

# 22. Short-term decision making: Differential analysis

## Learning objectives

After studying this chapter, you should be able to:

- Compare and contrast contribution margin income statements to traditional income statements.
- Explain differential analysis and describe its components.
- Make pricing decisions using differential analysis.
- Use differential analysis to decide whether to accept or reject special orders.
- Decide whether to eliminate or add product lines or segments of the business using differential analysis.
- Use differential analysis to decide whether to sell joint products at the split-off point or process them further.
- Decide whether to make or buy products using differential analysis.
- Use differential analysis to decide whether to improve product quality.

In this chapter, we will discuss how companies use financial information in making decisions. The framework for our discussion is differential analysis. We begin by presenting an alternative to the traditional income statement format. This alternative, the contribution margin income statement, generally is more useful for the managerial decisions we discuss in this chapter. Then we discuss differential analysis as a method of choosing the best solution to decision problems. We also present several applications of differential analysis to managerial problems that you will likely encounter.

## Contribution margin income statements

Both this and the previous chapter discuss the use of accounting for managerial decision making. We have introduced the concepts of fixed and variable costs, and shown how you can use these concepts in making decisions. However, income statements published for external use do not break costs down into fixed and variable components. We now present another income statement that not only breaks down costs into their fixed and variable components but also presents the total contribution margin. The contribution margin income statement subtracts variable costs from revenues to show the contribution margin, and then subtracts fixed costs to derive net income.

You can see the differences between the traditional and contribution margin income statements by contrasting two income statements based on the same data. Assume Bart Company had the following data relating to manufacturing and sales activities for May 2011:

**Bart Company**  
**May 2011**

Variable manufacturing costs (per unit):

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Direct materials	\$ 1
Direct labor	1
Overhead	1
Total	3
Variable selling expenses (per unit)	\$0.50
Fixed costs:	
Manufacturing overhead (\$1.00 per unit for \$ 9,000 9,000 units)	
Selling expenses	15,000
Administrative expenses	18,000
Selling price (per unit)	\$ 9

Look at Exhibit 26, where we compare the traditional and contribution margin methods.

### A. Traditional method

<b>Bart company</b>	
<b>Income statement</b>	
<b>For the month ending 2011 May 31</b>	
Revenue (9,000 units at \$9 per unit)	\$81,000
Less: Cost of goods sold (9,000 units at \$4 manufacturing cost per unit:	36,000
Less: \$3 variable + \$1 fixed)	
Gross margin	\$45,000
Less: Selling and administrative expenses (9,000 units at \$0.50 variable selling cost	37,500
per unit, plus fixed costs of \$15,000 for selling and \$18,000 for administrative)	
Net income tax	\$7,500

### B. Contribution margin method

<b>Bart company</b>	
<b>Income statement</b>	
<b>For the month ending 2011 May 31</b>	
Revenue (9,000 units at \$9 per unit)	\$81,000
Less: Variable cost of goods sold (9,000 units at \$3 variable manufacturing cost per unit)	\$27,000
Variable selling expenses (9,000 units at \$0.50 per unit)	4,500
Total contribution margin	\$ 49,500
Less: Fixed manufacturing costs	\$ 9,000
Less: Fixed selling expenses	15,000
Less: Fixed administrative expenses	18,000
Net income before tax	\$ 7,500

#### Exhibit 26: Comparative income statements

The contribution margin method shows managers the amount of variable costs, the amount of fixed costs, and the contribution the company is making toward covering fixed costs and earning net income. For example, suppose the managers of Bart Company asked, "What would be the impact on net income if we increase sales units by 10 per cent without changing unit price or variable cost per unit or total fixed costs?" Looking at the contribution margin statement, we predict the following increases:

Revenue increase (10% of \$81,000)	\$8,100
Variable cost of goods sold increase (10% of \$27,000)	\$2,700
Increase in total variable selling expense (10% of \$4,500)	450
Increase in total contribution margin	\$4,950

If we assume no increase in fixed costs, we expect Bart's net income to increase by USD 4,950.

The traditional statement does not break down costs into fixed and variable components, so we cannot easily answer the question posed by Bart's management. Most companies use the traditional approach for external financial statements, but they use the contribution margin format for internal purposes because it is more

informative. Management often needs information on the contribution margin rather than the gross margin to calculate break-even points and make decisions regarding special-order pricing.

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### An accounting perspective:

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#### Uses of technology

Generating multiple financial reports in different formats does not mean companies must keep several sets of books. After data are entered into a database, it is relatively simple for computer software to generate several sets of financial statements—a contribution margin income statement for managers, a traditional income statement for external financial reporting, and yet another report for tax purposes. Two problems remain: First, the reports are only as good as the quality of the data in the database. Second, people who read the financial statements must be sufficiently informed to understand the differences in the way the information is presented.

#### Differential analysis

**Differential analysis** involves analyzing the different costs and benefits that would arise from alternative solutions to a particular problem. **Relevant revenues or costs** in a given situation are future revenues or costs that differ depending on the alternative course of action selected. **Differential revenue** is the difference in revenues between two alternatives. **Differential cost or expense** is the difference between the amounts of relevant costs for two alternatives.<sup>4</sup>

Future costs that do not differ between alternatives are irrelevant and may be ignored since they affect both alternatives similarly. Past costs, also known as **sunk costs**, are not relevant in decision making because they have already been incurred; therefore, these costs cannot be changed no matter which alternative is selected.

