3. Reasons for decentralization include access to local information, cognitive limitations, more timely responses, focusing of central management, training, and motivation.
4. Margin reveals how much sales revenue remains as operating income (after subtracting expenses). Turnover reveals how many sales dollars result from each dollar invested in operating assets. $\text{Margin} = \text{Operating income} / \text{Sales}$ and $\text{Turnover} = \text{Sales} / \text{Average operating assets}$. By breaking ROI into margin and turnover, more information is available to assess performance. Knowledge of margin and turnover gives more insight into why the ROI may change from one period to the next.
5. ROI
 - (1) encourages managers to pay attention to the relationships among sales, expenses, and investment;
 - (2) encourages cost efficiency; and
 - (3) discourages excessive investment in operating assets.Increased profitability can be achieved (all else being equal) by increasing revenues, decreasing expenses, or lowering investment.
6. Residual income is equal to operating income minus the minimum rate of return multiplied by the average operating assets. EVA (economic value added) requires the company to calculate its actual cost of capital and use it as the minimum rate of return in the residual income calculation. In addition, EVA always uses after-tax income.
7. Yes, residual income and EVA can be negative. This means that the company earned less than its minimum rate of return or, in the case of EVA, its actual cost of capital.
8. A transfer price is the price charged for goods that are transferred from one division to another.
9. One policy is a market price where the transfer price equals the price at which the product would sell in a competitive market outside of the organization. A second policy is a cost-based price where the transfer price equals some measure of the product's cost plus a markup above cost. A third policy is a negotiated price where the transfer price equals an amount that is negotiated between the buyer and seller of the product.
10. The Balanced Scorecard is a strategic management system that defines a strategic-based responsibility accounting system. It translates an organization's mission and strategy into operational objectives and performance measures for four different perspectives: the financial perspective, the customer perspective, the internal business process perspective, and the learning and growth (infrastructure) perspective.

- 11.** The four perspectives of the Balanced Scorecard are financial, customer, internal business processes, and learning and growth. The financial perspective describes the economic consequences of actions taken in the other three perspectives. The customer perspective defines the customer and market segments in which the business unit will compete. The internal business process perspective describes the internal processes needed to provide value for customers and owners. The learning and growth (infrastructure) perspective defines the capabilities that an organization needs to create long-term growth and improvement.

MULTIPLE-CHOICE EXERCISES

- 12-1. a**
- 12-2. d**
- 12-3. c**
- 12-4. a**
- 12-5. b**
- 12-6. c**
- 12-7. a**
- 12-8. a**
- 12-9. b**
- 12-10. a**
- 12-11. d**
- 12-12. a**

CORNERSTONE EXERCISES**CE 12-13**

$$\begin{aligned}
 1. \text{ Average operating assets} &= \frac{\text{Beginning assets} + \text{Ending assets}}{2} \\
 &= \frac{\$345,000 + \$405,000}{2} \\
 &= \$375,000
 \end{aligned}$$

$$2. \text{ Margin} = \frac{\text{Operating income}}{\text{Sales}} = \frac{\$75,600}{\$630,000} = 0.12, \text{ or } 12 \text{ percent}$$

$$3. \text{ Turnover} = \frac{\text{Sales}}{\text{Average operating assets}} = \frac{\$630,000}{\$375,000} = 1.68$$

$$4. \text{ ROI} = \text{Margin} \times \text{Turnover} = 0.12 \times 1.68 = 0.20, \text{ or } 20 \text{ percent}$$

Alternatively,

$$\begin{aligned}
 \text{ROI} &= \frac{\text{Operating income}}{\text{Average operating assets}} \\
 &= \frac{\$75,600}{\$375,000} \\
 &= 0.20, \text{ or } 20 \text{ percent}
 \end{aligned}$$

