Chapter 26

# Incremental Analysis and Capital Budgeting

## STUDY OBJECTIVES

*After studying this chapter, you should be able to:*

1. Identify the steps in management's decision-making process.
2. Describe the concept of incremental analysis.
3. Identify the relevant costs in accepting an order at a special price.
4. Identify the relevant costs in a make-or-buy decision.
5. Give the decision rule for whether to sell or process materials further.
6. Identify the factors to consider in retaining or replacing equipment.
7. Explain the relevant factors in whether to eliminate an unprofitable segment.
8. Determine which products to make and sell when resources are limited.
9. Contrast annual rate of return and cash payback in capital budgeting.
10. Distinguish between the net present value and internal rate of return methods.

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- Scan **Study Objectives**
- Read **Feature Story**
- Read **Preview**
- Read text and answer DO IT! p. 1159, p. 1161, p. 1165, p. 1170, p. 1175
- Work **Comprehensive** DO IT! p. 1177
- Review **Summary of Study Objectives**
- Answer **Self-Study Questions**
- Complete **Assignments**

## Feature Story

### SOUP IS GOOD FOOD

When you hear the word *Campbell*, what is the first thing that comes to mind? Soup. Campbell *is* soup. It sells 38 percent of all the soup—including homemade—consumed in the United States.

But can a company survive on soup alone? In an effort to expand its operations and to lessen its reliance on soup, Campbell Soup Company (*www.campbellsoup.com*) in 1990 began searching for an additional line of business. Campbell's management believed it saw an opportunity in convenient meals that were low in fat, nutritionally rich, and had therapeutic value for heart patients and diabetics. This venture would require a huge investment—but the rewards were potentially tremendous.

The initial investment required building food labs, hiring nutritional scientists, researching prototype products, constructing new production facilities, and marketing the new products. Management predicted that with an initial investment of roughly $55 million, the company might generate sales of $200 million per year.

By 1994 the company had created 24 meals, and an extensive field-study revealed considerable health benefits from the products. Unfortunately, initial sales of the new product line, called Intelligent Quisine, were less than stellar. In 1997 Campbell hired a consulting firm to evaluate whether to continue the project. Product development of the new line was costing $20 million per year—a sum that some managers felt could be better spent developing new products in other divisions, or expanding overseas operations. In 1998 Campbell discontinued the project.

Campbell was not giving up on growth, but simply had decided to refocus its efforts on soup. The company's annual report stated management's philosophy: "Soup will be our growth engine." Campbell has sold off many of its non-soup businesses and in a recent year introduced 20 new soup products.

***Source:*** Vanessa O'Connell, "Food for Thought: How Campbell Saw a Breakthrough Menu Turn into Leftovers," *Wall Street Journal*, October 6, 1998.

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## *Inside Chapter 26...*

## Preview of Chapter 26

An important purpose of management accounting is to provide relevant information for decision making. Examples of these decisions include the following: (1) Campbell Soup's decision to produce "therapeutic meals" rather than some other food product. (2) Boeing's strategic decisions to spend $5 billion to build a plane for the 21st century—the B-777—and to cancel development of a larger version of the B-747. (3) The Coca-Cola Company's decision to spend $750 million to build twelve plants in Russia.

This chapter begins with an explanation of management's decision-making process. It then considers the topics of incremental analysis and capital budgeting. The content and organization of Chapter 26 are as follows.

**Incremental Analysis and Capital Budgeting**

| Incremental Analysis | Capital Budgeting |
|---|---|
| • Management's decision-making process<br>• Accept special-price order<br>• Make or buy<br>• Sell or process further<br>• Retain or replace equipment<br>• Eliminate unprofitable segment<br>• Allocate limited resources | • Evaluation process<br>• Annual rate of return<br>• Cash payback<br>• Discounted cash flow: NPV and IRR |

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# SECTION 1 Incremental Analysis

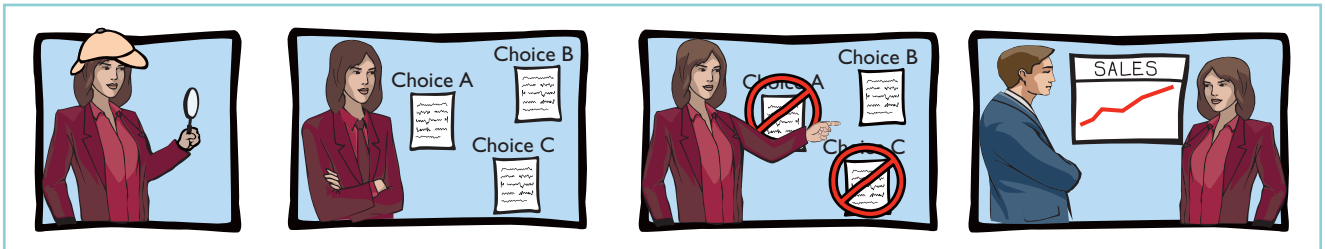
## MANAGEMENT'S DECISION-MAKING PROCESS

**STUDY OBJECTIVE 1**

**Identify the steps in management's decision-making process.**

Making decisions is an important management function. Management's decision-making process does not always follow a set pattern, because decisions vary significantly in their scope, urgency, and importance. It is possible, though, to identify some steps that are frequently involved in the process. These steps are shown in Illustration 26-1.

**Illustration 26-1**
Management's decision-making process



Accounting's contribution to the decision-making process occurs primarily in Steps 2 and 4—evaluating possible courses of action, and reviewing the results. In Step 2, for each possible course of action, accounting provides relevant revenue and cost data. These show the expected overall effect on net income. In Step 4, accounting prepares internal reports that review the actual impact of the decision.

In making business decisions, management ordinarily considers both financial and nonfinancial information. *Financial information* is related to revenues and costs and their effect on the company's overall profitability. *Nonfinancial information* relates to such factors as the effect of the decision on employee turnover, the environment, or the overall image of the company in the community. Although the nonfinancial information can be as important as the financial information, we focus primarily on financial information that is relevant to the decision.

## The Incremental Analysis Approach

**STUDY OBJECTIVE 2**
**Describe the concept of incremental analysis.**

**Decisions involve a choice among alternative courses of action.** Suppose that you were deciding whether to purchase or lease a computer for use in doing your accounting homework. The financial data relate to the cost of leasing versus the cost of purchasing. For example, leasing involves periodic lease payments; purchasing requires "up-front" payment of the purchase price. In other words, the financial data relevant to the decision are the data that vary among the possible alternatives. The process used to identify the financial data that change under alternative courses of action is called **incremental analysis**. In some cases, when you use incremental analysis, both costs **and** revenues will change. In other cases, only costs **or** revenues will change.

**ALTERNATIVE TERMINOLOGY**
**Incremental analysis is also called *differential analysis* because the analysis focuses on differences.**

Just as your decision to buy or lease a PC affects your future, similar decisions, on a larger scale, affect a company's future. Incremental analysis identifies the probable effects of those decisions on future earnings. Such analysis inevitably involves estimates and uncertainty. Gathering data for incremental analyses may involve market analysts, engineers, and accountants. In quantifying the data, the accountant is expected to produce the most reliable information available at the time the decision must be made.

## How Incremental Analysis Works

The following example illustrates the basic approach in incremental analysis.

| | A | B | C | D |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

**Illustration 26-2**
Basic approach in incremental analysis

will be $15,000 less under alternative B than under alternative A, but a $20,000 incremental cost saving will be realized.[1] Thus, alternative B will produce $5,000 more net income than alternative A.

Incremental analysis sometimes involves changes that at first glance might seem contrary to your intuition. For example, sometimes variable costs *do not change* under the alternative courses of action. Also, sometimes fixed costs *do change*. For example, direct labor, normally a variable cost, is not an incremental cost in deciding between two new factory machines if each asset requires the same amount of direct labor. In contrast, rent expense, normally a fixed cost, is an incremental cost in a decision to continue occupancy of a building or to purchase or lease a new building.

## TYPES OF INCREMENTAL ANALYSIS

A number of different types of decisions involve incremental analysis. The more common types of decisions are:

1. Accept an order at a special price.
2. Make or buy.
3. Sell or process further.
4. Retain or replace equipment.
5. Eliminate an unprofitable business segment.
6. Allocate limited resources.

We consider each of these types of analysis in the following pages.

### Accept an Order at a Special Price

**STUDY OBJECTIVE 3**

**Identify the relevant costs in accepting an order at a special price.**

Sometimes, a company has an opportunity to obtain additional business if it is willing to make a major price concession to a specific customer. To illustrate, assume that Sunbelt Company produces 100,000 automatic blenders per month, which is 80% of plant capacity. Variable manufacturing costs are $8 per unit. Fixed manufacturing costs are $400,000, or $4 per unit. The blenders are normally sold directly to retailers at $20 each. Sunbelt has an offer from Mexico Co. (a foreign wholesaler) to purchase an additional 2,000 blenders at $11 per unit. Acceptance of the offer would not affect normal sales of the product, and the additional units can be manufactured without increasing plant capacity. What should management do?

If management makes its decision on the basis of the total cost per unit of $12 ($8 + $4), the order would be rejected, because costs ($12) would exceed revenues ($11) by $1 per unit. However, since the units can be produced within existing plant capacity, the special order **will not increase fixed costs**. The relevant data for the decision, therefore, are the variable manufacturing costs per unit of $8 and the expected revenue of $11 per unit. Thus, as shown in Illustration 26-3, Sunbelt will increase its net income by $6,000 by accepting this special order.

[1] Although income taxes are sometimes important in incremental analysis, they are ignored in the chapter for simplicity's sake.

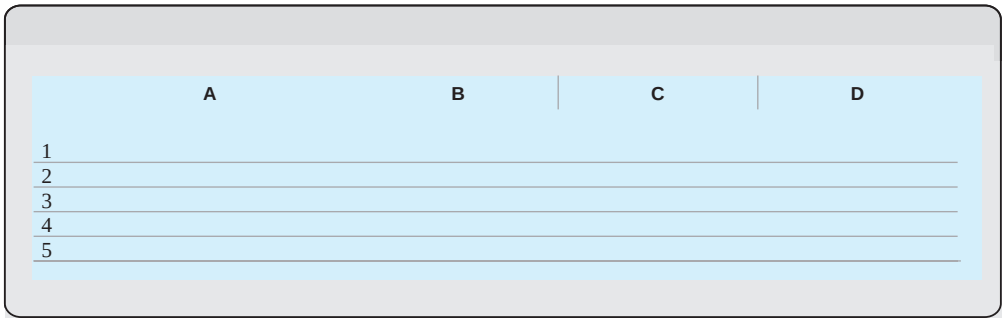



**Illustration 26-3**
Incremental analysis—accepting an order at a special price

## DO IT!

SPECIAL ORDERS

Cobb Company incurs a cost of $28 per unit, of which $18 is variable, to make a product that normally sells for $42. A foreign wholesaler offers to buy 5,000 units at $25 each. Cobb will incur shipping costs of $1 per unit. Compute the increase or decrease in net income Cobb will realize by accepting the special order, assuming Cobb has excess operating capacity. Should Cobb Company accept the special order?

### action plan

- ✔ Identify all revenues that will change as a result of accepting the order.
- ✔ Identify all costs that will change as a result of accepting the order, and net this amount against the change in revenues.

***Solution***

| | Reject | Accept | Net Income Increase (Decrease) |
|---|---|---|---|
| Revenues | $–0– | $125,000 | $125,000 |
| Costs | –0– | 95,000* | (95,000) |
| Net income | $–0– | $ 30,000 | $ 30,000 |

*(5,000 × $18) + (5,000 × $1)

Given the result of the analysis, Cobb Company should accept the special order.

Related exercise material: **BE26-2, BE26-3, E26-2, E26-3,** and **DO IT! 26-1.**

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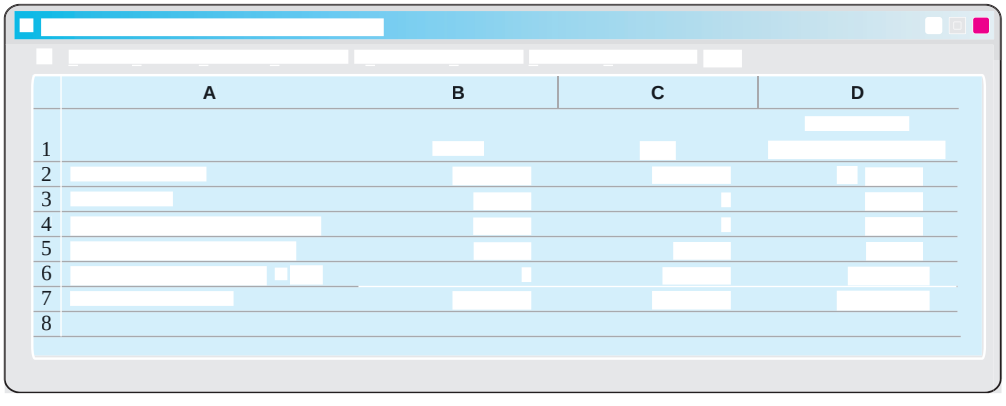
## Make or Buy

**STUDY OBJECTIVE 4**
**Identify the relevant costs in a make-or-buy decision.**

When a manufacturer assembles component parts in producing a finished product, management must decide whether to make or buy the components. For example, General Motors Corporation may either make or buy the batteries, tires, and radios used in its cars. Similarly, Hewlett-Packard Corporation may make or buy the electronic circuitry, cases, and printer heads for its printers. Boeing recently sold some of its commercial aircraft factories in an effort to cut production costs and focus instead on engineering and final assembly rather than manufacturing. The decision to make or buy components should be made on the basis of incremental analysis.

Illustration 26-5
Incremental analysis—make or buy



ETHICS NOTE

In the make-or-buy decision it is important for management to take into account the social impact of its choice. For instance, buying may be the most economically feasible solution, but such action could result in the closure of a manufacturing plant that employs many good workers.

This analysis indicates that Baron Company will incur $25,000 of additional costs by buying the ignition switches. Therefore, Baron should continue to make the ignition switches, even though the total manufacturing cost is $1 higher than the purchase price. The reason is that if the company purchases the ignition switches, it will still have fixed costs of $50,000 to absorb.

## OPPORTUNITY COST

The foregoing make-or-buy analysis is complete only if the productive capacity used to make the ignition switches cannot be converted to another purpose. If there is an opportunity to use this productive capacity in some other manner, then this opportunity cost must be considered. **Opportunity cost** is the potential benefit that may be obtained by following an alternative course of action.

To illustrate, assume that through buying the switches, Baron Company can use the released productive capacity to generate additional income of $28,000. This lost income is an additional cost of continuing to make the switches in the make-or-buy decision. This opportunity cost therefore is added to the "Make" column, for comparison. Illustration 26-6 shows that it is now advantageous to buy the ignition switches.

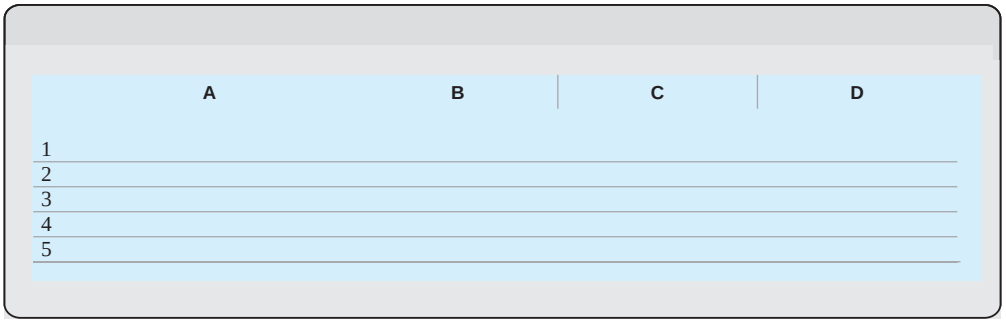



**Illustration 26-6**
Incremental analysis—make or buy, with opportunity cost

## DO IT!

MAKE OR BUY

Juanita Company must decide whether to make or buy some of its components. The costs of producing 50,000 electrical cords for its floor lamps are as follows.

| | | | |
|---|---|---|---|
| Direct materials | $60,000 | Variable overhead | $12,000 |
| Direct labor | $30,000 | Fixed overhead | $8,000 |

Instead of making the electrical cords at an average cost per unit of $2.20 ($110,000 ÷ 50,000), the company has an opportunity to buy the cords at $2.15 per unit. If the company purchases the cords, all variable costs and one-half of the fixed costs will be eliminated.