For certain decisions, revenues do not differ between alternatives. Under those circumstances, management should select the alternative with the least cost. In other situations, costs do not differ between alternatives. Accordingly, management should select the alternative that results in the largest revenue. Many times both future costs and revenues differ between alternatives. In these situations, the management should select the alternative that results in the greatest positive difference between future revenues and expenses (costs).

To illustrate relevant, differential, and sunk costs, assume that Joanna Bennett invested USD 400 in a tiller so she could till gardens to earn USD 1,500 during the summer. Not long afterward, Bennett was offered a job at a horse stable feeding horses and cleaning stalls for USD 1,200 for the summer. The costs that she would incur in tilling are USD 100 for transportation and USD 150 for supplies. The costs she would incur at the horse stable are USD 100 for transportation and USD 50 for supplies. If Bennett works at the stable, she would still have the tiller, which she could loan to her parents and friends at no charge.

The tiller cost of USD 400 is not relevant to the decision because it is a sunk cost. The transportation cost of USD 100 is also not relevant because it is the same for both alternatives. These costs and revenues are relevant:

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4 Some authors equate relevant cost and differential cost. This text uses the term relevant to identify which costs should be considered in a situation and the term differential to identify the amount by which these costs differ.

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	<b>Performing tilling service</b>	<b>Working at horse stable</b>	<b>Differential</b>
Revenues	\$1,500	\$1,200	\$300
Costs	150	50	100
Net benefit in favor of tilling service			\$200

Based on this differential analysis, Joanna Bennett should perform her tilling service rather than work at the stable. Of course, this analysis considers only cash flows; nonmonetary considerations, such as her love for horses, could sway the decision.

In many situations, total variable costs differ between alternatives while total fixed costs do not. For example, suppose you are deciding between taking the bus to work or driving your car on a particular day. The differential costs of driving a car to work or taking the bus would involve only the variable costs of driving the car versus the variable costs of taking the bus.

Suppose the decision is whether to drive your car to work every day for a year versus taking the bus for a year. If you bought a second car for commuting, certain costs such as insurance and an auto license that are fixed costs of owning a car would be differential costs for this particular decision.

Before studying the applications of differential analysis, you must realize that (1) two types of fixed costs exist and (2) opportunity costs are also relevant in choosing between alternatives. For this reason, we discuss committed fixed costs, discretionary fixed costs, and opportunity costs before concentrating on the applications of differential analysis.

Up to this point, we have treated fixed costs as if they were all alike. Now we describe two types of fixed costs—committed fixed costs and discretionary fixed costs.

**Committed fixed costs** **Committed fixed costs** relate to the basic facilities and organizational structure that a company must have to continue operations. These costs cannot be changed in the short run without seriously disrupting operations. Examples of committed fixed costs are leases on buildings and equipment and salaries of key executives. In the short run, these costs are not subject to the discretion or control of management. These costs result from past decisions that committed the company for several years. For instance, once a company constructs a building to house production operations, it is committed to use the building for many years. Thus, unlike some other types of fixed costs, the depreciation on that building is not as subject to management's control.

**Discretionary fixed costs** In contrast to committed fixed costs, management controls **discretionary fixed costs** from year to year. Each year management decides how much to spend on advertising, research and development, and employee training or development programs. Because it makes such decisions each year, these costs are under management's discretion. Management is not locked in or committed to a certain level of expense for longer than one budget period. In the next period, management may change the level of expense or eliminate the expense completely.

To some extent, management's philosophy can affect which fixed costs are committed and which are discretionary. For instance, some companies terminate people in the upper levels of management when they downsize, while other companies keep their management team intact. Thus, in some companies the salaries of top-level managers are discretionary while in other companies they are committed.

The discussion of committed fixed costs and discretionary fixed costs is relevant to CVP analysis. When almost all of a company's fixed costs are committed fixed costs, it has more difficulty reducing its break-even point for the next budget period than if most of its fixed costs are discretionary. A company with a large proportion of discretionary fixed costs may be able to reduce fixed costs dramatically in recessionary periods. By running lean, the company may show some income even when economic conditions are difficult. As a result, the company may enhance its chances of long-run survival.

Another cost concept relevant to decision making is opportunity cost. An **opportunity cost** is the potential benefit that is forgone by not following the next best alternative course of action. For example, assume that the two best uses of a plot of land are as a mobile home park (annual income of USD 100,000) and as a golf driving range (annual income of USD 60,000). The opportunity cost of using the land as a mobile home park is USD 60,000, while the opportunity cost of using the land as a driving range is USD 100,000.

Companies do not record opportunity costs in the accounting records because they are the costs of not following a certain alternative. Thus, opportunity costs are not transactions that occurred but that did not occur. However, opportunity cost is a relevant cost in many decisions because it represents a real sacrifice when one alternative is chosen instead of another.

### Applications of differential analysis

To illustrate the application of differential analysis to specific decision problems, we consider five decisions: (1) setting prices of products; (2) accepting or rejecting special orders; (3) adding or eliminating products, segments, or customers; (4) processing or selling joint products; and (5) deciding whether to make products or buy them. Although these five decisions are not the only applications of differential analysis, they represent typical short-term business decisions using differential analysis. Our discussion ignores income taxes.