CE 12-14

$$\begin{aligned}
 1. \text{ Average operating assets} &= \frac{\text{Beginning assets} + \text{Ending assets}}{2} \\
 &= \frac{\$345,000 + \$405,000}{2} \\
 &= \$375,000
 \end{aligned}$$

$$\begin{aligned}
 2. \text{ Residual income} &= \text{Operating income} - (\text{Minimum rate of return} \times \text{Average operating assets}) \\
 &= \$75,600 - (0.10 \times \$375,000) \\
 &= \$75,600 - \$37,500 \\
 &= \$38,100
 \end{aligned}$$

CE 12-15

$$\begin{aligned}
 \text{EVA} &= \text{After-tax operating income} - (\text{Actual percentage cost of capital} \times \\
 &\quad \text{Total capital employed}) \\
 &= \$45,360 - (0.08 \times \$400,000) \\
 &= \$45,360 - \$32,000 \\
 &= \$13,360
 \end{aligned}$$

CE 12-16

1. The full cost transfer price is \$540. Maple Division would be delighted with that price, but Indian Division would refuse to transfer since \$720 could be earned in the outside market.
2. The market price is \$720. Both Maple and Indian Division would be willing to transfer at that price (since neither division would be worse off than if it bought or sold in the outside market).
3. Minimum transfer price = \$720 – \$120 = \$600

This price is set by Indian Division, the selling division.

Maximum transfer price = \$720.

This price is the market price and is set by Maple Division, the buying division.

Yes, both divisions would be willing to accept a transfer price within the bargaining range. Precisely what the transfer price would be depends on the negotiating skills of the Indian and Maple division managers.

CE 12-17 (Appendix)

1. Theoretical cycle time = (25,000 hours)(60 minutes per hour)/250,000 units
= 6 minutes per unit
2. Actual cycle time = (25,000 hours)(60 minutes per hour)/200,000 units
= 7.5 minutes per unit
3. Theoretical velocity = 60 minutes per hour/6 minutes per unit
= 10 units per hour
4. Actual velocity = 60 minutes per hour/7.5 minutes per unit
= 8 units per hour

CE 12-18 (Appendix)

1. Processing time is equal to theoretical cycle time. That is, if everything goes smoothly and there is no wasted time, it takes 6 minutes to produce one unit. Nonprocessing time, therefore, must be the difference between actual cycle time (which includes some waste) and theoretical cycle time.

Processing time = Theoretical cycle time = 6 minutes

Nonprocessing time = Actual cycle time – Theoretical cycle time
= 7.5 – 6.0 = 1.5 minutes

$$\begin{aligned} 2. \text{ MCE} &= \frac{\text{Processing time}}{\text{Processing time} + \text{Nonprocessing time}} \\ &= \frac{6}{6.0 + 1.5} = 0.8, \text{ or } 80 \text{ percent} \end{aligned}$$

EXERCISES**E 12-19**

- a. Cost center
- b. Investment center
- c. Revenue center
- d. Profit center
- e. Investment center

E 12-20

1. Sales \$30,000,000
 Less expenses 27,600,000
 Operating income \$2,400,000
2. Margin = $\frac{\text{Operating income}}{\text{Sales}} = \frac{\$2,400,000}{\$30,000,000} = 0.08, \text{ or } 8\%$
 Turnover = $\frac{\text{Sales}}{\text{Average operating assets}} = \frac{\$30,000,000}{\$6,000,000} = 5$
3. ROI = Margin \times Turnover = $0.08 \times 5 = 0.40, \text{ or } 40\%$
 Alternatively,
 ROI = $\frac{\text{Operating income}}{\text{Average operating assets}} = \frac{\$2,400,000}{\$6,000,000} = 0.40, \text{ or } 40\%$

E 12-21

1. Average operating assets = $\frac{\$44,500 + \$33,900}{2}$
 = \$39,200
2. Margin = $\frac{\$137,200}{\$980,000} = 0.14, \text{ or } 14\%$
 Turnover = $\frac{\$980,000}{\$39,200} = 25$
3. ROI = Margin \times Turnover = $0.14 \times 25 = 3.50, \text{ or } 350\%$
 Alternatively,
 ROI = $\frac{\text{Operating income}}{\text{Average operating assets}} = \frac{\$137,200}{\$39,200} = 3.50, \text{ or } 350\%$
4. ROI measures a company's ability to generate income relative to its investment in assets. The greater the ROI, the more efficiently the company is in generating income from its assets.