**(a)** Prepare an incremental analysis showing whether the company should make or buy the electrical cords. **(b)** Will your answer be different if the released productive capacity will generate additional income of $25,000?

### action plan

- ✔ Look for the costs that change.
- ✔ Ignore the costs that do not change.
- ✔ Use the format in the chapter for your answer.
- ✔ Recognize that opportunity cost can make a difference.

### Solution

**(a)**

| | Make | Buy | Net Income Increase (Decrease) |
|---|---|---|---|
| Direct materials | $ 60,000 | $ –0– | $ 60,000 |
| Direct labor | 30,000 | –0– | 30,000 |
| Variable manufacturing costs | 12,000 | –0– | 12,000 |
| Fixed manufacturing costs | 8,000 | 4,000 | 4,000 |
| Purchase price | –0– | 107,500 | (107,500) |
| Total cost | $110,000 | $111,500 | $ (1,500) |

This analysis indicates that Juanita Company will incur $1,500 of additional costs if it buys the electrical cords.

**(b)**

| | Make | Buy | Net Income Increase (Decrease) |
|---|---|---|---|
| Total cost | $110,000 | $111,500 | $ (1,500) |
| Opportunity cost | 25,000 | | 25,000 |
| Total cost | $135,000 | $111,500 | $ 23,500 |

Yes, the answer is different: The analysis shows that net income will be increased by $23,500 if Juanita Company purchases the electrical cords.

Related exercise material: **BE26-4, E26-4,** and **DO IT! 26-2.**

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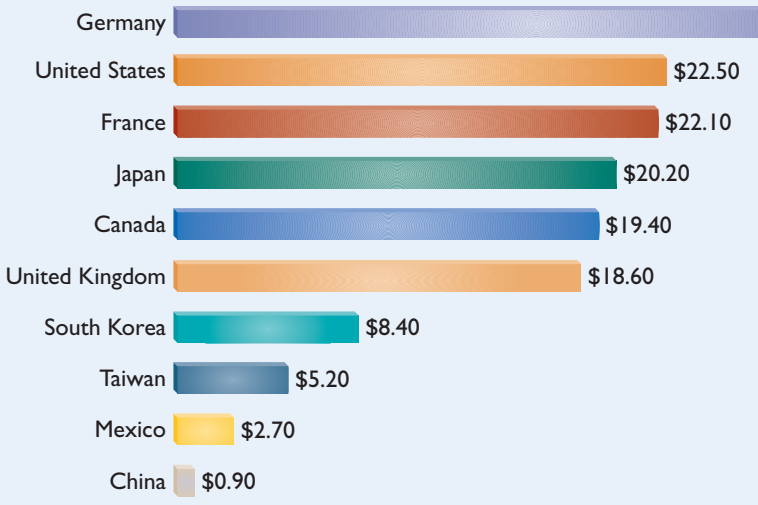
## ACCOUNTING ACROSS THE ORGANIZATION

### These Wheels Have Miles Before Installation

Consider the make-or-buy decision faced by Superior Industries International, Inc., a big aluminum-wheel maker in Van Nuys, California. For years, president Steve Borick had ignored the possibility of Chinese manufacturing. Then Mr. Borick started getting a blunt message from General Motors and Ford, with whom Superior does 85% of its business: Match the prices of Chinese wheel suppliers. Both auto makers said separately that if Superior could not agree to the lower prices, they would go directly to Chinese manufacturers or turn to other North American wheel-makers.




Stories like this, repeated in various industries, illustrate why manufacturers engage in overseas *off-shoring* (outsourcing). For example, compare the relative labor costs in major auto-producing nations, in dollars per hour, to see why incremental analysis often leads to outsourcing production to countries like China.

***Source:*** Norihiko Shirouzu, "Big Three's Outsourcing Plan: Make Parts Suppliers Do It," *Wall Street Journal*, June 10, 2004, p. A1.

? What are the disadvantages of outsourcing to a foreign country?

## Sell or Process Further

**STUDY OBJECTIVE 5**

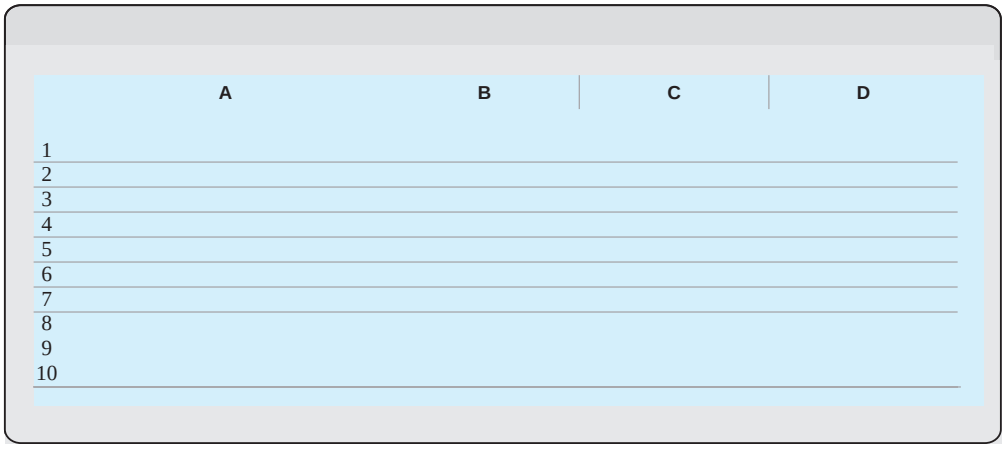
**Give the decision rule for whether to sell or process materials further.**

Many manufacturers have the option of selling products at a given point in the production cycle or continuing to process with the expectation of selling them at a higher price. For example, a bicycle manufacturer such as Schwinn could sell its 10-speed bicycles to retailers either unassembled or assembled. A furniture manufacturer such as Ethan Allen could sell its dining room sets to furniture stores either unfinished or finished. The sell-or-process-further decision should be made on the basis of incremental analysis. The basic decision rule is: **Process further as long as the incremental revenue from such processing exceeds the incremental processing costs.**

Assume, for example, that Woodmasters Inc. makes tables. The cost to manufacture an unfinished table is $35, computed as follows.

**Illustration 26-7**
Per unit cost of unfinished table

| | |
|---|---|
| Direct material | $15 |
| Direct labor | 10 |
| Variable manufacturing overhead | 6 |
| Fixed manufacturing overhead | 4 |
| **Manufacturing cost per unit** | **$35** |



| | A | B | C | D |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |

**Illustration 26-8**
Incremental analysis—sell or process further

**HELPFUL HINT**

**Current net income is known. Net income from processing further is an estimate. In making its decision, management could add a "risk" factor for the estimate.**

It is advantageous for Woodmasters to process the tables further. The incremental revenue of $10.00 from the additional processing is $1.60 higher than the incremental processing costs of $8.40.

## Retain or Replace Equipment

Management often has to decide whether to continue using an asset or replace it. To illustrate, assume that Jeffcoat Company has a factory machine with a book value of $40,000 and a remaining useful life of four years. A new machine is available that costs $120,000. It is expected to have zero salvage value at the end of its four-year useful life. If Jeffcoat acquires the new machine, variable manufacturing costs are expected to decrease from $160,000 to $125,000 annually, and the old unit will be scrapped. The incremental analysis for the four-year period is as follows.

In this case, it is advantageous to replace the equipment. The lower variable manufacturing costs related to the new equipment more than offset its purchase cost.

One other point about Jeffcoat's decision: **The book value of the old machine does not affect the decision.** Book value is a **sunk cost**, which is a cost that cannot be changed by any present or future decision. Sunk costs **are not relevant in incremental analysis**. In this example, if the company retains the asset, book value is depreciated over its remaining useful life. Or, if the company acquires the new unit, book value is recognized as a loss of the current period. Thus, the effect of book value on current and future earnings is the same regardless of the replacement decision. However, **any trade-in allowance or cash disposal value of the existing asset is relevant** to the decision, because the company will not realize this value if the old asset is continued in use.

## Eliminate an Unprofitable Segment

**STUDY OBJECTIVE 7**

**Explain the relevant factors in whether to eliminate an unprofitable segment.**

Management sometimes must decide whether to eliminate an unprofitable business segment. For example, in recent years many airlines have quit servicing certain cities or have cut back on the number of flights; and Goodyear recently quit producing several brands in the low-end tire market. Again, the key is to **focus on the relevant costs—the data that change under the alternative courses of action.** To illustrate, assume that Martina Company manufactures tennis racquets in three models: Pro, Master, and Champ. Pro and Master are profitable lines. Champ (highlighted in color in Illustration 26-10) operates at a loss. Condensed income statement data for the three segments are:

**Illustration 26-10**
Segment income data

| | Pro | Master | Champ | Total |
|---|---|---|---|---|
| Sales | $800,000 | $300,000 | **$100,000** | $1,200,000 |
| Variable expenses | 520,000 | 210,000 | **90,000** | 820,000 |
| Contribution margin | 280,000 | 90,000 | **10,000** | 380,000 |
| Fixed expenses | 80,000 | 50,000 | **30,000** | 160,000 |
| Net income | $200,000 | $ 40,000 | **$ (20,000)** | $ 220,000 |

It might be expected that total net income will increase by $20,000 to $240,000 if Martina Company eliminates the unprofitable Champ line of racquets. However, **net income may decrease if that line is discontinued**. The reason is that the other products will have to absorb the fixed expenses allocated to the Champ racquets. To illustrate, assume that the $30,000 of fixed costs applicable to the unprofitable segment are allocated ⅔ and ⅓ to the Pro and Master product lines, respectively. Fixed expenses will increase to $100,000 ($80,000 + $20,000) in the Pro line and to $60,000 ($50,000 + $10,000) in the Master line. Illustration 26-11 shows the revised income statements.

**HELPFUL HINT**

**A decision to discontinue a segment based solely on the bottom line—net loss—is inappropriate.**

**Illustration 26-11**
Income data after eliminating unprofitable product line

| | Pro | Master | Total |
|---|---|---|---|
| Sales | $800,000 | $300,000 | $1,100,000 |
| Variable expenses | 520,000 | 210,000 | 730,000 |
| Contribution margin | 280,000 | 90,000 | 370,000 |
| Fixed expenses | **100,000** | **60,000** | 160,000 |
| Net income | $180,000 | $ 30,000 | **$ 210,000** |

Total net income has decreased $10,000 ($220,000 − $210,000). This result is also obtained in the following incremental analysis of the Champ racquets.

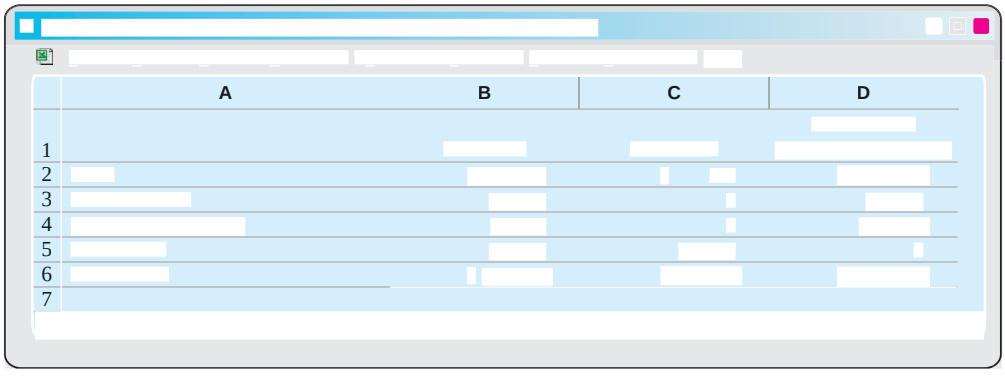



**Illustration 26-12**
Incremental analysis—eliminating an unprofitable segment

The loss in net income is attributable to the contribution margin ($10,000) that the company will not realize if it discontinues the segment.

In deciding on the future status of an unprofitable segment, management should consider the effect of elimination on related product lines. It may be possible for continuing product lines to obtain some or all of the sales lost by the discontinued product line. In some businesses, services or products may be linked—for example, free checking accounts at a bank, or coffee at a donut shop. In addition, management should consider the effect of eliminating the product line on employees who may have to be discharged or retrained.

## DO IT!

**UNPROFITABLE SEGMENTS**

Lambert, Inc. manufactures several types of accessories. For the year, the knit hats and scarves line had sales of $400,000, variable expenses of $310,000, and fixed expenses of $120,000. Therefore, the knit hats and scarves line had a net loss of $30,000. If Lambert eliminates the knit hats and scarves line, $20,000 of fixed costs will remain. Prepare an analysis showing whether the company should eliminate the knit hats and scarves line.

### action plan

- ✔ Identify the revenues that will change as a result of eliminating a product line.
- ✔ Identify all costs that will change as a result of eliminating a product line, and net the amount against the revenues.

### Solution

| | Continue | Eliminate | Net Income Increase (Decrease) |
|---|---|---|---|
| Sales | $400,000 | $ 0 | $(400,000) |
| Variable costs | 310,000 | 0 | 310,000 |
| Contribution margin | 90,000 | 0 | (90,000) |
| Fixed costs | 120,000 | 20,000 | 100,000 |
| Net income | $ (30,000) | $(20,000) | $ 10,000 |

The analysis indicates that Lambert should eliminate the knit hats and scarves line because net income will increase $10,000.

Related exercise material: **BE26-7, E26-8, E26-9,** and **DO IT! 26-3.**

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To illustrate, assume that Collins Company manufactures deluxe and standard pen and pencil sets. The limiting resource is machine capacity, which is 3,600 hours per month. Relevant data consist of the following.

**Illustration 26-13**
Contribution margin and machine hours

| | Deluxe Sets | Standard Sets |
|---|---|---|
| Contribution margin per unit | $8 | $6 |
| Machine hours required | 0.4 | 0.2 |

**HELPFUL HINT**
**CM alone is not enough in this decision. The key factor is CM per unit of limited resource.**

The deluxe sets may appear to be more profitable: They have a higher contribution margin ($8) than the standard sets ($6). However, the standard sets take fewer machine hours to produce than the deluxe sets. Therefore, Collins needs to find the **contribution margin per unit of limited resource**—in this case, contribution margin per machine hour. This is obtained by dividing the contribution margin per unit of each product by the number of units of the limited resource required for each product, as shown in Illustration 26-14.

**Illustration 26-14**
Contribution margin per unit of limited resource

| | Deluxe Sets | Standard Sets |
|---|---|---|
| Contribution margin per unit (**a**) | $8 | $6 |
| Machine hours required (**b**) | 0.4 | 0.2 |
| **Contribution margin per unit of limited resource [(a) ÷ (b)]** | **$20** | **$30** |

The computation shows that the standard sets have a higher contribution margin per unit of limited resource. This suggests that, given sufficient demand for standard sets, the company should shift the sales mix to standard sets or should increase machine capacity. If Collins Company is able to increase machine capacity from 3,600 hours to 4,200 hours, the additional 600 hours could be used to produce either the standard or deluxe pen and pencil sets. The total contribution margin under each alternative is found by multiplying the machine hours by the contribution margin per unit of limited resource, as shown below.

**Illustration 26-15**
Incremental analysis—computation of total contribution margin

| | Produce Deluxe Sets | Produce Standard Sets |
|---|---|---|
| Machine hours (**a**) | 600 | 600 |
| Contribution margin per unit of limited resource (**b**) | $20 | $30 |
| **Contribution margin [(a) × (b)]** | **$12,000** | **$18,000** |

From this analysis, we see that to maximize net income, Collins should use all of the increased capacity to make and sell the standard sets.