When applying differential analysis to pricing decisions, each possible price for a given product represents an alternative course of action. The sales revenues for each alternative and the costs that differ between alternatives are the relevant amounts in these decisions. Total fixed costs often remain the same between pricing alternatives and, if so, may be ignored. In selecting a price for a product, the goal is to select the price at which total future revenues exceed total future costs by the greatest amount, thus maximizing income.

A high price is not necessarily the price that maximizes income. The product may have many substitutes. If a company sets a high price, the number of units sold may decline substantially as customers switch to lower-priced competitive products. Thus, in the maximization of income, the expected volume of sales at each price is as important as the contribution margin per unit of product sold. In making any pricing decision, management should seek the combination of price and volume that produces the largest total contribution margin. This combination is often difficult to identify in an actual situation because management may have to estimate the number of units that can be sold at each price.

For example, assume that a company selling fried chicken in the New York market estimates product demand for its large bucket of chicken for a particular period to be:

Choice	Demand
1	15,000 units at \$6 per unit
2	12,000 units at \$7 per unit
3	10,000 units at \$8 per unit
4	7,000 units at \$9 per unit

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The company's fixed costs of USD 20,000 per year are not affected by the different volume alternatives. Variable costs are USD 5 per unit. What price should be set for the product? Based on the calculations shown in the table below, the company should select a price of USD 8 per unit because choice (3) results in the greatest total contribution margin. In the short run, maximizing total contribution margin maximizes profits.

Choice	Contribution margin per unit*	Number of units	=	Total margin	Fixed costs	Net income (loss)
1	\$1	15,000		\$15,000	\$20,000	\$(5,000)
2	2	12,000		24,000	20,000	4,000
3	3	10,000		30,000	20,000	10,000
4	4	7,000		28,000	20,000	8,000

\*Sales price  
– Variable cost.

Sometimes management has an opportunity to sell its product in two or more markets at two or more different prices. Movie theaters, for example, sell tickets at discount prices to particular groups of people—children, students, and senior citizens. Differential analysis can determine whether companies should sell their products at prices below regular levels.

Good business management requires keeping the cost of idleness at a minimum. When operating at less than full capacity, management should seek additional business. Management may decide to accept such additional business at prices lower than average unit costs if the differential revenues from the additional business exceed the differential costs. By accepting special orders at a discount, businesses can keep people employed that they would otherwise lay off.

To illustrate, assume Rios Company produces and sells a single product with a variable cost of USD 8 per unit. (See Exhibit 27 for details.) Annual capacity is 10,000 units, and annual fixed costs total USD 48,000. The selling price is USD 20 per unit and production and sales are budgeted at 5,000 units. Thus, budgeted income before income taxes is USD 12,000, as shown in Exhibit 27.

<b>Rios company</b>		
<b>Income statement</b>		
<b>For the period ending 2011</b>		
<b>May 31</b>		
Revenue (5,000 units at \$20)		\$100,000
Variable costs:		
Direct materials cost	\$20,000	
Labor	5,000	
Overhead	10,000	
Marketing and administrative costs	5,000	
Total variable costs (\$8 per unit)	\$40,000	
Fixed costs:		
Overhead	\$28,000	
Marketing and administrative costs	20,000	
Total fixed costs	48,000	
Total costs (\$17.60 per unit)	88,000	
Net income		\$12,000

Exhibit 27: Rios company before special order

Assume the company receives an order from a foreign distributor for 3,000 units at USD 10 per unit. This USD 10 price is not only half of the regular selling price per unit, but also less than the USD 17.60 average cost per unit (USD 88,000/5,000 units). However, the USD 10 price offered exceeds the variable cost per unit by USD 2. If the company accepts the order, net income increases to USD 18,000.

As shown in the income statement in Exhibit 28, revenue increases to USD 130,000 with the special order. Each of the variable costs increases in total by 60 per cent because total volume increases by 60 per cent (3,000 units in the special order/5,000 units regularly produced).

**Rios company**  
**Income statement**  
**For the period ending 2011 May**  
**31**

Revenue (5,000 units at \$20, 3,000 units at \$10)		\$130,000
Variable costs:		
Direct materials cost	\$32,000	
Labor	8,000	
Overhead	16,000	
Marketing and administrative costs	8,000	
Total variable costs (\$8 per unit)	\$64,000	
Fixed costs:		
Manufacturing overhead	\$28,000	
Marketing and administrative costs	20,000	
Total fixed costs	48,000	
Total costs (\$14 per unit)		112,000
Net income		\$18,000

Exhibit 28: Rios company if special order is accepted

Note that the fixed costs do not increase with the special order. Because the special order does not increase the fixed costs, the special order's revenues need only cover its variable costs.

If Rios Company continues to operate at 50 per cent capacity (producing 5,000 units) it would generate income of only USD 12,000. By accepting the special order, net income increases by USD 6,000.

Differential analysis would provide the following calculations:

	<b>Accept order</b>	<b>Reject order</b>	<b>Differential</b>
Revenues	\$130,000	\$100,000	\$30,000
Costs	112,000	88,000	24,000
Net benefit of accepting order			\$6,000

Variable costs set a floor for the selling price in special-order situations. Even if the price exceeds variable costs only slightly, the additional business increases net income, assuming fixed costs do not change. However, pricing just above variable costs of special-order business often brings only short-term increases in net income. In the long run, companies must cover all of their costs, not just the variable costs.