E 12-21 (Continued)

5. Elway Company might be a service organization with relatively few physical assets required to generate its sales revenue and income. For example, for many service organizations, and some manufacturers, one of the most important factors that generate revenue and income is human talent. However, human beings, while important in creating ideas and organizational value, are not recognized as assets in the balance sheet. Therefore, ROI will be higher when the factors that create a company's sales or income are not formally recognized as assets (i.e., the denominator is deflated relative to a company that requires greater assets to generate its given level of sales and income).

E 12-22

	<u>Year 1</u>	<u>Year 2</u>
1. Margin:		
$\frac{\$7,280,000}{\$52,000,000}$	0.14, or 14%	
$\frac{\$7,507,500}{\$57,750,000}$		0.13, or 13%
Turnover		
$\frac{\$52,000,000}{\$200,000,000}$	0.26	
$\frac{\$57,750,000}{\$262,500,000}$		0.22

2. ROI Year 1 = $0.14 \times 0.26 = 0.04^*$, or 4%

ROI Year 2 = $0.13 \times 0.22 = 0.03^*$, or 3%

*Rounded

E 12-23

1. Residual income = $\$340,000 - (0.07 \times \$3,500,000) = \$95,000$
2. ROI must have been greater than 7 percent, because residual income is positive.

Actual ROI = $\$340,000 / \$3,500,000 = 0.10^*$, or 10%

*Rounded

E 12-24

1. EVA = $\$1,125,000 - (0.11 \times \$3,500,000) = \$740,000$
2. Falconer is creating wealth because EVA is positive.

E 12-25

1. Adams Division EVA = $\$605,000 - (0.12 \times \$4,000,000) = \$125,000$
2. Jefferson Division EVA = $\$315,000 - (0.12 \times \$3,250,000) = (\$75,000)$
3. The Adams Division is creating wealth (i.e., the cost of making the income is lower than the income) since its EVA is positive. The Jefferson Division destroying wealth (i.e., the cost of making the income is higher than the income) since its EVA is negative.
4. In essence, Washington's management can increase Jefferson Division's EVA by doing any of the following items:
 - a. Increase the after-tax operating profit that is generated from using the same amount of invested capital (i.e., find ways to "do more with the same level of capital")
 - b. Continue to generate the same after-tax operating profit but use less capital to do so (i.e., find ways to "do the same thing but with less capital")
 - c. Continue to generate the same after-tax operating profit using the same amount of capital, but with a lower cost of capital (i.e., obtain capital more cheaply)

It is up to the management team to decide which of these three general strategies should be pursued and which specific actions should be implemented for the chosen strategy.

E 12-26

1. Adams Division EVA = $\$605,000 - (0.08 \times \$4,000,000) = \$285,000$
2. Jefferson Division EVA = $\$315,000 - (0.08 \times \$3,250,000) = \$55,000$

E 12-27

- 1. The maximum transfer price is set by the buying division, in this case, the Motel Division. The minimum transfer price is set by the selling division, in this case, the Furniture Division.**
- 2. Full cost transfer price = \$29**
- 3. The Motel Division would love to have a transfer price of \$29 per dresser (remember, it is currently paying \$40 per dresser). However, the Furniture Division will refuse to transfer at that price because it can sell all the dressers it can produce in the outside market for \$40.**

E 12-28

- 1. The maximum transfer price, set by the Motel Division, is \$40. Remember, the Motel Division would not pay any more than \$40 because that is the price it currently pays to outside suppliers.**
- 2. The minimum transfer price, set by the Furniture Division, is \$40. Remember that this division is operating at capacity and can sell all that it makes to outside buyers for \$40.**
- 3. If the transfer takes place, the transfer price will be \$40. No, it does not matter whether or not the transfer takes place, since the transfer price would be equal to the outside market price.**

E 12-29

1. The maximum transfer price, set by the Motel Division, is \$40.
2. The minimum transfer price, set by the Furniture Division, is \$14. In this case, only variable costs of \$14 per dresser are relevant because the Furniture Division has excess capacity.