# SECTION 2 Capital Budgeting

Individuals make capital expenditures when they buy a new home, car, or television set. Similarly, businesses make capital expenditures when they modernize plant facilities or expand operations. Companies like Campbell Soup must constantly determine how to invest their resources. Other examples: Hollywood studios recently

built 25 new sound stage projects to allow for additional filming in future years. Also, Union Pacific Resources Group Inc. announced that it would cut its capital budget by 19% in order to use the funds to reduce its outstanding debt.

In business, as for individuals, the amount of possible capital expenditures usually exceeds the funds available for such expenditures. Thus, the resources available must be allocated (budgeted) among the competing alternatives. The process of making capital expenditure decisions in business is known as **capital budgeting**. Capital budgeting involves choosing among various capital projects to find the one(s) that will maximize a company's return on its financial investment.

## EVALUATION PROCESS

Many companies follow a standard process in capital budgeting. At least once a year, top management requests proposals for projects from each department. A capital budgeting committee screens the proposals and submits its findings to the officers of the company. The officers, in turn, select the projects they believe to be most worthy of funding. They submit this list to the board of directors. Ultimately, the directors approve the capital expenditure budget for the year.

The involvement of top management and the board of directors in the process demonstrates the importance of capital budgeting decisions. These decisions often have a significant impact on a company's future profitability. In fact, poor capital budgeting decisions have led to the bankruptcy of some companies.

Accounting data are indispensable in assessing the probable effects of capital expenditures. To provide management with relevant data for capital budgeting decisions, you should be familiar with the quantitative techniques that may be used. The three most common techniques are: (1) annual rate of return, (2) cash payback, and (3) discounted cash flow. We demonstrate each of these techniques in the following sections. To illustrate the three quantitative techniques, assume that Tappan Company is considering an investment of $130,000 in new equipment. The new equipment is expected to last 10 years. It will have zero salvage value at the end of its useful life. Tappan uses the straight-line method of depreciation for accounting purposes. The expected annual revenues and costs of the new product that will be produced from the investment are:

| | | |
|---|---|---|
| Sales | | $200,000 |
| Less: Costs and expenses | | |
| Manufacturing costs (exclusive of depreciation) | $145,000 | |
| Depreciation expenses ($130,000 ÷ 10) | 13,000 | |
| Selling and administrative expenses | 22,000 | 180,000 |
| Income before income taxes | | 20,000 |
| Income tax expense | | 7,000 |
| Net income | | $ 13,000 |

**Illustration 26-16** Estimated annual net income from capital expenditure

## ANNUAL RATE OF RETURN

The **annual rate of return technique** is based directly on accounting data. It indicates **the profitability of a capital expenditure** by dividing expected annual net income by the average investment. Illustration 26-17 shows the formula for computing annual rate of return.

**STUDY OBJECTIVE 9**

**Contrast annual rate of return and cash payback in capital budgeting.**

| Expected Annual Net Income | ÷ | Average Investment | = | Annual Rate of Return |
|---|---|---|---|---|

**Illustration 26-17** Annual rate of return formula

Expected annual net income is obtained from the projected income statement. Tappan Company's expected annual net income is $13,000. Average investment is derived from the following formula.

Illustration 26-18
Formula for computing average investment

$$\text{Average Investment} = \frac{\text{Original Investment} + \text{Value at End of Useful Life}}{2}$$

The "value at the end of useful life" is the asset's salvage value, if any.

For Tappan Company, average investment is $65,000 ($130,000 + $0) ÷ 2. The expected annual rate of return for Tappan Company's investment in new equipment is therefore 20%, computed as follows:

$$\$13{,}000 \div \$65{,}000 = 20\%$$

**ALTERNATIVE TERMINOLOGY**

The minimum rate of return is also called the *hurdle rate* or *cutoff rate*.

Management then compares this annual rate of return with its required **minimum rate of return** for investments of similar risk. The minimum rate of return is generally based on the company's **cost of capital**. The **cost of capital** is the rate of return that management expects to pay on all borrowed and equity funds. The cost of capital is a company-wide (or sometimes a division-wide) rate; it does not relate to the cost of funding a specific project.

**HELPFUL HINT**

A capital budgeting decision based on only one technique may be misleading. It is often wise to analyze the investment from a number of different perspectives.

The annual rate of return decision rule is: **A project is acceptable if its rate of return is greater than management's minimum rate of return. It is unacceptable when the reverse is true.** When companies use the rate of return technique in deciding among several acceptable projects, **the higher the rate of return for a given risk, the more attractive the investment**.

The principal advantages of this technique are simplicity of calculation and management's familiarity with the accounting terms used in the computation. A major limitation of the annual rate of return approach is that it does not consider the time value of money. For example, no consideration is given as to whether cash inflows will occur early or late in the life of the investment. As explained in Appendix C at the back of the book, recognition of the time value of money can make a significant difference between the future value and the present value of an investment.

## CASH PAYBACK

The **cash payback technique** identifies the time period required to recover the cost of the capital investment from the annual cash inflow produced by the investment. Illustration 26-19 presents the formula for computing the cash payback period.

Illustration 26-19
Cash payback formula

$$\text{Cost of Capital Investment} \div \text{Net Annual Cash Flow} = \text{Cash Payback Period}$$

**HELPFUL HINT**

Net annual cash flow can also be approximated by net cash provided by operating activities from the statement of cash flows.

**Net annual cash flow** is approximated by taking net income and adding back depreciation expense. Depreciation expense is added back because depreciation on the capital expenditure does not involve an annual outflow of cash. Accordingly, the depreciation deducted in determining net income must be added back to determine net annual cash flows.

In the Tappan Company example, net annual cash flow is $26,000, as shown below.

Illustration 26-20
Computation of net annual cash flow

| | |
|---|---|
| Net income | $13,000 |
| Add: Depreciation expense | 13,000 |
| **Net annual cash flow** | **$26,000** |

The cash payback period in this example is therefore five years, computed as follows.

$$\$130{,}000 \div \$26{,}000 = 5 \text{ years}$$

Evaluation of the payback period is often related to the expected useful life of the asset. For example, assume that at Tappan Company a project is unacceptable if the payback period is longer than 60% of the asset's expected useful life. The five-year payback period in this case is 50% of the project's expected useful life. Thus, the project is acceptable.

It follows that when companies use the payback method to decide among acceptable alternative projects, **the shorter the payback period, the more attractive the investment**. This is true for two reasons: First, the earlier the investment is recovered, the sooner the company can use the cash funds for other purposes. Second, the risk of loss from obsolescence and changed economic conditions is less in a shorter payback period.

The preceding computation of the cash payback period assumes **equal** cash flows in each year of the investment's life. In many cases, this assumption is not valid. In the case of **uneven** cash flows, the company determines the cash payback period when the cumulative net cash flows from the investment equal the cost of the investment.

To illustrate, assume that Chen Company proposes an investment in a new website that is estimated to cost $300,000. Illustration 26-21 shows the proposed investment cost, net annual cash flows, cumulative net cash flows, and the cash payback period.

| Year | Investment | Net Annual Cash Flow | Cumulative Net Cash Flow |
|---|---|---|---|
| 0 | $300,000 | | |
| 1 | | $ 60,000 | $ 60,000 |
| 2 | | 90,000 | 150,000 |
| 3 | | 90,000 | 240,000 |
| 4 | | 120,000 | 360,000 |
| 5 | | 100,000 | 460,000 |
| Cash payback period = **3.5 years** | | | |

**Illustration 26-21**
Net annual cash flow schedule

As Illustration 26-21 shows, at the end of year 3, cumulative cash flow of $240,000 is less than the investment cost of $300,000. However, at the end of year 4 the cumulative net cash flow of $360,000 exceeds the investment cost. The net cash flow needed in year 4 to equal the investment cost is $60,000 ($300,000 − $240,000). Assuming the net cash flow occurs evenly during year 4, we then divide this amount by the annual net cash flow in year 4 ($120,000) to determine the point during the year when the cash payback occurs. Thus, we get 0.50 ($60,000/$120,000), or half of the year, and the cash payback period is 3.5 years.

The cash payback method may be useful as an initial screening tool. It may be the most critical factor in the capital budgeting decision for a company that desires a fast turnaround of its investment because of a weak cash position. Like the annual rate of return, cash payback is relatively easy to compute and understand.

However, cash payback is not ordinarily the only basis for the capital budgeting decision because it ignores the expected profitability of the project. To illustrate, assume that Projects X and Y have the same payback period, but Project X's useful life is double the useful life of Project Y's. Project X's earning power, therefore, is twice as long as Project Y's. A further—and major—disadvantage of this technique is that it ignores the time value of money.

## DO IT!

CAPITAL BUDGETING

Rochelle Company is considering purchasing new equipment for $250,000. The equipment has a 5-year useful life, and depreciation would be $50,000 (assuming straight-line depreciation and zero salvage value). The purchase of the equipment should increase net income by $25,000 each year for 5 years. **(a)** Compute the annual rate of return. **(b)** Compute the cash payback period.

### action plan

Use appropriate formulas:

- ✔ Annual rate of return = Expected annual net income ÷ Average investment.
- ✔ Average investment = (Original investment + Value at end of useful life) ÷ 2.
- ✔ Cash payback period = Cost of capital investment ÷ Net annual cash flow.
- ✔ Net annual cash flow = Net income + Depreciation expense.

### *Solution*

**(a)** Average investment = ($250,000 + 0) ÷ 2 = $125,000
Annual rate of return = $25,000 ÷ $125,000 = 20%

**(b)** Net annual cash flow = $25,000 + $50,000 = $75,000
Cash payback period = $250,000 ÷ $75,000 = 3.3 years

Related exercise material: **BE26-9, BE26-10, E26-11, E26-12, E26-13,** and **DO IT! 26-4.**

The Navigator

## MANAGEMENT INSIGHT

### *Are You Ready for the 50-Inch Screen?*

Building a new factory to produce 50-inch-plus TV screens can cost $4 billion at a time when prices for flat screens are tumbling. Now the makers of those giant liquid-crystal displays are wondering whether such investments are worth the gamble.

If LCD makers decide to hold off on building new factories, price declines for wide-screen TVs could slow in two or three years as production falls behind added consumer demand. Experts also say a slowdown in factory building could also bring welcome relief for the industry by reducing its volatile profit swings.

Since 2000, LCD makers have been on a nonstop construction binge, building new factories to produce the latest generation of screens arriving every 18 months or so. . . . Now, with the eighth generation of screens, the cost to build new factories is higher than ever—running between $3 billion to $4 billion each. And this generation of factories is optimized for screens measuring 50 inches or more diagonally, which so far is a much smaller potential market than that targeted by previous screen generations.

***Source:*** Evan Ramstad, "The 50-Inch Screen Poses a Gamble," *Wall Street journal*, June 8, 2006, p. B3.

? In building factories to manufacture 50-inch TV screens, how might companies build risk factors into their financial analyses?

## DISCOUNTED CASH FLOW

**STUDY OBJECTIVE 10**

**Distinguish between the net present value and internal rate of return methods.**

The **discounted cash flow technique** is generally recognized as the best conceptual approach to making capital budgeting decisions. This technique considers both the estimated total net cash flows from the investment and the time value of money. The expected total net cash flow consists of the sum of the annual net cash flows plus the estimated liquidation

proceeds when the asset is sold for salvage at the end of its useful life. But because liquidation proceeds are generally immaterial, we ignore them in subsequent discussions.

Two methods are used with the discounted cash flow technique: (1) net present value, and (2) internal rate of return. **Before we discuss the methods, we recommend that you examine Appendix C if you need a review of present value concepts.**

## Net Present Value Method

The **net present value (NPV) method** involves discounting net cash flows to their present value and then comparing that present value with the capital outlay required by the investment. The difference between these two amounts is referred to as **net present value (NPV)**. Company management determines what interest rate to use in discounting the future net cash flows. This rate, often referred to as the **discount rate** or **required rate of return** is discussed in a later section.

The NVP decision rule is this: **A proposal is acceptable when net present value is zero or positive.** At either of those values, the rate of return on the investment equals or exceeds the required rate of return. When net present value is negative, the project is unacceptable. Illustration 26-22 shows the net present value decision criteria.

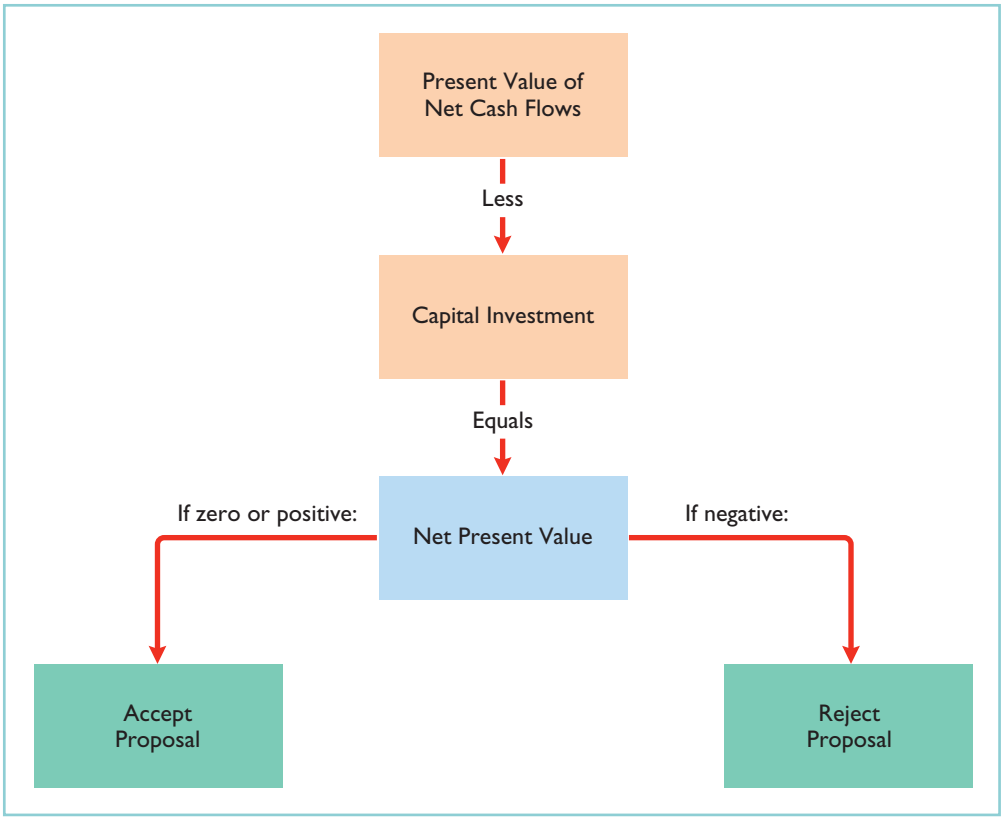



**Illustration 26-22**
Net present value decision criteria

When making a selection among acceptable proposals, **the higher the positive net present value, the more attractive the investment**. The next two sections demonstrate use of this method. In each case, we assume that the investment has no salvage value.

**ETHICS NOTE**

Discounted future cash flows may not take into account all of the important considerations needed to make an informed capital budgeting decision. Other issues, for example, could include worker safety, product quality, and environmental impact.