Periodically, management has to decide whether to add or eliminate certain products, segments, or customers. If you have watched a store or a plant open or close in your area, you have seen the results of these decisions. Differential analysis is useful in this decision making because a company's income statement does not automatically associate costs with certain products, segments, or customers. Thus, companies must reclassify costs as those that the action would change and those that it would not change.

If companies add or eliminate products, they usually increase or decrease variable costs. The fixed costs may change, but not in many cases. Management bases decisions to add or eliminate products only on the differential items; that is, the costs and revenues that change.

To illustrate, assume that the Campus Bookstore is considering eliminating its art supplies department. If the bookstore dropped the art supplies department, it would lose revenues of USD 100,000 annually. The bookstore's management assigns costs of USD 110,000 (USD 80,000 variable and USD 30,000 fixed) to the art supplies

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department. Therefore, art supplies has an apparent annual loss of USD 10,000 (USD 100,000 revenue minus USD 110,000 costs). But careful cost analysis reveals that if the art supplies department were dropped, the reduction in costs would be only USD 80,000. The USD 30,000 fixed costs were general bookstore fixed costs allocated to the art supplies department. These fixed costs would continue to be incurred and would not be saved by closing the art supplies department. Look at the differential analysis in Exhibit 29. Note that the art supplies department has been contributing USD 20,000 (USD 100,000 revenues - USD 80,000 variable costs) annually toward covering the fixed costs of the business. Consequently, its elimination could be a costly mistake unless there is a more profitable use for the vacated facilities.

	<b>Art Supplies Keep</b>	<b>Department Close</b>	<b>Differential</b>
Revenues	\$100,000	\$-0-	\$100,000
Variable costs	80,000	-0-	80,000
Fixed costs	30,000	30,000	-0-
Net benefit of keeping art supplies department			\$ 20,000

Exhibit 29: Differential analysis: Decision whether to close a department

If the company has a profitable alternative use for the vacated facilities, the potential income from that alternative represents an opportunity cost of retaining the product, segment, or customer. Assume, for example, that the bookstore could use the facilities currently occupied by the art supplies department to open a new department to display and sell personal computers, printers, and software. This new department would contribute USD 35,000 to the bookstore's income.

The relevant costs in the decision to retain the art supplies department are USD 115,000 (USD 80,000 of variable manufacturing costs and USD 35,000 of opportunity cost), while the relevant revenues are still USD 100,000. Therefore, the bookstore has a net disadvantage in keeping the art supplies department because it loses USD 15,000 compared to the computer department.

Sometimes two or more products result from a common raw material or production process; these products are called **joint products**. Companies can process these products further or sell them in their current condition. For instance, when Chevron refines crude oil, it produces a wide variety of fuels, solvents, lubricants, and residual petrochemicals.

Management can use differential analysis to decide whether to process a joint product further or to sell it in its present condition. **Joint costs** are those costs incurred up to the point where the joint products split off from each other. These costs are sunk costs and are not considered when deciding whether to process a joint product further before selling it or to sell it in its condition at the split-off point.

The following example illustrates the issue of whether to process or sell joint products. Assume that Pacific Paper, Inc., produces two paper products, A and B, from a common manufacturing process. Each of the products could either be sold in its present form or processed further and sold at a higher price. Data for both products follow:

<b>Product</b>	<b>Selling price per unit at split-off point</b>	<b>Cost per unit of further processing</b>	<b>Selling price per unit after further processing</b>
A	\$10	\$6	\$21
B	12	7	18

The differential revenues and costs of further processing of the two products are as follows:

Product	Different revenue of further processing	Differential cost of further processing	Net advantage (disadvantage) of further processing
A	\$11	\$6	\$5
B	6	7	(1)

Based on this analysis, Pacific Paper should process product A further to increase income by USD 5 per unit sold. The company should not process product B further because that would decrease income by USD 1 per unit sold.

Companies use this same form of differential analysis to decide whether they should discard their by-products or process them further. **By-products** are additional products resulting from the production of a main product and generally have a small market value compared to the main product. Sometimes companies consider by-products to be waste materials. For example, the bark from trees cut into lumber is a by-product of lumber production. Although a by-product, companies convert this bark into fuel or landscaping material. When the differential revenue of further processing exceeds the differential cost, firms should do further processing. As concerns increase about the effects of waste on the environment, companies find more and more waste materials that can be converted into by-products.

Managers also apply differential analysis to make-or-buy decisions. A **make-or-buy decision** occurs when management must decide whether to make or purchase a part or material used in manufacturing another product. Management must compare the price paid for a part with the additional costs incurred to manufacture the part. When most of the manufacturing costs are fixed and would exist in any case, it is likely to be more economical to make the part rather than buy it.