3. Benefit to Furniture Division:

Revenue ($\$35 \times 10,000$)	\$350,000
Less: Variable cost ($\$14 \times 10,000$)	140,000
Benefit	<u>\$210,000</u>

Benefit to Motel Division:

Outside supplier ($\$40 \times 10,000$)	\$400,000
Transfer price ($\$35 \times 10,000$)	350,000
Benefit	<u>\$ 50,000</u>

Benefit to company = \$210,000 + \$50,000 = \$260,000

E 12-30 (Appendix)

1. Theoretical cycle time = (10,000 hours)(60 minutes per hour)/50,000 units
= 12 minutes per unit
2. Actual cycle time = (10,000 hours)(60 minutes per hour)/40,000 units
= 15 minutes per unit
3. Theoretical velocity = 60 minutes per hour/12 minutes per unit
= 5 units per hour
4. Actual velocity = 60 minutes per hour/15 minutes per unit
= 4 units per hour

E 12-31 (Appendix)

1. Theoretical cycle time = (30,000 hours)(60 minutes per hour)/90,000 units
= 20 minutes per unit
2. Actual cycle time = (30,000 hours)(60 minutes per hour)/75,000 units
= 24 minutes per unit
3. Theoretical velocity = 60 minutes per hour/20 minutes per unit
= 3 units per hour
4. Actual velocity = 60 minutes per hour/24 minutes per unit
= 2.5 units per hour

E 12-32 (Appendix)

1. Processing time = Theoretical cycle time = 9 minutes per unit

$$\begin{aligned}\text{Nonprocessing time} &= \text{Actual cycle time} - \text{Theoretical cycle time} \\ &= 15 \text{ minutes} - 9 \text{ minutes} = 6 \text{ minutes per unit}\end{aligned}$$

$$\begin{aligned}\text{2. MCE} &= \frac{\text{Processing time}}{\text{Processing time} + \text{Nonprocessing time}} \\ &= \frac{9}{9 + 6} = 0.6\end{aligned}$$

E 12-33 (Appendix)

1. Processing time = Theoretical cycle time = 10 minutes per unit

$$\begin{aligned}\text{Nonprocessing time} &= \text{Actual cycle time} - \text{Theoretical cycle time} \\ &= 16 \text{ minutes} - 10 \text{ minutes} = 6 \text{ minutes per unit}\end{aligned}$$

$$\begin{aligned}\text{2. MCE} &= \frac{\text{Processing time}}{\text{Processing time} + \text{Nonprocessing time}} \\ &= \frac{10}{10 + 6} = 0.625\end{aligned}$$

PROBLEMS

P 12-34

1. a. ROI of division without radio = $\$725,000/\$3,625,000 = 0.20$, or 20%
 b. ROI of the radio project = $\$640,000/\$4,000,000 = 0.16$, or 16%
 c. ROI of division with radio = $\$1,365,000/\$7,625,000 = 0.18$, or 18%*
2. a. Residual income of division without radio = $\$725,000 - (0.12)(\$3,625,000)$
 = \$290,000
 b. Residual income of the radio project = $\$640,000 - (0.12)(\$4,000,000)$
 = \$160,000
 c. Residual income of division with radio = $\$1,365,000 - (0.12)(\$7,625,000)$
 = \$450,000
3. This depends on whether Leslie's division is evaluated on the basis of ROI or on the basis of residual income. Overall division ROI will decrease; so if ROI is the basis for evaluation, she will decline the investment. On the other hand residual income for the project is positive and will raise overall residual income. If the division is evaluated on the basis of residual income the project will be accepted.