### EQUAL NET ANNUAL CASH FLOWS

Tappan Company's net annual cash flows are $26,000. If we assume this amount **is uniform over the asset's useful life**, we can compute the present value of the net annual cash flows by using the present value of an annuity

of 1 for 10 periods (in Table 2, Appendix C). The computations at rates of return of 12% and 15%, respectively, are:

**Illustration 26-23**
Present value of net annual cash flows

| | Present Values at Different Discount Rates | |
|---|---|---|
| | 12% | 15% |
| Discount factor for 10 periods | 5.65022 | 5.01877 |
| Present value of net annual cash flows: | | |
| $26,000 × 5.65022 | $146,906 | |
| $26,000 × 5.01877 | | $130,488 |

The analysis of the proposal by the net present value method is as follows:

**Illustration 26-24**
Computations of net present value

| | 12% | 15% |
|---|---|---|
| Present value of net annual cash flows | $146,906 | $130,488 |
| Capital investment | 130,000 | 130,000 |
| **Positive (negative) net present value** | **$ 16,906** | **$ 488** |

**HELPFUL HINT**

**The ABC Co. expects equal cash flows over an asset's 5-year useful life.**

**What discount factor should it use in determining present values if management wants (1) a 12% return or (2) a 15% return?**

**Answer: Using Table 2, the factors are (1) 3.60478 and (2) 3.35216.**

The proposed capital expenditure is acceptable at a required rate of return of both 12% and 15% because the net present values are positive.

## UNEQUAL NET ANNUAL CASH FLOWS

When net annual cash flows are unequal, we cannot use annuity tables to calculate their present value. Instead, we use tables showing the **present value of a single future amount for each net annual cash flow**.

To illustrate, assume that Tappan Company management expects the same aggregate net annual cash flow ($260,000) over the life of the investment. But because of a declining market demand for the new product over the life of the equipment, the net annual cash flows are higher in the early years and lower in the later years. The present value of the net annual cash flows is calculated as follows using Table 1 in Appendix C.

**Illustration 26-25**
Computing present value of unequal annual cash flows

| Year | Assumed Net Annual Cash Flows | Discount Factor | | Present Value | |
|---|---|---|---|---|---|
| | | 12% | 15% | 12% | 15% |
| | (1) | (2) | (3) | (1) × (2) | (1) × (3) |
| 1 | $ 36,000 | .89286 | .86957 | $ 32,143 | $ 31,305 |
| 2 | 32,000 | .79719 | .75614 | 25,510 | 24,196 |
| 3 | 29,000 | .71178 | .65752 | 20,642 | 19,068 |
| 4 | 27,000 | .63552 | .57175 | 17,159 | 15,437 |
| 5 | 26,000 | .56743 | .49718 | 14,753 | 12,927 |
| 6 | 24,000 | .50663 | .43233 | 12,159 | 10,376 |
| 7 | 23,000 | .45235 | .37594 | 10,404 | 8,647 |
| 8 | 22,000 | .40388 | .32690 | 8,885 | 7,192 |
| 9 | 21,000 | .36061 | .28426 | 7,573 | 5,969 |
| 10 | 20,000 | .32197 | .24719 | 6,439 | 4,944 |
| | **$260,000** | | | **$155,667** | **$140,061** |

Therefore, the analysis of the proposal by the net present value method is as follows.

| | 12% | 15% |
|---|---|---|
| Present value of net annual cash flows | $155,667 | $140,061 |
| Capital investment | 130,000 | 130,000 |
| **Positive (negative) net present value** | **$ 25,667** | **$ 10,061** |

**Illustration 26-26**
Analysis of proposal using net present value method

In this example, the present values of the net annual cash flows are greater than the $130,000 capital investment. Thus, the project is acceptable at both a 12% and 15% required rate of return. The difference between the present values using the 12% rate under equal cash flows ($146,906) and unequal net annual cash flows ($155,667) is due to the pattern of the net cash flows.

## Internal Rate of Return Method

The **internal rate of return method** differs from the net present value method in that it finds the **interest yield of the potential investment**. The **internal rate of return** (IRR) is the interest rate that will cause the present value of the proposed capital expenditure to equal the present value of the expected net annual cash flows. The determination of the internal rate of return involves two steps.

**Step 1. Compute the internal rate of return factor.** The formula for this factor is:

| Capital Investment | ÷ | Net Annual Cash Flows | = | Internal Rate of Return Factor |
|---|---|---|---|---|

**Illustration 26-27**
Formula for internal rate of return factor

The computation for Tappan Company, assuming equal net annual cash flows,[2] is:

$$\$130{,}000 \div \$26{,}000 = 5.0$$

**Step 2. Use the factor and the present value of an annuity of 1 table to find the internal rate of return.** Table 2 of Appendix C is used in this step. The internal rate of return is the discount factor that is closest to the internal rate of return factor for the time period covered by the net annual cash flows.

For Tappan Company, the net annual cash flows are expected to continue for 10 years. Thus, it is necessary to read across the period-10 row in Table 2 to find the discount factor. The row for 10 periods is reproduced below for your convenience.

TABLE 2
PRESENT VALUE OF AN ANNUITY OF 1

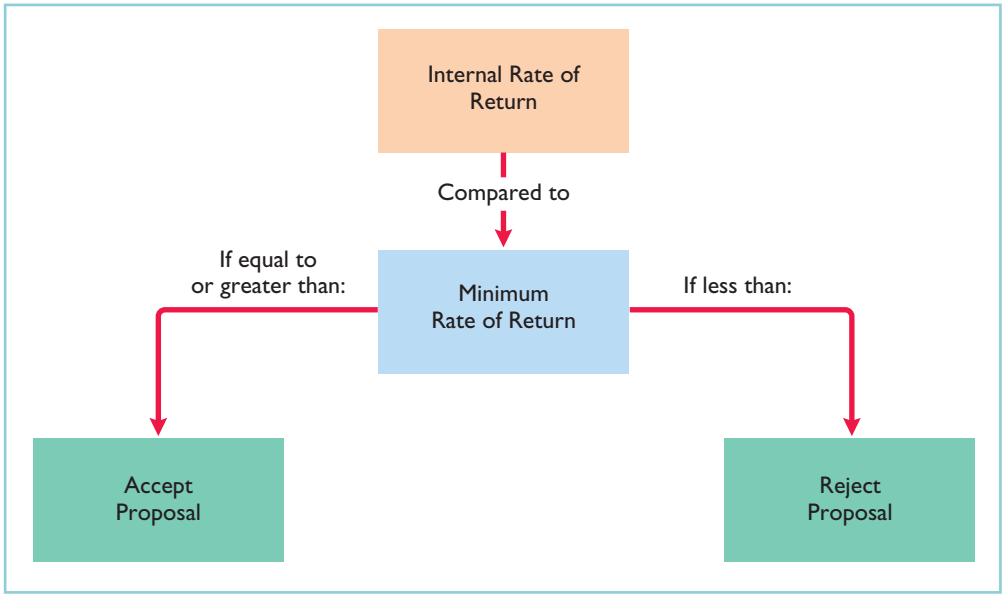
| (*n*) Periods | 5% | 6% | 8% | 9% | 10% | 11% | 12% | 15% |
|---|---|---|---|---|---|---|---|---|
| 10 | 7.72173 | 7.36009 | 6.71008 | 6.41766 | 6.14457 | 5.88923 | 5.65022 | **5.01877** |

In this case, the closest discount factor to 5.0 is 5.01877, which represents an interest rate of approximately 15%. The rate of return can be further determined by interpolation, but since we are using estimated net annual cash flows, such precision is seldom required.

[2]When net annual cash flows are equal, the internal rate of return factor is the same as the cash payback period.

Once managers know the internal rate of return, they compare it to the company's required rate of return (the discount rate). The IRR decision rule is as follows: **Accept the project when the internal rate of return is equal to or greater than the required rate of return. Reject the project when the internal rate of return is less than the required rate of return.** Illustration 26-28 below shows these relationships. Assuming the minimum required rate of return is 10% for Tappan Company, the project is acceptable because the 15% internal rate of return is greater than the required rate.

**Illustration 26-28**
Internal rate of return decision criteria




The IRR method is widely used in practice. Most managers find the internal rate of return easy to interpret.

## Comparing Discounted Cash Flow Methods

Illustration 26-29 compares the two discounted cash flow methods—net present value and internal rate of return. When properly used, either method provides management with relevant quantitative data for making capital budgeting decisions.

**Illustration 26-29**
Comparison of discounted cash flow methods

| Item | Net Present Value | Internal Rate of Return |
|---|---|---|
| 1. Objective | Compute net present value (a dollar amount). | Compute internal rate of return (a percentage). |
| 2. Decision rule | If net present value is zero or positive, accept the proposal. If net present value is negative, reject the proposal. | If internal rate of return is equal to or greater than the minimum required rate of return, accept the proposal. If internal rate of return is less than the minimum required rate, reject the proposal. |

## DO IT!

DISCOUNTED CASH FLOW

Watertown Paper Corporation is considering adding another machine for the manufacture of corrugated cardboard. The machine would cost $900,000. It would have an estimated life of 6 years and no salvage value. The company estimates that annual cash inflows would increase by $400,000 and that annual cash outflows would increase by $190,000. Management has a required rate of return of 9%.

**(a)** Calculate the net present value on this project, and discuss whether it should be accepted.

**(b)** Calculate the internal rate of return on this project, and discuss whether it should be accepted.

### action plan

- ✔ Compute net annual cash flow: Estimated annual cash inflows ÷ Estimated annual cash outflows.
- ✔ Use the NPV technique to calculate the difference between net cash flows and the initial investment.
- ✔ Accept the project if the net present value is positive.
- ✔ Compute the IRR factor: Capital investment ÷ Net annual cash flows.
- ✔ Look up the factor in the present value of an annuity table to find the internal rate of return.
- ✔ Accept the project if the internal rate of return is equal to or greater than the required rate of return.

### Solution

**(a)**

| | |
|---|---|
| Estimated annual cash inflows | $400,000 |
| Estimated annual cash outflows | 190,000 |
| Net annual cash flow | $210,000 |

| | Cash Flow | 9% Discount Factor | Present Value |
|---|---|---|---|
| Present value of net annual cash flows | $210,000 | 4.48592* | $942,043 |
| Capital investment | | | 900,000 |
| Net present value | | | $ 42,043 |

*Table 2, Appendix C

Since the net present value is greater than zero, Watertown should accept the project.

**(b)** $900,000 ÷ 210,000 = 4.285714. Using Table 2 of Appendix C and the factors that correspond with the six-period row, 4.285714 is between the factors for 10% and 11%. Since the project has an internal rate that is greater than 10% and the required rate of return is only 9%, Watertown should accept the project.

Related exercise material: **BE26-11, BE26-12, BE26-13, E26-12, E26-13, E26-14, E26-15,** and **DO IT! 26-5.**

The Navigator

Be sure to read **ALL ABOUT YOU: *What Is a Degree Worth?*** on page 1176 for information on how topics in this chapter apply to your personal life.

# What Is a Degree Worth?

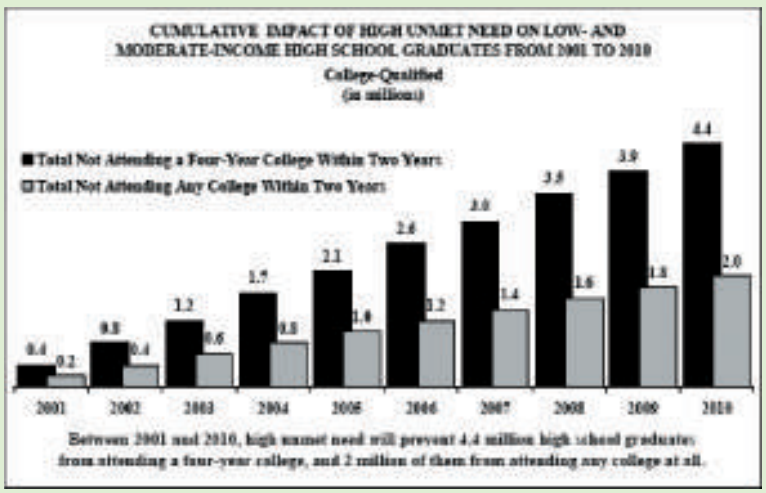
It may not have occurred to you at the time, but you already made a huge decision in your life that was ideally suited to both incremental analysis and capital budgeting. No, it's not your choice of whether to have pizza or Chinese food at lunch today. We are referring to your decision to pursue a post–high-school degree. If you weren't going to college, you could be working full-time. School costs money, which is an expenditure that you could have avoided. Also, if you did not go to college, many of you would avoid mountains of school-related debt. While you cannot go back and redo your initial decision, we can look at some facts to evaluate the wisdom of your decision.

## Some Facts

* Over a lifetime of work, high-school graduates earn an average of $1.2 million, associate's degree holders earn an average of $1.6 million, and people with bachelor's degrees earn about $2.1 million.
* A year of tuition at a public four-year college costs about $8,655, and a year of tuition at a public two-year college costs about $1,359.
* There has also been considerable research on other, less-tangible benefits of post–high-school education. For example, some have suggested that there is a relationship between higher education and good health. Research also suggests that college-educated people are more optimistic.
* About 600,000 students drop out of four-year colleges each year.

## About the Numbers

Tuition is very expensive. As a result, many students have high "unmet needs"—the portion of college expenses not provided by family or student aid. The graph below suggests that in the coming decade an increasing number of students with high "unmet" financial needs will decide not to pursue any form of post–high-school education. This has obvious implications for their long-term personal financial well-being. It also has significant implications for the well-being of the United States as a society. Research shows that people with post–high-school degrees pay more in taxes. Also, without adequate educational training of its citizenry, the United States will be less able to compete in a high-tech world.




**Source:** "Empty Promises: The Myth of College Access in America," A Report of the Advisory Committee on Student Financial Assistance, June 2002, *www.ed.gov/about/bdscomm/list/acsfa/emptypromises.pdf*, p. 28 (accessed August 2006).

## What Do You Think?

Each year many students decide to drop out of school. Many of them never return. Suppose that you are working two jobs and going to college and that you are not making ends meet. Your grades are suffering due to your lack of available study time. You feel depressed. Should you drop out of school?

**YES:** You can always go back to school. If your grades are bad, and you are depressed, what good is school doing you anyway?

**NO:** Once you drop out, it is very hard to get enough momentum to go back. Dropping out will dramatically reduce your long-term opportunities. It is better to stay in school, even if you take only one class per semester.

**Sources:** Kathleen Porter, "The Value of a College Degree," ERIC Clearinghouse on Higher Education, Washington DC, *www.ericdigests.org/2003-3/value.htm* (accessed August 2006).



The authors' comments on this situation appear on page 1196.

## Comprehensive DO IT!

Sierra Company is considering a long-term capital investment project called ZIP. The project will require an investment of $120,000, and it will have a useful life of 4 years. Annual net income for ZIP is expected to be: Year 1 $12,000; Year 2 $10,000; Year 3 $8,000; and Year 4 $6,000. Depreciation is computed by the straight-line method with no salvage value. The company's cost of capital is 12%.

### Instructions

**(a)** Compute the annual rate of return for the project.
**(b)** Compute the cash payback period for the project. (Round to two decimals.)
**(c)** Compute the net present value for the project. (Round to nearest dollar.)
**(d)** Should the project be accepted? Why?

### action plan

- ✔ To compute annual rate of return, divide expected annual net income by average investment.
- ✔ To compute cash payback, divide cost of the investment by net annual cash flows.
- ✔ Recall that net annual cash flow equals annual net income plus annual depreciation expense.
- ✔ Be careful to use the correct discount factor in using the net present value method.

### Solution to Comprehensive DO IT!

**(a)** $9,000 ($36,000 ÷ 4) ÷ $60,000 ($120,000 ÷ 2) = 15%

**(b)** Depreciation expense is $120,000 ÷ 4 years = $30,000.

Net annual cash flows are:

| | |
|---|---|
| Year 1 | $12,000 + $30,000 = $42,000 |
| Year 2 | $10,000 + $30,000 = $40,000 |
| Year 3 | $8,000 + $30,000 = $38,000 |
| Year 4 | $6,000 + $30,000 = $36,000 |

Cumulative net cash flows would be $82,000 ($42,000 + $40,000) at the end of year 2 and $120,000 ($42,000 + $40,000 + $38,000) at the end of year 3. Since the cumulative net cash flows at the end of year 3 exactly equal the initial cash investment of $120,000, the cash payback period is 3 years.