To illustrate the application of differential analysis to make-or-buy decisions, assume that Small Motor Company manufactures a part costing USD 6 for use in its toy automobile engines. Cost components are: materials, USD 3.00; labor, USD 1.50; fixed overhead costs, USD 1.05; and variable overhead costs, USD 0.45. Small could purchase the part for USD 5.25. Fixed overhead would presumably continue even if the part were purchased. The added costs of manufacturing amount to only USD 4.95 (USD 3.00 + USD 1.50 + USD 0.45). This amount is 30 cents per unit less than the purchase price of the part. Therefore, manufacturing the part should be continued as shown in the following analysis:

	Make	Buy	Differential
Costs	\$4.95	\$5.25	\$0.30
Net advantage of making			\$0.30

In make-or-buy decisions, management also should consider the opportunity cost of not utilizing the space for some other purpose. In the previous example, if the opportunity costs of not using this space in its best alternative use is more than 30 cents per unit times the number of units produced, the part should be purchased.

In some manufacturing situations, firms avoid a portion of fixed costs by buying from an outside source. For example, suppose eliminating a part would reduce production so that a supervisor's salary could be saved. In such a situation, firms should treat these fixed costs the same as variable costs in the analysis because they would be relevant costs.

Sometimes the cost to manufacture may be only slightly less than the cost of purchasing the part or material. Then management should place considerable weight on other factors such as the competency of existing personnel

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to undertake manufacturing the part or material, the availability of working capital, and the cost of any loans that may be necessary.

### Applying differential analysis to quality

High quality is essential to success in a competitive environment. Therefore, companies use differential analysis to make decisions about the quality of their products.

Assume Erie Waters produces bottled water. The variable cost of a case (12 one-liter bottles) is as follows:

Water and bottles	\$2.00
Inspection and rework costs	1.00
All other variable costs	3.00
Total variable cost per case	\$6.00

In addition, the company has USD 150,000 of fixed costs per year.

The company inspects the product at various stages. When inspectors find the water is below standard or the bottles have defects, production workers replace the water and/or the bottles. The cost of inspecting the product and replacing water and/or bottles averages USD 1.00 per case, and is shown as inspection and rework costs.

Management of Erie Waters is concerned about product quality. Despite the inspection just noted, management has learned that dissatisfied customers are switching to competitive products. Management is considering purchasing a high-quality water product. This product would increase water and bottle costs to USD 2.50 per case while decreasing inspection and rework costs to USD .40 per case. All other variable costs would remain at USD 3.00 per case. Erie Waters would sell this water for USD 8.00 per case. If the high-quality water is purchased, Erie Waters expects to sell 100,000 cases of water this year at USD 8.00 per case. If Erie continues to use the current low-quality water, the company expects to sell 90,000 cases of water this year at USD 8.00 per case. Fixed costs are USD 150,000 per year whether the company buys high-quality water or low-quality water. Should Erie Waters buy the high-quality water? We compare the two alternatives in Exhibit 30.

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### An accounting perspective:

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### Business insight

The 1950s through 1970s were boom periods for manufacturing companies in the United States. As one of the few industrial countries left intact after World War II, the United States had little competition from manufacturers in other countries. But, countries such as Japan, Taiwan and Korea made a comeback and dominated in steel, automobiles, and electronics.

By the end of the 20th century, US industry realized that without a substantial improvement in quality, it could not compete in worldwide markets.

	<b>Low-quality water (90,000 cases)</b>	<b>High-quality water (100,000 cases)</b>
Revenue at \$8.00 per case	\$ 720,000	\$ 800,000
Water and bottles at \$2.00 per case for low quality and \$2.50 per case for high quality	(180,000)	(250,000)
Inspection and rework at \$1.00 per case for low quality and \$0.40 per case for high quality	(90,000)	(40,000)
All other variable costs at \$3.00 per case	(270,000)	(300,000)
Fixed costs	(150,000)	(150,000)
Net income	\$ 30,000	\$ 60,000

### Exhibit 30: Decision whether to improve quality

Erie Waters should purchase the high-quality water because it increases net income from USD 30,000 to USD 60,000 per year. In addition, a high-quality product improves the company's prospects for maintaining or even increasing its market share in years to come. Many companies have learned the hard way that letting quality slip creates a bad reputation that is hard to overcome.

The focus of this chapter has been short-term decision making. Part of decision making involves planning through the use of budgets. The topic of Chapter 23 is budgeting—an important tool for company management.

### Understanding the learning objectives

- The contribution margin format separates fixed costs from variable costs; the traditional method does not.
- The contribution margin format reports contribution margin; the traditional method reports gross margin.

In a manufacturing company:

(a) Contribution margin = Revenue - Variable manufacturing costs - Variable nonmanufacturing costs

(b) Gross margin = Revenue - Cost of goods sold (where cost of goods sold equals Variable manufacturing cost of goods sold + Fixed manufacturing cost of goods sold)

- Differential analysis involves analyzing the different costs and benefits that would arise from alternative solutions to a particular situation.
- The components are: (1) differential revenue, the difference in revenue between two alternatives; and (2) differential cost or expense, the difference between relevant costs for two alternatives.
- In selecting a price for a product, the goal is to select the price at which total future revenues exceed total future variable costs by the greatest amount or, in other words, the price that results in the greatest total contribution margin.

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### A broader perspective: Differential analysis in sports

When the major sports teams acquire stars, many observers think the price is too high. By using differential analysis, the teams figure that the acquisition will be profitable for the club based on the increased ticket sales and other revenues that would follow the acquisition.