*Rounded

P 12-35

	Year 1	Year 2	Year 3
ROI	8.00%	6.97%*	6.30%
Margin	12.00%	11.00%	10.50%
Turnover	0.67	0.63*	0.60

2. ROI: $\frac{\$1,200,000}{\$15,000,000} = 0.08$, or 8%

Margin: $\frac{\$1,200,000}{\$10,000,000} = 0.12$, or 12%

Turnover: $\frac{\$10,000,000}{\$15,000,000} = 0.67$

The ROI increased because expenses decreased and assets turned over at a higher rate (sales increased).

*Rounded

P 12-35 (Continued)

3. Operating assets: $\$15,000,000 \times 80\% = \$12,000,000$

$$\text{ROI: } \frac{\$945,000}{\$12,000,000} = 7.88\%^*$$

$$\text{Margin: } \frac{\$945,000}{\$9,000,000} = 10.5\%$$

$$\text{Turnover: } \frac{\$9,000,000}{\$12,000,000} = 0.75$$

The ROI increased because assets decreased.

4. ROI: $\frac{\$1,200,000}{\$12,000,000} = 0.10, \text{ or } 10\%$

$$\text{Margin: } \frac{\$1,200,000}{\$10,000,000} = 0.12, \text{ or } 12\%$$

$$\text{Turnover: } \frac{\$10,000,000}{\$12,000,000} = 0.83^*$$

The ROI increased because expenses decreased and assets turned over at a higher rate (sales increased and the amount of assets decreased). Both margin and turnover increased.

*Rounded

P 12-36

1. Air conditioner ROI = $\$90,000/\$750,000 = 0.12, \text{ or } 12\%$

$$\text{Turbocharger ROI} = \$82,080/\$540,000 = 0.15, \text{ or } 15\%$$

2.	<u>With Air Conditioner</u>	<u>With Turbocharger</u>	<u>With Both Investments</u>	<u>Neither Investment</u>
Income	\$ 4,425,000	\$ 4,417,080	\$ 4,507,080	\$ 4,335,000
Assets	\$29,650,000	\$29,440,000	\$30,190,000	\$28,900,000
ROI	14.92%*	15.00%*	14.93%*	15.00%*

3. The manager will choose turbocharger, but not the air conditioner.

4. a. Residual income with air conditioner $= \$4,425,000 - (0.14)(\$29,650,000)$
 $= \$274,000$

b. Residual income with turbocharger $= \$4,417,080 - (0.14)(\$29,440,000)$
 $= \$295,480$

c. Residual income with both $= \$4,507,080 - (0.14)(\$30,190,000)$
 $= \$280,480$

*Rounded

P 12-36 (Continued)

$$\begin{aligned} \text{d. Residual income with neither} &= \$4,335,000 - (0.14)(\$28,900,000) \\ &= \$289,000 \end{aligned}$$

While the residual income is positive in all four cases, the manager will choose the turbocharger, but not the air conditioner, since the residual income is highest for that alternative.

$$\begin{aligned} 5. \text{ a. Residual income with air conditioner} &= \$4,425,000 - (0.10)(\$29,650,000) \\ &= \$1,460,000 \\ \text{ b. Residual income with turbocharger} &= \$4,417,080 - (0.10)(\$29,440,000) \\ &= \$1,473,080 \\ \text{ c. Residual income with both} &= \$4,507,080 - (0.10)(\$30,190,000) \\ &= \$1,488,080 \\ \text{ d. Residual income with neither} &= \$4,335,000 - (0.10)(\$28,900,000) \\ &= \$1,445,000 \end{aligned}$$

The manager will chose to invest in both the air conditioner and the turbocharger. In this case, the minimum required return on investment, 10 percent, is lower than the ROIs of both projects. Therefore, both, projects are profitable, and the highest residual income is earned by investing in both.