**(c)**

| Year | Discount Factor | Net Annual Cash Flow | Present Value |
|---|---|---|---|
| 1 | .89286 | $42,000 | $ 37,500 |
| 2 | .79719 | 40,000 | 31,888 |
| 3 | .71178 | 38,000 | 27,048 |
| 4 | .63552 | 36,000 | 22,879 |
| | | | 119,315 |
| | | Capital investment | 120,000 |
| | | Negative net present value | $ (685) |

**(d)** The annual rate of return of 15% is good. However, the cash payback period is 75% of the project's useful life, and net present value is negative. The recommendation is to reject the project.

The Navigator

## SUMMARY OF STUDY OBJECTIVES

1 **Identify the steps in management's decision-making process.** Management's decision-making process is: (a) identify the problem and assign responsibility, (b) determine and evaluate possible courses of action, (c) make the decision, and (d) review the results of the decision.

2 **Describe the concept of incremental analysis.** Incremental analysis identifies financial data that change under alternative courses of action. These data are relevant to the decision because they will vary in the future among the possible alternatives.

3 **Identify the relevant costs in accepting an order at a special price.** The relevant information in accepting an order at a special price is the difference between the variable costs to produce the special order and expected revenues.

4 **Identify the relevant costs in a make-or-buy decision.** In a make-or-buy decision, the relevant costs are (a) the manufacturing costs that will be saved, (b) the purchase price, and (c) opportunity costs.

5 **Give the decision rule for whether to sell or process materials further.** The decision rule for whether to sell or process materials further is: Process further as long as the incremental revenue from processing exceeds the incremental processing costs.

6 **Identify the factors to consider in retaining or replacing equipment.** The factors to consider in determining whether equipment should be retained or replaced are the effects on variable costs and the cost of the new equipment. Also, any trade-in allowance or cash disposal value of the existing asset must be considered.

7 **Explain the relevant factors in whether to eliminate an unprofitable segment.** In deciding whether to eliminate an unprofitable segment, determine the contribution margin, if any, produced by the segment and the disposition of the segment's fixed expenses.

8 **Determine which products to make and sell when resources are limited.** When a company has limited resources, find the contribution margin per unit of limited resource. Then multiply this amount by the units of limited resource to determine which product maximizes net income.

9 **Contrast annual rate of return and cash payback in capital budgeting.** The *annual rate of return* is obtained by dividing expected annual net income by the average investment. The higher the rate of return, the more attractive the investment. The *cash payback* technique identifies the time period to recover the cost of the investment. The formula is: Cost of capital expenditure divided by estimated net annual cash flow equals cash payback period. The shorter the payback period, the more attractive the investment.

10 **Distinguish between the net present value and internal rate of return methods.** Under the *net present value* method, compare the present value of future net cash flows with the capital investment to determine net present value. The NPV decision rule is: Accept the project if net present value is zero or positive. Reject the investment if net present value is negative.

Under the *internal rate of return* method, find the interest yield of the potential investment. The IRR decision rule is: Accept the project when the internal rate of return is equal to or greater than the required rate of return. Reject the project when the internal rate of return is less than the required rate.

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## GLOSSARY

**Annual rate of return technique** Determines the profitability of a capital expenditure by dividing expected annual net income by the average investment. (p. 1167).

**Capital budgeting** The process of making capital expenditure decisions in business. (p. 1167).

**Cash payback technique** Identifies the time period required to recover the cost of a capital investment from the net annual cash flow produced by the investment. (p. 1168).

**Cost of capital** The rate of return that management expects to pay on all borrowed and equity funds. (p. 1168).

**Discounted cash flow technique** Considers both the estimated total net cash flows from the investment and the time value of money. (p. 1170).

**Discount rate** Interest rate used in discounting the future net cash flows. (p. 1171).

**Incremental analysis** The process of identifying the financial data that change under alternative courses of action. (p. 1157).

**Internal rate of return (IRR)** The rate that will cause the present value of the proposed capital expenditure to equal the present value of the expected net annual cash flows. (p. 1173).

**Internal rate of return method** Finds the interest yield of the potential investment. (p. 1173).

**Net present value (NPV)** The difference that results when the original capital outlay is subtracted from the discounted net cash flows. (p. 1171).

**Net present value method** Discounts net cash flows to their present value and then compares that present value to the capital outlay required by the investment. (p. 1171).

**Opportunity cost** The potential benefit that may be obtained from following an alternative course of action. (p. 1160).

**Sunk cost** A cost that cannot be changed by any present or future decision. (p. 1164).

## SELF-STUDY QUESTIONS

*Answers are at the end of the chapter.*

(SO 1) **1.** Three of the steps in management's decision process are: (1) Review results of decision. (2) Identify the problem. (3) Make the decision. The steps are performed in the following order.
**a.** (1), (2), (3).
**b.** (3), (2), (1).
**c.** (2), (1), (3).
**d.** (2), (3), (1).

(SO 2) **2.** Incremental analysis is the process of identifying the financial data that:
**a.** do not change under alternative courses of action.
**b.** change under alternative courses of action.
**c.** are mixed under alternative courses of action.
**d.** No correct answer is given.

(SO 3) **3.** It costs a company $14 of variable costs and $6 of fixed costs to produce product A that sells for $30. A foreign buyer offers to purchase 3,000 units at $18 each. If the

special offer is accepted and produced with unused capacity, net income will:
**a.** decrease $6,000.
**b.** increase $6,000.
**c.** increase $12,000.
**d.** increase $9,000.

(SO 3) **4.** Jobart Company is currently operating at full capacity. It is considering buying a part from an outside supplier rather than making it in-house. If Jobart purchases the part, it can use the released productive capacity to generate additional income of $30,000 from producing a different product. When conducting incremental analysis in this make-or-buy decision, the company should:
**a.** ignore the $30,000.
**b.** add $30,000 to other costs in the "Make" column.
**c.** add $30,000 to other costs in the "Buy" column.
**d.** subtract $30,000 from the other costs in the "Make" column.

(SO 4) **5.** In a make-or-buy decision, relevant costs are:
**a.** manufacturing costs that will be saved.
**b.** the purchase price of the units.
**c.** opportunity costs.
**d.** all of the above.

(SO 5) **6.** The decision rule in a sell-or-process-further decision is: Process further as long as the incremental revenue from processing exceeds:
**a.** incremental processing costs.
**b.** variable processing costs.
**c.** fixed processing costs.
**d.** No correct answer is given.

(SO 5) **7.** Walton, Inc. makes an unassembled product that it currently sells for $55. Production costs are $20. Walton is considering assembling the product and selling it for $68. The cost to assemble the product is estimated at $12. What decision should Walton make?
**a.** Sell before assembly; net income per unit will be $12 greater.
**b.** Sell before assembly; net income per unit will be $1 greater.
**c.** Process further; net income per unit will be $13 greater.
**d.** Process further; net income per unit will be $1 greater.

(SO 6) **8.** In a decision to retain or replace equipment, the book value of the old equipment is a(n):
**a.** opportunity cost. **c.** incremental cost.
**b.** sunk cost. **d.** marginal cost.

(SO 7) **9.** If an unprofitable segment is eliminated:
**a.** net income will always increase.
**b.** variable expenses of the eliminated segment will have to be absorbed by other segments.
**c.** fixed expenses allocated to the eliminated segment will have to be absorbed by other segments.
**d.** net income will always decrease.

**10.** A segment of Hazard Inc. has the following data. (SO 7)

| | |
|---|---|
| Sales | $200,000 |
| Variable costs | $140,000 |
| Fixed costs | $100,000 |

If this segment is eliminated, 50% of the fixed costs will be eliminated, and the rest will be allocated to the remaining segments. What should Hazard do?
**a.** Eliminate the segment; net income will be $50,000 greater.
**b.** Eliminate the segment; net income will be $10,000 greater.
**c.** Keep the segment; net income will be $200,000 greater.
**d.** Keep the segment; net income will be $10,000 greater.

**11.** If the contribution margin per unit is $15 and it takes 3.0 machine hours to produce the unit, the contribution margin per unit of limited resource is: (SO 8)
**a.** $25. **c.** $45.
**b.** $5. **d.** No correct answer is given.

**12.** Which of the following is *incorrect* about the annual rate of return technique? (SO 9)
**a.** The calculation is simple.
**b.** The accounting terms used are familiar to management.
**c.** The timing of the net cash flows is not considered.
**d.** The time value of money is considered.

**13.** What is a weakness of the cash payback approach? (SO 9)
**a.** It uses accrual-based accounting numbers.
**b.** It ignores the time value of money.
**c.** It is complicated to compute.
**d.** It cannot be used if a project has uneven net annual cash flows.

**14.** A project should be accepted if its internal rate of return exceeds: (SO 10)
**a.** zero.
**b.** the rate of return on a government bond.
**c.** the company's required rate of return.
**d.** the rate the company pays on borrowed funds.

**15.** A positive net present value means that the: (SO 10)
**a.** project's rate of return is less than the cutoff rate.
**b.** project's rate of return exceeds the required rate of return.
**c.** project's rate of return equals the required rate of return.
**d.** project is unacceptable.

Go to the book's companion website, **www.wiley.com/college/weygandt**, for Additional Self-Study questions.

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## QUESTIONS

**1.** What steps are frequently involved in management's decision-making process?

**2.** Your roommate, Matt Mikan, contends that accounting contributes to most of the steps in management's decision-making process. Is your roommate correct? Explain.

**3.** "Incremental analysis involves the accumulation of information concerning a single course of action." Do you agree? Why?

**4.** Jerry Karr asks your help concerning the relevance of variable and fixed costs in incremental analysis. Help Jerry with his problem.

5. What data are relevant in deciding whether to accept an order at a special price?
6. Perney Company has an opportunity to buy parts at $7 each that currently cost $10 to make. What manufacturing costs are relevant to this make-or-buy decision?
7. Define the term "opportunity cost." How may this cost be relevant in a make-or-buy decision?
8. What is the decision rule in deciding whether to sell a product or process it further?
9. Your roommate, Betty Melton, is confused about sunk costs. Explain to your roommate the meaning of sunk costs and their relevance to a decision to retain or replace equipment.
10. Slocum Inc. has one product line that is unprofitable. What circumstances may cause overall company net income to be lower if the unprofitable product line is eliminated?
11. How is the contribution margin per unit of limited resources computed?
12. Describe the process a company may use in screening and approving the capital expenditure budget.
13. Your classmate, Laura Elder, is confused about the factors that are included in the annual rate of return technique. What is the formula for this technique?
14. Hector Ruiz is trying to understand the term "cost of capital." Define the term, and indicate its relevance to the decision rule under the annual rate of return technique.
15. Pete Hetzel claims the formula for the cash payback technique is the same as the formula for the annual rate of return technique. Is Pete correct? What is the formula for the cash payback technique?
16. What are the advantages and disadvantages of the cash payback technique?
17. Two types of present value tables may be used with the discounted cash flow technique. Identify the tables and the circumstance(s) when each table should be used.
18. What is the decision rule under the net present value method?
19. Identify the steps required in using the internal rate of return method.
20. Gillaspie Company uses the internal rate of return method. What is the decision rule for this method?

## BRIEF EXERCISES

*Identify the steps in management's decision-making process.*
(SO 1)

**BE26-1** The steps in management's decision-making process are listed in random order below. Indicate the order in which the steps should be executed.

—Make a decision.
—Identify the problem and assign responsibility.
—Review results of the decision.
—Determine and evaluate possible courses of action.

*Determine incremental changes.*
(SO, 2)

**BE26-2** Ming Company is considering two alternatives. Alternative A will have sales of $150,000 and costs of $100,000. Alternative B will have sales of $180,000 and costs of $120,000. Compare Alternative A to Alternative B showing incremental revenues, costs, and net income. Which alternative should you choose?

*Determine whether to accept a special order.*
(SO 3)

**BE26-3** In Karnes Company it costs $30 per unit ($20 variable and $10 fixed) to make a product that normally sells for $45. A foreign wholesaler offers to buy 4,000 units at $23 each. Karnes will incur special shipping costs of $1 per unit. Assuming that Karnes has excess operating capacity, prepare an incremental analysis that indicates the net income (loss) Karnes would realize by accepting the special order. Should the order be accepted?

*Determine whether to make or buy a part.*
(SO 4)

**BE26-4** Bartley Manufacturing incurs unit costs of $8 ($5 variable and $3 fixed) in making a sub-assembly part for its finished product. A supplier offers to make 10,000 of the part at $5.30 per unit. If the offer is accepted, Bartley will save all variable costs but no fixed costs. Prepare an analysis showing the total cost saving, if any, Bartley will realize by buying the part. What should they do?

*Determine whether to sell or process further.*
(SO 5)

**BE26-5** Stanton Inc. makes unfinished bookcases that it sells for $60. Production costs are $30 variable and $10 fixed. Because it has unused capacity, Stanton is considering finishing the bookcases and selling them for $72. Variable finishing costs are expected to be $8 per unit with no increase in fixed costs. Prepare an analysis on a per unit basis showing whether Stanton should sell unfinished or finished bookcases.

*Determine whether to retain or replace equipment.*
(SO 6)

**BE26-6** Felton Company has a factory machine with a book value of $90,000 and a remaining useful life of 4 years. A new machine is available at a cost of $200,000. This machine will have a 4-year useful life with no salvage value. The new machine will lower annual variable manufacturing costs from $600,000 to $440,000. Prepare an analysis showing whether the old machine should be retained or replaced.

**BE26-7** Derby, Inc. manufactures golf clubs in three models. For the year, the Eagle line has a net loss of $20,000 from sales $200,000, variable expenses $180,000, and fixed expenses $40,000. If the Eagle line is eliminated, $34,000 of fixed costs will remain. Prepare an analysis showing whether the Eagle line should be eliminated.

*Determine whether to eliminate an unprofitable segment.* (SO 7)

**BE26-8** In Nevitt Company, data concerning two products are: Contribution margin per unit—Product A $11, Product B $12; machine hours required for one unit—Product A 2, Product B 2.5. Compute the contribution margin per unit of limited resource for each product.

*Show allocation of limited resources.* (SO 8)

**BE26-9** Adler Company is considering purchasing new equipment for $300,000. It is expected that the equipment will produce annual net income of $10,000 over its 10-year useful life. Annual depreciation will be $30,000. Compute the cash payback period.

*Compute the cash payback period for a capital investment.* (SO 9)

**BE26-10** Engles Oil Company is considering investing in a new oil well. It is expected that the oil well will increase annual revenues by $130,000 and will increase annual expenses by $80,000 including depreciation. The oil well will cost $490,000 and will have a $10,000 salvage value at the end of its 10-year useful life. Calculate the annual rate of return.

*Compute annual rate of return.* (SO 9)

**BE26-11** Harry Company is considering two different, mutually exclusive capital expenditure proposals. Project A will cost $395,000, has an expected useful life of 10 years, a salvage value of zero, and is expected to increase net annual cash flows by $70,000. Project B will cost $270,000, has an expected useful life of 10 years, a salvage value of zero, and is expected to increase net annual cash flows by $50,000. A discount rate of 9% is appropriate for both projects. Compute the net present value of each project. Which project should be accepted?

*Compute net present value.* (SO 10)

**BE26-12** Frost Company is evaluating the purchase of a rebuilt spot-welding machine to be used in the manufacture of a new product. The machine will cost $170,000, has an estimated useful life of 7 years, a salvage value of zero, and will increase net annual cash flows by $33,740. What is its approximate internal rate of return?

*Calculate internal rate of return.* (SO 10)

**BE26-13** Horak Company accumulates the following data concerning a proposed capital investment: cash cost $225,000, net annual cash flow $34,000, present value factor of cash inflows for 10 years 6.71 (rounded). Determine the net present value, and indicate whether the investment should be made.