When the a major league baseball team acquires an expensive super-star many people in the baseball world wonder if it is a wise financial decision. In many cases, the team becomes a pennant contender after the acquisition, and attendance at their games increases dramatically compared to the previous year. The differential costs of acquiring the super-star appears to have been justified.

Sports teams routinely face make-or-buy decisions concerning their players. Some teams, such as the New York Yankees, have extensive farm systems. They usually develop players by bringing them up through the system. Teams also buy players by waiting until young players have proven themselves with other teams, then acquiring them. Variable costs set a floor for the selling price in cost analyses. Such pricing should be appraised concerning their long-range effects on company and industry price structures. In the long run, full costs must be covered.

- Costs must be reclassified as those that would be changed by the elimination and those that would not. In effect, one must simply assume elimination and compare the reduction in revenues with the eliminated costs.
- Joint costs are those costs incurred up to the point where the joint products split off from each other. These costs are sunk costs in deciding whether to process a joint product further before selling it or to sell it in its condition at the split-off point.
- A make-or-buy decision concerns whether to manufacture or purchase a part or material used in manufacturing of another product. The price that would be paid for the part if it were purchased is compared with the additional costs that would be incurred if the part were manufactured.
- High quality is essential to success in a competitive environment. Therefore, companies use differential analysis to make decisions about the quality of their products.

#### Demonstration problem

National Express, an international delivery service, is considering eliminating operations in Eastern Europe. If the company dropped the East European market, it would lose revenues of USD 1,000,000 annually. Management assigns costs of USD 1,200,000 (USD 800,000 variable and USD 400,000 fixed) to the East European market. Therefore, the East European market has an apparent annual loss of USD 200,000 per year (USD 1,000,000 revenue minus USD 1,200,000 costs). Careful cost analysis reveals that if East European operations were dropped, the reduction in costs would be only USD 800,000 of variable and USD 250,000 of fixed costs. The remaining USD 150,000 of fixed costs were general fixed costs the company allocated to the East European market. These costs would continue to be incurred and would not be saved by shutting down the East European market.

### Solution to demonstration problem

The differential analysis for National Express's analysis of its East European operations is as follows:

	<b>East European Operations Keep</b>	<b>Eliminate</b>	<b>Differential</b>
Revenues	\$1,000,000	\$ -0-	\$1,000,000
Variable costs	800,000	-0-	800,000
Fixed costs	400,000	150,000	250,000
Net advantage of keeping East European operations open			\$ (50,000)

Elimination of the East European market is justified according to this analysis. By eliminating this market, National Express would reduce revenues by USD 1,000,000 and would reduce costs by USD 1,500,000 (USD 800,000 + USD 250,000), resulting in a USD 50,000 benefit of closing the operations (or a USD 50,000 differential loss by keeping the operations open).

### Key terms\*

**By-products** Additional products resulting from the production of a main product. By-products generally have a small market value compared to the main product.

**Committed fixed costs** Costs relating to the basic facilities and organizational structure that a company must have to continue operations.

**Differential analysis** An analysis of the different costs and benefits that would arise from alternative solutions to a particular problem.

**Differential cost or expense** The difference between the amounts of relevant costs for two alternatives.

**Differential revenue** The difference between the amounts of relevant revenues for two alternatives.

**Discretionary fixed costs** Fixed costs subject to management control from year to year; an example is advertising expense.

**Joint costs** Those production costs incurred up to the point where the joint products split off from each other.

**Joint products** Two or more products resulting from a common raw material or production process.

**Make-or-buy decision** A decision concerning whether to manufacture or purchase a part or material used in manufacturing another product.

**Opportunity cost** The potential benefit that is forgone from not following the next best alternative course of action.

**Relevant revenues or costs** Revenues or costs that will differ in the future depending on which alternative course of action is selected.

**Sunk costs** Past costs that are not relevant in decision making because they have already been incurred.

\*Some terms listed in earlier chapters are repeated here for your convenience.

### Self-test

#### True-false

Indicate whether each of the following statements is true or false.

Opportunity costs are recorded in the accounting records because they are the costs of not following a certain alternative.

Only variable costs can be differential costs.

Contribution margin is often more valuable to management than gross margin when making decisions.

It is important to estimate sunk costs for decision making.

## 22. Short-term decision making: Differential analysis

The decision whether to sell at the split-off point or process further is one that a petroleum company might make.

A restaurant's chef must decide whether to make soup from dry soup mix purchased at a store or to make the soup from scratch using vegetables, meats, and pasta. This decision is an example of a make-or-buy decision.

### Multiple choice

Select the best answer for each of the following questions.

Differential analysis is best described by which of the following statements:

- a. Determines only the difference in revenues between two alternatives.
- b. Analyzes opportunity costs.
- c. Determines only the difference between relevant costs for two alternatives.
- d. Analyzes future revenues and costs that differ depending on the course of action selected.

In selecting a price for a product using differential analysis, which of the following decisions should be made?

- a. The highest price should always be selected.
- b. The price that will result in the greatest total contribution margin, assuming fixed costs are the same for each price-quantity combination, should be selected.
- c. Total future revenues should exceed total future variable and fixed costs.
- d. All of the above.

Which of the following decisions involve differential analysis?

- a. The decision to close a segment of a business.
- b. The decision by a record store to add videotapes to its product line.
- c. The decision by a university to drop its intercollegiate football program.
- d. All of the above.