P 12-37

$$\begin{aligned} 1. \quad & \$310,000 / \$3,000,000 = 0.1033, \text{ or } 10.33\%^* \\ 2. \quad \text{Margin:} \quad & \frac{\$310,000}{\$3,450,000} = 0.0899, \text{ or } 8.99\%^* \\ \text{Turnover:} \quad & \frac{\$3,450,000}{\$3,000,000} = 1.15 \\ \text{ROI} &= 1.15 \times 8.99\% = 0.1034 \text{ or } 10.34\%^* \end{aligned}$$

*The difference between the ROI computed here and the ROI in Requirement 1 is due to rounding.

$$\begin{aligned} 3. \quad & \frac{\$310,000 + \$57,500}{\$3,000,000 + \$500,000^*} = 10.5\% \\ & \frac{\$600,000 + \$400,000}{2} \end{aligned}$$

Because ROI with investment is larger than ROI without it, the manager will approve the investment.

*Rounded

P 12-37 (Continued)

$$4. \text{ Margin: } \frac{\$310,000 + \$57,500}{\$3,450,000 + \$575,000} = 0.0913, \text{ or } 9.13\%^*$$

$$\text{Turnover: } \frac{\$3,450,000 + \$575,000}{\$3,000,000 + \$500,000} = 1.15$$

The margin has increased, and the turnover ratio has stayed the same.

$$5. \text{ EVA without investment} = \$310,000 - (0.07)(\$3,000,000) = \$100,000$$

$$\text{EVA with investment} = \$367,500 - (0.07)(\$3,500,000) = \$122,500$$

EVA has increased with the investment, so the manager would approve the investment.

*Rounded

P 12-38

1. Lorne should not reduce the price charged to Rosario if he can sell all he produces. It does not matter whether the two divisions trade internally or not.
2. The minimum price is \$53, and the maximum is \$75. Yes, Lorne should consider the transfer, since his income will increase by \$59,500 [$3,500(\$70 - \$53)$].
3. The transfer price would be \$75.60 ($\63×1.2). No, the transfer would not occur, since the transfer price is higher than the outside price that Rosario could get.

P 12-39

1.	<u>Component Y34</u>	<u>Model SC67</u>	<u>Company</u>
Sales	\$260,000	\$1,680,000	\$1,940,000
Variable expenses	160,000	920,000	1,080,000
Contribution margin	<u>\$100,000</u>	<u>\$ 760,000</u>	<u>\$ 860,000</u>

2. The transfer price should be the market price of \$12. This is the minimum price for the Components Division and the maximum price for the PSF Division.
3. Unless the PSF Division is able to increase the price of Model SC67, the manager will discontinue production and will not purchase any of the components. (The cost of producing the scanner will increase from \$38 to \$43.50, a cost greater than the current selling price of \$42.)

P 12-39 (Continued)

4. All 40,000 units of Component Y34 will be sold externally at the market price of \$12 per unit.

5. Sales	\$480,000
Variable expenses	160,000
Contribution margin	<u>\$320,000</u>

The contribution margin decreases by \$540,000. Cam made the wrong decision.

P 12-40

1. Minimum: \$26
Maximum: \$31
2. Negotiated transfer price = $\frac{\$26 + \$31}{2} = \$28.50$

In terms of full cost-plus markup,

$$\$28.50 = \$20.00 + (\text{Markup percentage} \times \text{Full cost})$$

$$\text{Markup} = \$28.50 - \$20.00 = \$8.50$$

$$\text{Markup percentage} = \$8.50/\$20.00 = 0.425, \text{ or } 42.5\%$$

3. New minimum: \$27
New maximum: \$32
- $$\frac{\$27 + \$32}{2} = \$29.50$$

or full cost plus 47.5% [$\$20.00 + (\$9.50/\$20.00)$]

4. The two divisions would renegotiate because the buying division would probably be able to buy the necessary part at a lower price from another supplier. The Auxiliary Components Division might have to reduce its price.