*Compute net present value of an investment.* (SO 10)

## DO IT! REVIEW

**DO IT! 26-1** Corn Company incurs a cost of $35 per unit, of which $20 is variable, to make a product that normally sells for $58. A foreign wholesaler offers to buy 6,000 units at $31 each. Corn will incur additional costs of $2 per unit to imprint a logo and to pay for shipping. Compute the increase or decrease in net income Corn will realize by accepting the special order, assuming Corn has sufficient excess operating capacity. Should Corn Company accept the special order?

*Evaluate special order.* (SO 3)

**DO IT! 26-2** Barney Company must decide whether to make or buy some of its components. The costs of producing 60,000 switches for its generators are as follows.

*Evaluate make-or-buy opportunity.* (SO 4)

| | | | |
|---|---|---|---|
| Direct materials | $30,000 | Variable overhead | $45,000 |
| Direct labor | $42,000 | Fixed overhead | $60,000 |

Instead of making the switches at an average cost of $2.95 ($177,000 ÷ 60,000), the company has an opportunity to buy the switches at $2.75 per unit. If the company purchases the switches, all the variable costs and one-third of the fixed costs will be eliminated.

**(a)** Prepare an incremental analysis showing whether the company should make or buy the switches. **(b)** Would your answer be different if the released productive capacity will generate additional income of $30,000?

**DO IT! 26-3** Lion Corporation manufactures several types of accessories. For the year, the gloves and mittens line had sales of $500,000, variable expenses of $375,000, and fixed expenses of $150,000. Therefore, the gloves and mittens line had a net loss of $25,000. If Lion eliminates the line, $40,000 of fixed costs will remain.

*Analyze whether to eliminate unprofitable segment.* (SO 7)

Prepare an analysis showing whether the company should eliminate the gloves and mittens line.

**DO IT! 26-4** Beacon Company is considering purchasing new equipment for $350,000. The equipment has a 5-year useful life, and depreciation would be $70,000 (assuming straight-line depreciation

*Compute capital budgeting measures.* (SO 9)

and zero salvage value). The purchase of the equipment should increase net income by $40,000 each year for 5 years. **(a)** Compute the annual rate of return. **(b)** Compute the cash payback period.

*Compute discounted cash flow measures.*
(SO 10)

**DO IT! 26-5** Maranantha Box Corporation is considering adding another machine for the manufacture of corrugated cardboard. The machine would cost $700,000. It would have an estimated life of 6 years and no salvage value. The company estimates that annual cash inflows would increase by $300,000 and that annual cash outflows would increase by $140,000. Management has a required rate of return of 9%.

**(a)** Calculate the net present value on this project, and discuss whether it should be accepted. **(b)** Calculate the internal rate of return on this project, and discuss whether it should be accepted.

## EXERCISES

*Analyze statements about decision making and incremental analysis.*
(SO 1, 2)

**E26-1** Pender has prepared the following list of statements about decision making and incremental analysis.

1. The first step in management's decision-making process is, "Determine and evaluate possible courses of action."
2. The final step in management's decision-making process is to actually make the decision.
3. Accounting's contribution to management's decision-making process occurs primarily in evaluating possible courses of action and in reviewing the results.
4. In making business decisions, management ordinarily considers only financial information because it is objectively determined.
5. Decisions involve a choice among alternative courses of action.
6. The process used to identify the financial data that change under alternative courses of action is called incremental analysis.
7. Costs that are the same under all alternative courses of action sometimes affect the decision.
8. When using incremental analysis, some costs will always change under alternative courses of action, but revenues will not.
9. Variable costs will change under alternative courses of action, but fixed costs will not.

**Instructions**

Identify each statement as true or false. If false, indicate how to correct the statement.

*Make incremental analysis for special order.*
(SO 3)

**E26-2** Wyco Company manufactures toasters. For the first 8 months of 2011, the company reported the following operating results while operating at 75% of plant capacity.

| | |
|---|---|
| Sales (400,000 units) | $4,000,000 |
| Cost of goods sold | 2,400,000 |
| Gross profit | 1,600,000 |
| Operating expenses | 900,000 |
| Net income | $ 700,000 |

Cost of goods sold was 70% variable and 30% fixed. Operating expenses were 60% variable and 40% fixed.

In September, Wyco Company receives a special order for 40,000 toasters at $6.00 each from Salono Company of Mexico City. Acceptance of the order would result in $8,000 of shipping costs but no increase in fixed operating expenses.

**Instructions**

**(a)** Prepare an incremental analysis for the special order.
**(b)** Should Wyco Company accept the special order? Why or why not?

*Make incremental analysis for special-order decision.*
(SO 3)

**E26-3** Innova Company produces golf discs which it normally sells to retailers for $7 each. The cost of manufacturing 20,000 golf discs is:

| | |
|---|---|
| Materials | $ 10,000 |
| Labor | 30,000 |
| Variable overhead | 20,000 |
| Fixed overhead | 40,000 |
| Total | $100,000 |

Innova also incurs 5% sales commission ($0.35) on each disc sold.

Mudd Corporation offers Innova $4.75 per disc for 5,000 discs. Mudd would sell the discs under its own brand name in foreign markets not yet served by Innova. If Innova accepts the offer, its fixed overhead will increase from $40,000 to $45,000 due to the purchase of a new imprinting machine. No sales commission will result from the special order.

**Instructions**

**(a)** Prepare an incremental analysis for the special order.
**(b)** Should Innova accept the special order? Why or why not?
**(c)** What assumptions underlie the decision made in part (b)?

**E26-4** Shannon Inc. has been manufacturing its own shades for its table lamps. The company is currently operating at 100% of capacity. Variable manufacturing overhead is charged to production at the rate of 50% of direct labor cost. The direct materials and direct labor cost per unit to make the lamp shades are $4.00 and $6.00, respectively. Normal production is 40,000 table lamps per year.

*Make incremental analysis for make-or-buy decision.* (SO 4)

A supplier offers to make the lamp shades at a price of $13.50 per unit. If Shannon Inc. accepts the supplier's offer, all variable manufacturing costs will be eliminated, but the $40,000 of fixed manufacturing overhead currently being charged to the lamp shades will have to be absorbed by other products.

**Instructions**

**(a)** Prepare the incremental analysis for the decision to make or buy the lamp shades.
**(b)** Should Shannon Inc. buy the lamp shades?
**(c)** Would your answer be different in (b) if the productive capacity released by not making the lamp shades could be used to produce income of $35,000?

**E26-5** Stacy McGuire recently opened her own basketweaving studio. She sells finished baskets in addition to the raw materials needed by customers to weave baskets of their own. Stacy has put together a variety of raw material kits, each including materials at various stages of completion. Unfortunately, owing to space limitations, Stacy is unable to carry all varieties of kits originally assembled and must choose between two basic packages.

*Make incremental analysis for further processing of materials.* (SO 5)

The basic introductory kit includes undyed, uncut reeds (with dye included) for weaving one basket. This basic package costs Stacy $12 and sells for $27. The second kit, called Stage 2, includes cut reeds that have already been dyed. With this kit the customer need only soak the reeds and weave the basket. Stacy is able to produce the second kit by using the basic materials included in the first kit and adding one hour of her own time (to produce two kits), which she values at $18 per hour. Because she is more efficient at cutting and dying reeds than her average customer, Stacy is able to make two kits of the dyed reeds, in one hour, from one kit of undyed reeds. The kit of dyed and cut reeds sells for $33.

**Instructions**

Determine whether Stacy's basketweaving shop should carry the basic introductory kit with undyed and uncut reeds, or the Stage 2 kit with reeds already dyed and cut. Prepare an incremental analysis to support your answer.

**E26-6** Donkey Bikes could sell its bicycles to retailers either assembled or unassembled. The cost of an unassembled bike is as follows.

*Make incremental analysis for sell-or-process-further decision.* (SO 5)

| | |
|---|---|
| Direct materials | $150 |
| Direct labor | 70 |
| Variable overhead (70% of direct labor) | 49 |
| Fixed overhead (30% of direct labor) | 21 |
| Manufacturing cost per unit | $290 |

The unassembled bikes are sold to retailers at $400 each.

Donkey currently has unused productive capacity that is expected to continue indefinitely; management has concluded that some of this capacity can be used to assemble the bikes and sell them at $450 each. Assembling the bikes will increase direct materials by $5 per bike, and direct labor by $20 per bike. Additional variable overhead will be incurred at the normal rates, but there will be no additional fixed overhead as a result of assembling the bikes.

**Instructions**

**(a)** Prepare an incremental analysis for the sell-or-process-further decision.
**(b)** Should Donkey sell or process further? Why or why not?

*Make incremental analysis for retaining or replacing equipment.*
(SO 6)

**E26-7** Crone Enterprises uses a word processing computer to handle its sales invoices. Lately, business has been so good that it takes an extra 3 hours per night, plus every third Saturday, to keep up with the volume of sales invoices. Management is considering updating its computer with a faster model that would eliminate all of the overtime processing.

| | Current Machine | New Machine |
|---|---|---|
| Original purchase cost | $15,000 | $21,000 |
| Accumulated depreciation | 6,000 | — |
| Estimated operating costs | 24,000 | 20,000 |
| Useful life | 5 years | 5 years |

If sold now, the current machine would have a salvage value of $5,000. If operated for the remainder of its useful life, the current machine would have zero salvage value. The new machine is expected to have zero salvage value after 5 years.

**Instructions**
Should the current machine be replaced? (Ignore the time value of money.)

*Make incremental analysis for elimination of division.*
(SO 7)

**E26-8** Judy Herzog, a recent graduate of Rolling's accounting program, evaluated the operating performance of Klumpe Company's six divisions. Judy made the following presentation to the Klumpe board of directors and suggested the Ketchum Division be eliminated. "If the Ketchum Division is eliminated," she said, "our total profits would increase by $16,870."

| | The Other Five Divisions | Ketchum Division | Total |
|---|---|---|---|
| Sales | $1,664,200 | $ 98,200 | $1,762,400 |
| Cost of goods sold | 978,520 | 76,470 | 1,054,990 |
| Gross profit | 685,680 | 21,730 | 707,410 |
| Operating expenses | 527,940 | 38,600 | 566,540 |
| Net income | $ 157,740 | $(16,870) | $ 140,870 |

In the Ketchum Division, cost of goods sold is $56,000 variable and $20,470 fixed, and operating expenses are $12,000 variable and $26,600 fixed. None of the Ketchum Division's fixed costs will be eliminated if the division is discontinued.

**Instructions**
Is Judy right about eliminating the Ketchum Division? Prepare a schedule to support your answer.

*Make incremental analysis for elimination of a product line.*
(SO 7)

**E26-9** Shatner Company makes three models of phasers. Information on the three products is given below.

| | Stunner | Double-Set | Mega-Power |
|---|---|---|---|
| Sales | $300,000 | $500,000 | $200,000 |
| Variable expenses | 150,000 | 200,000 | 140,000 |
| Contribution margin | 150,000 | 300,000 | 60,000 |
| Fixed expenses | 120,000 | 225,000 | 90,000 |
| Net income | $ 30,000 | $ 75,000 | $(30,000) |

Fixed expenses consist of $300,000 of common costs allocated to the three products based on relative sales, and additional fixed expenses of $30,000 (Stunner), $75,000 (Double-Set), and $30,000 (Mega-Power). The common costs will be incurred regardless of how many models are produced. The other fixed expenses would be eliminated if a model is phased out.

Jim Kirk, an executive with the company, feels the Mega-Power line should be discontinued to increase the company's net income.

**Instructions**
**(a)** Compute current net income for Shatner Company.
**(b)** Compute net income by product line and in total for Shatner Company if the company discontinues the Mega-Power product line. (*Hint:* Allocate the $300,000 common costs to the two remaining product lines based on their relative sales.)
**(c)** Should Shatner eliminate the Mega-Power product line? Why or why not?

**E26-10** Freese Company manufactures and sells three products. Relevant per unit data concerning each product are given below.

*Compute contribution margin and determine the product to be manufactured.*
(SO 8)

| | Product | | |
|---|---|---|---|
| | A | B | C |
| Selling price | $11 | $12 | $15 |
| Variable costs and expenses | $4 | $8 | $9 |
| Machine hours to produce | 2 | 1 | 2 |

**Instructions**

**(a)** Compute the contribution margin per unit of the limited resource (machine hour) for each product.

**(b)** Assuming 3,000 additional machine hours are available, which product should be manufactured?

**(c)** Prepare an analysis showing the total contribution margin if the additional hours are (1) divided equally among the products, and (2) allocated entirely to the product identified in (b) above.

**E26-11** Carleton Service Center just purchased an automobile hoist for $15,000. The hoist has a 5-year life and an estimated salvage value of $1,080. Installation costs were $2,900, and freight charges were $820. Carleton uses straight-line depreciation.

*Compute cash payback period and annual rate of return.*
(SO 9)

The new hoist will be used to replace mufflers and tires on automobiles. Carleton estimates that the new hoist will enable his mechanics to replace four extra mufflers per week. Each muffler sells for $65 installed. The cost of a muffler is $35, and the labor cost to install a muffler is $10.

**Instructions**

**(a)** Compute the payback period for the new hoist.

**(b)** Compute the annual rate of return for the new hoist. (Round to one decimal.)

**E26-12** Suzaki Manufacturing Company is considering three new projects, each requiring an equipment investment of $22,000. Each project will last for 3 years and produce the following cash inflows.

*Compute cash payback period and net present value.*
(SO 9, 10)

| Year | AA | BB | CC |
|---|---|---|---|
| 1 | $ 7,000 | $ 9,500 | $13,000 |
| 2 | 9,000 | 9,500 | 10,000 |
| 3 | 15,000 | 9,500 | 9,000 |
| Total | $31,000 | $28,500 | $32,000 |

The equipment's salvage value is zero. Suzaki uses straight-line depreciation. Suzaki will not accept any project with a payback period over 2 years. Suzaki's minimum required rate of return is 12%.

**Instructions**

**(a)** Compute each project's payback period, indicating the most desirable project and the least desirable project using this method. (Round to two decimals.)

**(b)** Compute the net present value of each project. Does your evaluation change? (Round to nearest dollar.)

**E26-13** Rondello Company is considering a capital investment of $150,000 in additional productive facilities. The new machinery is expected to have a useful life of 5 years with no salvage value. Depreciation is by the straight-line method. During the life of the investment, annual net income and cash inflows are expected to be $18,000 and $48,000, respectively. Rondello has a 12% cost of capital rate, which is the minimum acceptable rate of return on the investment.

*Compute annual rate of return, cash payback period, and net present value.*
(SO 9, 10)

**Instructions**

(Round to two decimals.)

**(a)** Compute (1) the annual rate of return and (2) the cash payback period on the proposed capital expenditure.

**(b)** Using the discounted cash flow technique, compute the net present value.

*Determine internal rate of return.*
(SO 10)

**E26-14** Omega Company is considering three capital expenditure projects. Relevant data for the projects are as follows.

| Project | Investment | Annual Income | Life of Project |
|---|---|---|---|
| 22A | $240,000 | $13,300 | 6 years |
| 23A | 270,000 | 21,000 | 9 years |
| 24A | 288,000 | 20,000 | 8 years |

Annual income is constant over the life of the project. Each project is expected to have zero salvage value at the end of the project. Omega Company uses the straight-line method of depreciation.

**Instructions**

**(a)** Determine the internal rate of return for each project. Round the internal rate of return factor to three decimals.

**(b)** If Omega Company's minimum required rate of return is 11%, which projects are acceptable?

*Compute net present value and recommend project.*
(SO 10)

**E26-15** Vasquez Corporation is considering investing in two different projects. It could invest in both, neither, or just one of the projects. The forecasts for the projects are as follows.

| | Project A | Project B |
|---|---|---|
| Capital investment | $200,000 | $300,000 |
| Net annual cash flows | $50,000 | $65,000 |
| Length of project | 5 years | 7 years |

The minimum rate of return acceptable to Vasquez is 10%.

**Instructions**

**(a)** Compute the net present value of the two projects.

**(b)** What capital budgeting decision should Vasquez make?

**(c)** Project A could be modified. By spending $20,000 more initially, the net annual cash flows could be increased by $10,000 per year. Would this change Vasquez's decision?