Assume Mikey Shoe Company is considering making special shoes just for Olympic athletes. In making this decision, how would you categorize the salary of the president of Mikey?

- a. Differential variable cost.
- b. Differential revenue.
- c. Discretionary fixed cost.
- d. Committed fixed cost.

Now turn to “Answer to self-test” at the end of the chapter to check your answers.

### Questions

- Identify types of decisions that can be made using differential analysis.

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- What is a committed fixed cost? Give some examples.
- What is a discretionary fixed cost? Give some examples.
- Give an example of a fixed cost that might be considered committed for one company and discretionary for another.
- What is the disadvantage of a company having all committed fixed costs? Explain.
- What is an opportunity cost? Give some examples.
- What essential feature distinguishes the contribution margin income statement from the traditional income statement?
- **Real world question** Give an example of a make-or-buy decision that you have made or someone you know has made.
- **Real world question** Give an example in which your campus bookstore replaces one of its departments with another it currently does not have. (For example, it stops selling magazines and starts selling cameras.) What revenues and costs would be differential?
- **Real world question** Assume that McDonald's, of McDonald's fast-food restaurants, currently buys its french fries from agricultural growers and food processors. In doing so, McDonald's has decided to buy the materials for its french fries instead of "make" them. (Assume that making french fries includes growing the potatoes.) What factors would go into McDonald's decision to buy instead of make french fries?
- **Real world question** Suppose that Wal-Mart, one of the fastest growing companies in the world, were to close one of its stores. Which differential revenues and costs would be affected by that decision?

## Exercises

**Exercise A** The following data are for Paso Robles Company for the year ended 2009 December 31:

Costs:	
Direct material	\$ 90,000
Direct labor	130,000
Manufacturing overhead:	
Variable	45,000
Fixed	90,000
Sales commissions (variable)	25,000
Sales salaries (fixed)	20,000
Administrative expenses (fixed)	35,000
Selling price per unit	\$ 10
Units produced and sold	60,000

Assume direct materials and direct labor are variable costs. Prepare a contribution margin income statement and a traditional income statement.

**Exercise B** Assume you had invested USD 1,000 in a lawn mower to set up a lawn mowing business for the summer. During the first week, you could choose either to mow the grounds at a housing development for USD 1,400 or to help paint a garage for USD 1,360. Each job would take one week. You cannot do both. You would incur additional costs of USD 160 for lawn mowing and USD 80 for garage painting. These costs include USD 60 under

## 22. Short-term decision making: Differential analysis

each alternative for transportation to the job. Prepare a schedule showing the net benefit or advantage of selecting one alternative over the other.

**Exercise C** The marketing department of Specialty Coffees estimates the following monthly demand for espresso in these four price-quantity relationships:

	<b>Demand</b>
1	9,000 cups at \$1.00 per cup
2	8,000 cups at \$1.25 per cup
3	6,000 cups at \$1.50 per cup
4	4,000 cups at \$1.75 per cup

The fixed costs of USD 3,000 per month are not affected by the different price-volume alternatives. Variable costs are USD 0.25 per cup. What price should Specialty Coffees set for espresso?

**Exercise D** Viking Corporation is operating at 80 per cent of capacity, which means it produces 8,000 units. Variable cost is USD 100 per unit. Wholesaler Y offers to buy 2,000 additional units at USD 120 per unit. Wholesaler Z proposes to buy 1,500 additional units at USD 140 per unit. Which offer, if either, should Viking Corporation accept? Fixed costs are not affected by accepting either offer.

**Exercise E** Analysis of Hair Care Company's citrus hair conditioner reveals that it is losing USD 5,000 annually. The company sells 5,000 units of citrus hair conditioner each year at USD 10 per unit. Variable costs are USD 6 per unit. None of the company's fixed costs would be saved if the citrus hair conditioner were eliminated. What would be the increase or decrease in company net income if citrus hair condition were eliminated?

**Exercise F** The luggage department of Sampson Company has revenues of USD 1,000,000; variable expenses of USD 250,000; direct fixed costs of USD 500,000; and allocated, indirect fixed costs of USD 300,000 in an average year. If the company eliminates this department, what would be the effect on net income?

**Exercise G** Raiders Company manufactures two joint products. At the split-off point, they have sales values of:

Product 1	\$18 per unit
Product 2	12 per unit

After further processing, the company can sell them for USD 36 and USD 16, respectively. Product 1 costs USD 12 per unit to process further and Product 2 costs USD 8 to process further. Should further processing be done on either or both of these products? Why or why not?

**Exercise H** Gopherit Corporation currently is manufacturing 40,000 units per year of a part used in its final product. The cost of producing this part is USD 50 per unit. The variable portion of this cost consists of direct materials of USD 25, direct labor of USD 15, and variable manufacturing overhead of USD 3. The company could earn USD 100,000 per year from the space now used to manufacture this part. Assuming equal quality and availability, what is the maximum price per unit that Gopherit Corporation should pay to buy the part rather than make it? (The total fixed costs would not be affected by this decision.)

**Exercise I** Ortez Company buys strawberries and produces strawberry jam. The variable cost of a case of strawberry jam is as follows:

Materials (strawberries and jars)	\$10.00
Inspection and rework costs	4.00
All other variable costs	8.00
Total variable cost per case	\$22.00

In addition, the company has USD 1,000,000 of fixed costs per year.