P 12-41 (Appendix)

$$\begin{aligned} 1. \text{ Theoretical rate} &= \frac{\$2,700,000}{600,000} \\ &= \$4.50 \text{ per minute} \end{aligned}$$

$$\begin{aligned} \text{Theoretical conversion cost per unit} &= \$4.50 \times 30 \\ &= \$135.00 \end{aligned}$$

$$2. \text{ Applied conversion cost per unit} = \$4.50 \times 40 = \$180$$

$$\text{Note: } \frac{60}{1.5} = 40 \text{ minutes used per unit}$$

3. An incentive exists to reduce product cost by reducing cycle time. For example, current cycle time is 40 minutes per unit. If cycle time could be reduced to 30 minutes per unit, conversion costs would be reduced from \$180 per unit to \$135 per unit, reducing the unit product cost by \$45. Reducing cycle time increases the ability to meet deliveries on time as well as increasing the ability of the firm to respond quickly to customer demands.

P 12-42 (Appendix)

1.
 - a. Customer
 - b. Internal business process
 - c. Financial
 - d. Financial
 - e. Learning and growth
 - f. Internal business process
 - g. Customer
 - h. Internal business process
 - i. Learning and growth
 - j. Customer
 - k. Financial

2. Answers will vary.

Financial—contribution margin by product

Customer—number of complaints

Internal business process—number of accidents per month

Learning and growth—hours of continuing education provided per month

P 12-43 (Appendix)

$$1. \text{ Theoretical velocity} = \frac{1,000 \text{ repairs}}{500 \text{ hours}} = 2 \text{ per hour}$$

$$\begin{aligned} \text{Theoretical cycle time} &= \frac{60 \text{ minutes per hour}}{2 \text{ repairs per hour}} \\ &= 30 \text{ minutes} \end{aligned}$$

$$\begin{aligned} 2. \text{ MCE} &= \frac{\text{Productivity time}}{\text{Total time}} \\ &= \frac{30}{30 + 4 + 10 + 6} = 0.60, \text{ or } 60\% \end{aligned}$$

$$3. \text{ Actual cycle time} = 30 + 4 + 10 + 6 = 50 \text{ minutes}$$

$$\text{Actual velocity} = \frac{60}{50} = 1.20 \text{ repairs per hour}$$

CASES

Case 12-44

$$1. \text{ ROI based on initial estimates} = \frac{\$1,870,000}{\$15,600,000} = 0.1199, \text{ or } 11.99\%^*$$

$$\text{ROI based on Mel's estimates} = \frac{\$2,340,000}{\$15,600,000} = 0.15, \text{ or } 15\%^*$$

2. Jason is definitely facing an ethical dilemma. While it is true that the sales and expense projections are estimates, they are the best ones available to him. If he uses a sales revenue projection from the top end of the range, he will be deliberately basing the ROI estimate on a highly unlikely sales figure. Sales and expense projections are not fantasy figures. They are supposed to be management's best estimate of what will actually happen. If Jason prepares the report in accordance with Mel's desires, he will be knowingly fabricating data.

One might wonder whether or not Mel's offer to "back up" Jason is sufficient to let Jason off the hook. It is not. If Mel wants the false projections badly enough, let him sign them. Jason may have thought he had his dream job, but it is about to turn into a nightmare. Companies don't take kindly to employees who lie, and this lie is sure to come out. If the project is approved, and the sales do not approach \$2.34 million, you can bet that the vice president of sales will be quick to point out that she predicted only \$1.87 million. Mel will surely pin the blame directly on Jason, the one whose name is on the report.

3. Jason should prepare the report using the figures he thinks are most descriptive of the project's potential. He should feel free to include information about the predicted range of sales and to point out any other information that reflects favorably on the project. If Mel continues to pressure Jason, then Jason might consider looking for another job.

*Rounded