## EXERCISES: SET B

Visit the book's website at **www.wiley.com/college/weygandt**, and choose the Student Companion site, to access Exercise Set B.

## PROBLEMS: SET A

*Make incremental analysis for special order, and identify nonfinancial factors in decision.*
(SO 3)

**P26-1A** Korte Company is currently producing 16,000 units per month, which is 80% of its production capacity. Variable manufacturing costs are currently $8.00 per unit. Fixed manufacturing costs are $56,000 per month. Korte pays a 9% sales commission to its sales people, has $30,000 in fixed administrative expenses per month, and is averaging $320,000 in sales per month.

A special order received from a foreign company would enable Korte Company to operate at 100% capacity. The foreign company offered to pay 75% of Korte's current selling price per unit. If the order is accepted, Korte will have to spend an extra $2.00 per unit to package the product for overseas shipping. Also, Korte Company would need to lease a new stamping machine to imprint the foreign company's logo on the product, at a monthly cost of $2,500. The special order would require a sales commission of $3,500.

**Instructions**

**(a)** Compute the number of units involved in the special order and the foreign company's offered price per unit.

**(b)** What is the manufacturing cost of producing one unit of Korte's product for regular customers?

**(c)** Prepare an incremental analysis of the special order. Should management accept the order?

**(d)** What is the lowest price that Korte could accept for the special order to earn net income of $1.20 per unit?

**(e)** What nonfinancial factors should management consider in making its decision?

**P26-2A** The management of Martinez Manufacturing Company has asked for your assistance in deciding whether to continue manufacturing a part or to buy it from an outside supplier. The part, called Tropica, is a component of Martinez's finished product.

*Make incremental analysis related to make or buy; consider opportunity cost, and identify nonfinancial factors.* (SO 4)

An analysis of the accounting records and the production data revealed the following information for the year ending December 31, 2010.

1. The Machinery Department produced 36,000 units of Tropica.
2. Each Tropica unit requires 10 minutes to produce. Three people in the Machinery Department work full time (2,000 hours per year) producing Tropica. Each person is paid $11.00 per hour.
3. The cost of materials per Tropica unit is $2.00.
4. Manufacturing overhead costs directly applicable to the production of Tropica are: indirect labor, $5,500; utilities, $1,300; depreciation, $1,600; property taxes and insurance, $1,000. All of the costs will be eliminated if Tropica is purchased.
5. The lowest price for a Tropica from an outside supplier is $3.90 per unit. Freight charges will be $0.30 per unit, and a part-time receiving clerk at $8,500 per year will be required.
6. If Tropica is purchased, the excess space will be used to store Martinez's finished product. Currently, Martinez rents storage space at approximately $0.60 per unit stored per year. Approximately 6,000 units per year are stored in the rented space.

**Instructions**

**(a)** Prepare an incremental analysis for the make-or-buy decision. Should Martinez make or buy the part? Why?

**(b)** Prepare an incremental analysis, assuming the released facilities can be used to produce $10,000 of net income in addition to the savings on the rental of storage space. What decision should now be made?

**(c)** What nonfinancial factors should be considered in the decision?

**P26-3A** Deskins Manufacturing Company has four operating divisions. During the first quarter of 2010 the company reported total income from operations of $61,000 and the following results for the divisions.

*Compute contribution margin, and prepare incremental analysis concerning elimination of divisions.* (SO 7)

| | Division | | | |
|---|---|---|---|---|
| | **Denver** | **Miami** | **San Diego** | **Tacoma** |
| Sales | $455,000 | $730,000 | $920,000 | $515,000 |
| Cost of goods sold | 380,000 | 480,000 | 576,000 | 430,000 |
| Selling and administrative expenses | 120,000 | 207,000 | 246,000 | 120,000 |
| Income (loss) from operations | $ (45,000) | $ 43,000 | $ 98,000 | $ (35,000) |

Analysis reveals the following percentages of variable costs in each division.

| | **Denver** | **Miami** | **San Diego** | **Tacoma** |
|---|---|---|---|---|
| Cost of goods sold | 95% | 80% | 90% | 90% |
| Selling and administrative expenses | 80 | 60 | 70 | 60 |

Discontinuance of any division would save 60% of the fixed costs and expenses for that division.

Top management is deeply concerned about the unprofitable divisions (Denver and Tacoma). The consensus is that one or both of the divisions should be eliminated.

**Instructions**

**(a)** Compute the contribution margin for the two unprofitable divisions.

**(b)** Prepare an incremental analysis concerning the possible elimination of (1) the Denver Division and (2) the Tacoma Division. What course of action do you recommend for each division?

**(c)** Prepare a columnar condensed income statement using the CVP format for Deskins Manufacturing Company, assuming (1) the Denver Division is eliminated, and (2) the unavoidable fixed costs and expenses of the Denver Division are allocated 30% to Miami, 50% to San Diego, and 20% to Tacoma.

**(d)** Compare the total income from operations with the Denver Division ($61,000) to total income from operations without this division.

*Compute annual rate of return, cash payback, and net present value.*
(SO 9, 10)

**P26-4A** Timmons Corporation is considering three long-term capital investment proposals. Relevant data on each project are as follows.

| | Project | | |
|---|---|---|---|
| | **Brown** | **Red** | **Yellow** |
| Capital investment | $190,000 | $220,000 | $250,000 |
| Annual net income: | | | |
| Year 1 | 25,000 | 20,000 | 26,000 |
| 2 | 16,000 | 20,000 | 24,000 |
| 3 | 13,000 | 20,000 | 23,000 |
| 4 | 10,000 | 20,000 | 17,000 |
| 5 | 8,000 | 20,000 | 20,000 |
| Total | $ 72,000 | $100,000 | $110,000 |

Salvage value is expected to be zero at the end of each project. Depreciation is computed by the straight-line method. The company's minimum rate of return is the company's cost of capital which is 12%.

**Instructions**

**(a)** Compute the annual rate of return for each project. (Round to one decimal.)
**(b)** Compute the cash payback period for each project. (Round to two decimals.)
**(c)** Compute the net present value for each project. (Round to nearest dollar.)
**(d)** Rank the projects on each of the foregoing bases. Which project do you recommend?

*Compute annual rate of return, cash payback, and net present value.*
(SO 9, 10)

**P26-5A** Wendy Dobson is the managing director of the Wichita Day Care Center. Wichita is currently set up as a full-time child care facility for children between the ages of 12 months and 6 years. Wendy is trying to determine whether the center should expand its facilities to incorporate a newborn care room for infants between the ages of 6 weeks and 12 months. The necessary space already exists. An investment of $25,000 would be needed, however, to purchase cribs, high chairs, etc. The equipment purchased for the room would have a 5-year useful life with zero salvage value.

The newborn nursery would be staffed to handle 12 infants on a full-time basis. The parents of each infant would be charged $200 weekly, and the facility would operate 52 weeks of the year. Staffing the nursery would require two full-time specialists and five part-time assistants at an annual cost of $103,800. Food, diapers, and other miscellaneous supplies are expected to total $14,000 annually.

**Instructions**

**(a)** Determine (1) annual net income and (2) net cash flow for the new nursery.
**(b)** Compute (1) the annual rate of return and (2) the cash payback period for the new nursery. (Round to two decimals.)
**(c)** Assuming that Wichita can borrow the money needed for expansion at 10%, compute the net present value of the new room. (Round to the nearest dollar.)
**(d)** What should Wendy conclude from these computations?

*Compute net present value and internal rate of return.*
(SO 10)

**P26-6A** Aqua Tech Testing is considering investing in a new testing device. It has two options: Option A would have an initial lower cost but would require a significant expenditure for rebuilding after 5 years. Option B would require no rebuilding expenditure, but its maintenance costs would be higher. Since the option B machine is of initial higher quality, it is expected to have a salvage value at the end of its useful life. The following estimates were provided. The company's cost of capital is 9%.

| | **Option A** | **Option B** |
|---|---|---|
| Initial cost | $90,000 | $170,000 |
| Net annual cash flows | $20,000 | $32,000 |
| Cost to rebuild (end of year 5) | $26,500 | $0 |
| Salvage value | $0 | $27,500 |
| Estimated useful life | 8 years | 8 years |

**Instructions**

**(a)** Compute the (1) net present value, and (2) internal rate of return for each option. (*Hint:* To solve for internal rate of return, experiment with alternative discount rates to arrive at a net present value of zero.)
**(b)** Which option should be accepted?

## PROBLEMS: SET B

**P26-1B** Haslett Inc. manufactures basketballs for the National Basketball Association (NBA). For the first 6 months of 2011, the company reported the following operating results while operating at 90% of plant capacity.

*Make incremental analysis for special order, and identify nonfinancial factors in decision.* (SO 3)

| | Amount | Per Unit |
|---|---|---|
| Sales | $4,500,000 | $50.00 |
| Cost of goods sold | 3,150,000 | 35.00 |
| Selling and administrative expenses | 360,000 | 4.00 |
| Net income | $ 990,000 | $11.00 |

Fixed costs for the period were: Cost of goods sold $900,000, and selling and administrative expenses $135,000.

In July, normally a slack manufacturing month, Haslett receives a special order for 9,000 basketballs at $32 each from the European Basketball Association (EBA). Acceptance of the order would increase variable selling and administrative expenses $0.50 per unit because of shipping costs but would not increase fixed costs and expenses.

**Instructions**

**(a)** Prepare an incremental analysis for the special order.
**(b)** Should Haslett Inc. accept the special order?
**(c)** What is the minimum selling price on the special order to produce net income of $5.00 per ball?
**(d)** What nonfinancial factors should management consider in making its decision?

**P26-2B** The management of Finnigan Manufacturing Company is trying to decide whether to continue manufacturing a part or to buy it from an outside supplier. The part, called BIZBE, is a component of the company's finished product.

*Make incremental analysis related to make or buy; consider opportunity cost, and identify nonfinancial factors.* (SO 4)

The following information was collected from the accounting records and production data for the year ending December 31, 2010.

1. 6,000 units of BIZBE were produced in the Machining Department.
2. Variable manufacturing costs applicable to the production of each BIZBE unit were: direct materials $4.75, direct labor $4.60, indirect labor $0.45, utilities $0.35.
3. Fixed manufacturing costs applicable to the production of BIZBE were:

| Cost Item | Direct | Allocated |
|---|---|---|
| Depreciation | $1,100 | $ 900 |
| Property taxes | 500 | 200 |
| Insurance | 900 | 600 |
| | $2,500 | $1,700 |

All variable manufacturing and direct fixed costs will be eliminated if BIZBE is purchased. Allocated costs will have to be absorbed by other production departments.

4. The lowest quotation for 6,000 BIZBE units from a supplier is $66,000.
5. If BIZBE units are purchased, freight and inspection costs would be $0.30 per unit, and receiving costs totaling $750 per year would be incurred by the Machining Department.

**Instructions**

**(a)** Prepare an incremental analysis for BIZBE. Your analysis should have columns for (1) Make BIZBE, (2) Buy BIZBE, and (3) Net Income Increase/Decrease.
**(b)** Based on your analysis, what decision should management make?
**(c)** Would the decision be different if Finnegan Company has the opportunity to produce $6,000 of net income with the facilities currently being used to manufacture BIZBE? Show computations.
**(d)** What nonfinancial factors should management consider in making its decision?

**P26-3B** Tryon Manufacturing Company has four operating divisions. During the first quarter of 2011, the company reported aggregate income from operations of $135,000 and the divisional results shown on the next page.

*Compute contribution margin, and prepare incremental analysis concerning elimination of divisions.* (SO 7)

| | Division | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Sales | $510,000 | $390,000 | $310,000 | $170,000 |
| Cost of goods sold | 300,000 | 250,000 | 270,000 | 150,000 |
| Selling and administrative expenses | 60,000 | 80,000 | 65,000 | 70,000 |
| Income (loss) from operations | $150,000 | $ 60,000 | $ (25,000) | $(50,000) |

Analysis reveals the following percentages of variable costs in each division.

| | I | II | III | IV |
|---|---|---|---|---|
| Cost of goods sold | 70% | 80% | 75% | 90% |
| Selling and administrative expenses | 40 | 50 | 60 | 70 |

Discontinuance of any division would save 50% of the fixed costs and expenses for that division.

Top management is very concerned about the unprofitable divisions (III and IV). Consensus is that one or both of the divisions should be discontinued.

**Instructions**

**(a)** Compute the contribution margin for Divisions III and IV.

**(b)** Prepare an incremental analysis concerning the possible discontinuance of (1) Division III and (2) Division IV. What course of action do you recommend for each division?

**(c)** Prepare a columnar condensed income statement for Tryon Manufacturing, assuming Division IV is eliminated. Use the CVP format. Division IV's unavoidable fixed costs are allocated equally to the continuing divisions.

**(d)** Reconcile the total income from operations ($135,000) with the total income from operations without Division IV.

*Compute annual rate of return, cash payback, and net present value.*

(SO 9, 10)

**P26-4B** Bensen Corporation is considering three long-term capital investment proposals. Each investment has a useful life of 5 years. Relevant data on each project are as follows.

| | Project Ric | Project Rac | Project Roe |
|---|---|---|---|
| Capital investment | $140,000 | $150,000 | $180,000 |
| Annual net income: | | | |
| Year 1 | 13,000 | 18,000 | 27,000 |
| 2 | 13,000 | 17,000 | 22,000 |
| 3 | 13,000 | 13,000 | 16,000 |
| 4 | 13,000 | 12,000 | 13,000 |
| 5 | 13,000 | 9,000 | 12,000 |
| Total | $ 65,000 | $ 69,000 | $ 90,000 |

Depreciation is computed by the straight-line method with no salvage value. The company's cost of capital is 15%.

**Instructions**

**(a)** Compute the annual rate of return for each project. (Round to one decimal.)

**(b)** Compute the cash payback period for each project. (Round to two decimals.)

**(c)** Compute the net present value for each project. (Round to nearest dollar.)

**(d)** Rank the projects on each of the foregoing bases. Which project do you recommend?

*Compute annual rate of return, cash payback, and net present value.*

(SO, 9, 10)

**P26-5B** Betty Dillman is an accounting major at a midwestern state university located approximately 60 miles from a major city. Many of the students attending the university are from the metropolitan area and visit their homes regularly on the weekends. Betty, an entrepreneur at heart, realizes that few good commuting alternatives are available for students doing weekend travel. She believes that a weekend commuting service could be organized and run profitably from several suburban and downtown shopping mall locations. Betty has gathered the following investment information.

1. Six used vans would cost a total of $96,000 to purchase and would have a 3-year useful life with negligible salvage value. Betty plans to use straight-line depreciation.
2. Ten drivers would have to be employed at a total payroll expense of $70,000.

3. Other annual out of pocket expenses associated with running the commuter service would include Gasoline $28,000, Maintenance $2,800, Repairs $3,500, Insurance $3,200, Advertising $1,500. (Exclude interest expense.)
4. Betty has visited several financial institutions to discuss funding for her new venture. The best interest rate she has been able to negotiate is 10%. Use this rate for cost of capital.
5. Betty expects each van to make ten round trips weekly and carry an average of five students each trip. The service is expected to operate 30 weeks each years. Each student will be charged $16.00 for a round-trip ticket.

**Instructions**

**(a)** Determine the annual (1) net income, and (2) net cash flow for the commuter service.
**(b)** Compute (1) the annual rate of return, and (2) the cash payback period. (Round to two decimals.)
**(c)** Compute the net present value of the commuter service. (Round to the nearest dollar.)
**(d)** What should Betty conclude from these computations?

**P26-6B** Oklahoma Clinic is considering investing in new heart-monitoring equipment. It has two options: Option A would have an initial lower cost but would require a significant expenditure for rebuilding after 4 years. Option B would require no rebuilding expenditure, but its maintenance costs would be higher. Since the option B machine is of initial higher quality, it is expected to have a salvage value at the end of its useful life. The following estimates were made of the cash flows. The company's cost of capital is 8%.

*Compute net present value, and internal rate of return.* (SO 10)

| | Option A | Option B |
|---|---|---|
| Initial cost | $135,000 | $203,000 |
| Net annual cash flows | $31,000 | $40,000 |
| Cost to rebuild (end of year 4) | $50,000 | $0 |
| Salvage value | $0 | $10,000 |
| Estimated useful life | 8 years | 8 years |

**Instructions**

**(a)** Compute the (1) net present value and (2) internal rate of return for each option. (*Hint:* To solve for internal rate of return, experiment with alternative discount rates to arrive at a net present value of zero.)
**(b)** Which option should be accepted?

## PROBLEMS: SET C

Visit the book's companion website at **www.wiley.com/college/weygandt**, and choose the Student Companion site, to access Problem Set C.

## COMPREHENSIVE PROBLEM: CHAPTERS 19 TO 26

You would like to start a business manufacturing a unique model of bicycle helmet. In preparation for an interview with the bank to discuss your financing needs, you develop answers to the following questions. A number of assumptions are required; clearly note all assumptions that you make.

**Instructions**

**(a)** Identify the types of costs that would likely be involved in making this product.
**(b)** Set up five columns as indicated.

| | Product Costs | | | |
|---|---|---|---|---|
| Item | Direct Materials | Direct Labor | Manufacturing Overhead | Period Costs |

Classify the costs you identified in (a) into the manufacturing cost classifications of product costs (direct materials, direct labor, and manufacturing overhead) and period costs.
**(c)** Assign hypothetical monthly dollar figures to the costs you identified in (a) and (b).

**(d)** Assume you have no raw materials or work in process beginning or ending inventories. Prepare a projected cost of goods manufactured schedule for the first month of operations.
**(e)** Project the number of helmets you expect to produce the first month of operations. Compute the cost to produce one bicycle helmet. Review the result to ensure it is reasonable; if not, return to part (c) and adjust the monthly dollar figures you assigned accordingly.
**(f)** What type of cost accounting system will you likely use—job order or process costing?
**(g)** Explain how you would assign costs in either the job order or process costing system you plan to use.
**(h)** Classify your costs as either variable or fixed costs. For simplicity, assign all costs to either variable or fixed, assuming there are no mixed costs, using the format shown.

| Item | Variable Costs | Fixed Costs | Total Costs |
|---|---|---|---|

**(i)** Compute the unit variable cost, using the production number you determined in (e).
**(j)** Project the number of helmets you anticipate selling the first month of operations. Set a unit selling price, and compute both the contribution margin per unit and the contribution margin ratio.
**(k)** Determine your break-even point in dollars and in units.
**(l)** Prepare projected operating budgets (sales, production, direct materials, direct labor, manufacturing overhead, selling and administrative expense, and income statement). You will need to make assumptions for each of the following:

| | |
|---|---|
| Direct materials budget: | Quantity of direct materials required to produce one helmet; cost per unit of quantity; desired ending direct materials (assume none). |
| Direct labor budget: | Direct labor time required per helmet; direct labor cost per hour. |
| Budgeted income statement: | Income tax expense is 45% of income from operations. |

**(m)** Prepare a cash budget for the month. Assume the percentage of sales that will be collected from customers is 75%, and the percentage of direct materials that will be paid in the current month is 75%.
**(n)** Determine a relevant range of activity, using the number of helmets produced as your activity index. Recast your manufacturing overhead budget into a flexible monthly budget for two additional activity levels.
**(o)** Identify one potential cause of materials, direct labor, and manufacturing overhead variances for your product.
**(p)** Assume that you wish to purchase production equipment that costs $720,000. Determine the cash payback period, utilizing the monthly cash flow that you computed in part (m) multiplied by 12 months (for simplicity).
**(q)** Identify any nonfinancial factors that should be considered before commencing your business venture.

## WATERWAYS CONTINUING PROBLEM

(This is a continuation of the Waterways Problem from Chapters 19 through 25.)

**WCP26** Waterways Corporation puts much emphasis on cash flow when it plans for capital investments. The company chose its discount rate of 8% based on the rate of return it must pay its owners and creditors. Using that rate, Waterways then uses different methods to determine the best decisions for making capital outlays. Waterways is considering buying five new backhoes to replace the backhoes it now has. This problem asks you to evaluate that decision, using various capital budgeting techniques.


*Go to the book's companion website,* **www.wiley.com/college/weygandt**, *to find the remainder of this problem.*

# BROADENING YOUR PERSPECTIVE

## Decision Making Across the Organization

**BYP26-1** Morganstern Company is considering the purchase of a new machine. The invoice price of the machine is $170,000, freight charges are estimated to be $4,000, and installation costs are expected to be $6,000. Salvage value of the new equipment is expected to be zero after a useful life of 4 years. Existing equipment could be retained and used for an additional 4 years if the new machine is not purchased. At that time, the salvage value of the equipment would be zero. If the new machine is purchased now, the existing machine would be scrapped. Morganstern's accountant, Diane Gallup, has accumulated the following data regarding annual sales and expenses with and without the new machine.

1. Without the new machine, Morganstern can sell 10,000 units of product annually at a per unit selling price of $100. If the new unit is purchased, the number of units produced and sold would increase by 20%. The selling price would remain the same.
2. The new machine is faster than the old machine, and it is more efficient in its usage of materials. With the old machine the gross profit rate will be 25% of sales. With the new machine the rate will be 28% of sales.
3. Annual selling expenses are $135,000 with the current equipment. Because the new equipment would produce a greater number of units to be sold, annual selling expenses are expected to increase by 10% if it is purchased.
4. Annual administrative expenses are expected to be $100,000 with the old machine and $113,000 with the new machine.
5. The current book value of the existing machine is $36,000. Morganstern uses straight-line depreciation.
6. Morganstern's management wants a minimum rate of return of 15% on its investment and a payback period of no more than 3 years.

**Instructions**

With the class divided into groups, answer the following. (Ignore income tax effects.)

**(a)** Prepare an incremental analysis for the 4 years showing whether Morganstern should keep the existing machine or buy the new machine.
**(b)** Calculate the annual rate of return for the new machine. (Round to two decimals.)
**(c)** Compute the payback period for the new machine. (Round to two decimals.)
**(d)** Compute the net present value of the new machine. (Round to the nearest dollar.)
**(e)** On the basis of the foregoing data, would you recommend that Morganstern buy the machine? Why?

## Managerial Analysis

**BYP26-2** Barone Company manufactures private-label small electronic products, such as alarm clocks, calculators, kitchen timers, stopwatches, and automatic pencil sharpeners. Some of the products are sold as sets, and others are sold individually. Products are studied as to their sales potential, and then cost estimates are made. The Engineering Department develops production plans, and then production begins. The company has generally had very successful product introduction. Only two products introduced by the company have been discontinued.

One of the products currently sold is a multi-alarm alarm clock. The clock has four alarms that can be programmed to sound at various times and for varying lengths of time. The company has experienced a great deal of difficulty in making the circuit boards for the clocks. The production process has never operated smoothly. The product is unprofitable at the present time, primarily because of warranty repairs and product recalls. Two models of the clocks were recalled, for example, because they sometimes caused an electric shock when the alarms were being shut off. The Engineering Department is attempting to revise the manufacturing process, but the revision will take another 6 months at least.

The clocks were very popular when they were introduced, and since they are private-label, the company has not suffered much from the recalls. Presently, the company has a very large order for several items from Kmart Stores. The order includes 5,000 of the multi-alarm clocks.

When Barone suggested that Kmart purchase the clocks from another manufacturer, Kmart threatened to rescind the entire order unless the clocks were included.

Barone has therefore investigated the possibility of having another company make the clocks for them. The clocks were bid for the Kmart order, based on an estimated $5.50 cost to manufacture, as follows.

| | |
|---|---|
| Circuit board, 1 each @ $1.00 | $1.00 |
| Plastic case, 1 each @ $0.50 | 0.50 |
| Alarms, 4 @ $0.15 each | 0.60 |
| Labor, 15 minutes @ $12/hour | 3.00 |
| Overhead, $1.60 per labor hour | 0.40 |

Barone could purchase clocks to fill the Kmart order for $9 from Silver Star, a Korean manufacturer with a very good quality record. Silver Star has offered to reduce the price to $7.50 after Barone has been a customer for 6 months, placing an order of at least 1,000 units per month. If Barone becomes a "preferred customer" by purchasing 15,000 units per year, the price would be reduced still further to $4.50.

Sigma Products, a local manufacturer, has also offered to make clocks for Barone. They have offered to sell 5,000 clocks for $5 each. However, Sigma Products has been in business for only 6 months. They have experienced significant turnover in their labor force, and the local media have reported that the owners may soon face tax evasion charges. The owner of Sigma Products is an electronic engineer, however, and the quality of the clocks is likely to be good.

If Barone decides to purchase the clocks from either Silver Star or Sigma, all the costs to manufacturer could be avoided, except a total of $5,000 in overhead costs for machine depreciation. The machinery is fairly new, and has no alternate use.

**Instructions**

**(a)** What is the difference in profit under each of the alternatives if the clocks are to be sold for $13.00 each to Kmart?

**(b)** What are the most important nonfinancial factors that Barone should consider when making this decision?

**(c)** What should Barone do in regard to the Kmart order? What should it do in regard to continuing to manufacture the multi-alarm alarm clocks? Be prepared to defend your answer.

## Real-World Focus

**BYP26-3** Founded in 1983, the Beverly Hills Fan Company is located in Woodland Hills, California. With 23 employees and sales of less than $10 million, the company is relatively small. Management feels that there is potential for growth in the upscale market for ceiling fans and lighting. They are particularly optimistic about growth in Mexican and Canadian markets.

Presented below is information from the president's letter in the company's annual report.

**BEVERLY HILLS FAN COMPANY**
President's Letter

An aggressive product development program was initiated during the past year resulting in new ceiling fan models planned for introduction next year. Award winning industrial designer Ron Rezek created several new fan models for the Beverly Hills Fan and L.A. Fan lines, including a new Showroom Collection, designed specifically for the architectural and designer markets. Each of these models has received critical acclaim, and order commitments for next year have been outstanding. Additionally, our Custom Color and special order fans continued to enjoy increasing popularity and sales gains as more and more customers desire fans that match their specific interior decors. Currently, Beverly Hills Fan Company offers a product line of over 100 models of contemporary, traditional, and transitional ceiling fans.

**Instructions**

**(a)** What points did the company management need to consider before deciding to offer the special-order fans to customers?

**(b)** How would incremental analysis be employed to assist in this decision?

## Exploring the Web

**BYP26-4** Campbell Soup Company is an international provider of soup products. Management is very interested in continuing to grow the company in its core business, while "spinning off" those businesses that are not part of its core operation.

**Address: www.campbellsoups.com**, or go to **www.wiley.com/college/weygandt**

**Steps**

1. Go to the home page of Campbell Soup Company at the address shown above.
2. Choose **Our Company** and then **Investor Center**.
3. Choose **Financial Reports**.
4. Choose the 2007 annual report, or the current annual report if 2007 is no longer available.

**Instructions**

Review the financial statements and management's discussion and analysis, and answer the following questions.

**(a)** What was the total amount reported as "Purchases of Plant Assets" in the 2007 statement of cash flows? How does this amount compare with the previous year?
**(b)** What range of interest rates does the company report on its long-term liabilities in the notes to its financial statements?
**(c)** Assume that this year's capital expenditures are expected to increase cash flows by $45 million. What is the expected internal rate of return (IRR) for these capital expenditures? (Assume a 10-year period for the cash flows.)

## Communication Activity

**BYP26-5** Refer back to E26-11 to address the following.

**Instructions**

Prepare a memo to Angie Baden, your supervisor. Show your calculations from E26-11, parts **(a)** and **(b)**. In one or two paragraphs, discuss important nonfinancial considerations. Make any assumptions you believe to be necessary. Make a recommendation, based on your analysis.

## Ethics Case

**BYP26-6** DeVito Company operates in a state where corporate taxes and workmen's compensation insurance rates have recently doubled. DeVito's president has assigned you the task of preparing an economic analysis and making a recommendation about whether to move the company's entire operation to Missouri. The president is slightly in favor of such a move because Missouri is his boyhood home, and he also owns a fishing lodge there.

You have just completed building your dream house, moved in, and sodded the lawn. Your children are all doing well in school and sports and, along with your spouse, want no part of a move to Missouri. If the company does move, so will you because your town is a one-industry community, and you and your spouse will have to move to have employment. Moving when everyone else does will cause you to take a big loss on the sale of your house. The same hardships will be suffered by your coworkers, and the town will be devastated.

In compiling the costs of moving versus not moving, you have latitude in the assumptions you make, the estimates you compute, and the discount rates and time periods you project. You are in a position to influence the decision singlehandedly.

**Instructions**

**(a)** Who are the stakeholders in this situation?
**(b)** What are the ethical issues in this situation?
**(c)** What would you do in this situation?

## "All About You" Activity

**BYP26-7** Managerial accounting techniques can be used in a wide variety of settings. As we have frequently pointed out, you can use them in many personal situations. They also can be useful in trying to find solutions for societal issues that appear to be hard to solve.

**Instructions**

Read the *Fortune* article "The Toughest Customers: How Hardheaded Business Metrics Can Help the Hard-core Homeless," by Cait Murphy, available at *http://money.cnn.com/magazines/fortune/fortune_archive/2006/04/03/8373067/index.htm.* Answer the following questions.

**(a)** How does the article define "chronic" homelessness?

**(b)** In what ways does homelessness cost a city money? What are the estimated costs of a chronic homeless person to various cities?

**(c)** What are the steps suggested to address the problem?

**(d)** What is the estimated cost of implementing this program in New York? What results have been seen?

**(e)** In terms of incremental analysis, frame the relevant costs in this situation.

## Answers to Insight and Accounting Across the Organization Questions

**p. 1162 These Wheels Have Miles Before Installation**

Q: What are the disadvantages of outsourcing to a foreign country?

A: *Possible disadvantages of outsourcing are that the supplier loses control over the quality of the product, as well as the timing of production. Also, the company exposes itself to price changes caused by changes in the value of the foreign currency. In addition, shipping large, heavy products such as tires is costly, and disruptions in shipping (due to strikes, weather, etc.) can cause delays in final assembly of vehicles. As a result of the outsourcing, the company will have to reassign, or even lay off, many skilled workers. Not only is this very disruptive to the lives of those employees, it also hurts morale of the remaining employees. As more U.S employers begin to use robotic automation in their facilities, they are able to reduce the amount of labor required, and thus are beginning to be able to compete more favorably with foreign suppliers.*

**p. 1170 Are You Ready for the 50-Inch Screen?**

Q: In building factories to manufacture 50-inch TV screens, how might companies build risk factors into their financial analyses?

A: *One approach is to use sensitivity analysis. Sensitivity analysis uses a number of outcome estimates to get a sense of the variability among potential returns. In addition, more distant cash flows can be discarded or given a low weighting because of their high uncertainty.*

## Authors' Comments on *All About You:* What Is a Degree Worth? (p. 1176)

This is a very difficult decision. All of the evidence suggests that your short-term and long-term prospects will be far greater with some form of post–high-school degree. Because of this, we feel strongly that you should make every effort to continue your education. Many of the discussions provided in this text presented ideas on how to get control of your individual financial situation. We would encourage you to use these tools to identify ways to reduce your financial burden in order to continue your education. We also want to repeat that even taking only one course a semester is better than dropping out. Your instructors and advisors frequently provide advice to students who are faced with the decision about whether to continue with their education. If you are in this situation, we would encourage you to seek their advice since the implications of this decision can be long-lasting.

## Answers to Self-Study Questions

**1.** d **2.** b **3.** c **4.** b **5.** d **6.** a **7.** d **8.** b **9.** c **10.** d **11.** b **12.** d **13.** b **14.** c **15.** b