The company inspects the product at various stages. The cost of inspecting the product and replacing jam and/or jars averages USD 4.00 per case, shown as in the inspection and rework costs.

Management is considering purchasing high-quality strawberries. This would increase materials costs to USD 12.00 per case, while decreasing inspection and rework costs to USD 2.00 per case. All other costs would remain at USD 8.00 per case for variable costs and USD 1,000,000 for fixed costs whether or not the high-quality strawberries were purchased. Ortez's jam sells for USD 40 per case. If the high-quality strawberries were purchased, the company could sell 100,000 cases of jam this year at USD 40 per case. If the company continued to use the current low-quality berries, it could sell 80,000 cases of jam this year at USD 40 per case.

Should Ortez purchase the high-quality strawberries?

### Problems

**Problem A** Montonya Company has the following selected data for the current year:

Sales (10,000 units)	\$90,000
Direct materials	30,000
Direct labor costs	10,000
Variable manufacturing overhead	3,500
Fixed manufacturing overhead	7,500
Variable selling and administrative expenses	2,500
Fixed selling and administrative expenses	15,000

The company produced and sold 10,000 units. Direct materials and direct labor are variable costs.

- Prepare an income statement for the current year using the contribution margin format.
- Prepare an income statement for the current year using the traditional format.
- What additional information do you learn from the contribution margin format?

**Problem B** Pick-Me-Up Company is introducing a new coffee in its stores and must decide what price to set for the coffee beans. An estimated demand schedule for the product follows:

Price	One-pound units demanded
\$ 5	80,000
6	72,000
7	56,000
8	48,000
9	36,000
10	30,000

Estimated costs follow:

Variable manufacturing costs	\$2 per unit
Fixed manufacturing costs	\$40,000 per year
Variable selling and administrative costs	\$1 per unit
Fixed selling and administrative costs	\$20,000 per year

- Prepare a schedule showing management the total revenue, total cost, and total profit or loss for each selling price.
- Which price do you recommend to the management of Pick-Me-Up? Explain your answer.

**Problem C** Ocean View Company operates tour boats. Its predicted operations for the year are as follows:

Sales (1,000 tours per year)	\$400,000
Costs:	

## 22. Short-term decision making: Differential analysis

Variable	\$250 per tour
Fixed	\$100,000 per year

The company has received a request to offer 100 tours for USD 300 each. Ocean View has plenty of capacity to do these tours in addition to its regular business. Doing these tours would not affect the company's regular sales or its fixed costs.

- Should the company do the special tours for USD 300 per tour?
- What is the effect of the decision on the company's operating profit?

**Problem D** Following are sales and other operating data for the three products made and sold by Ranger Company:

	Product			
	A	B	C	Total
Sales	\$ 600,000	\$ 300,000	\$ 200,000	\$ 1,100,000
Manufacturing costs:				
Fixed	\$ 60,000	\$ 20,000	\$ 60,000	\$ 140,000
Variable	280,000	220,000	100,000	600,000
Selling and administrative expenses:				
Fixed	20,000	20,000	12,000	52,000
Variable	40,000	20,000	30,000	90,000
Total costs	\$ 400,000	\$ 280,000	\$ 202,000	\$ 882,000
Net income	\$ 200,000	\$ 20,000	\$ (2,000)	\$ 218,000

In view of the net loss for Product C, Ranger's management is considering dropping that product. All variable costs are direct costs and would be eliminated if Product C were dropped. Fixed costs are indirect costs; no fixed costs would be eliminated. Assume that the space used to produce Product C would be left idle.

Would you recommend the elimination of Product C? Give supporting computations.

**Problem E** Sierra Lumber Company produces lumber. The company has two grades of lumber at the split-off point, A and B. Grade A sells for USD 4 per board foot and Grade B sells for USD 2 per board foot. This lumber is suitable for framing and most exterior work but not for the interior of buildings. Either grade can be further processed to make it suitable for interior work at a cost of USD 1.20 per board foot. After this further processing, the firm can sell Grade A lumber for USD 5.50 per board foot and Grade B for USD 3.00 per board foot.

Would you recommend the company sell the lumber at the split-off point or process it further to make it suitable for interior work? Explain and give supporting computations.

**Problem F** Skate-Right Company, a skateboard manufacturer, is currently operating at 60 per cent capacity and producing about 8,000 units a year. To use more capacity, the manager has been considering the research and development department's suggestion that the company manufacture its own wheels.

Currently the company purchases wheels from a supplier at a unit price of USD 20. (Each unit is a set of wheels for a skateboard.) Estimates show the company can manufacture its own wheels at USD 10 for direct materials costs and USD 4 for direct labor cost per unit. The variable factory overhead is USD 1 per unit. The company's accountants would probably allocate another USD 6 per unit to the wheels.

- Should Skate-Right make or buy the wheels?

b. Suppose Skate-Right could rent out the factory space needed to make the wheels for USD 30,000 a month. How would this affect your decision in (a), if at all?

**Problem G** Quality Calc, Inc., purchases calculator components and assembles them into handheld calculators. The variable cost of one Model A-25 is as follows:

Materials	\$10
Inspection and rework costs	2
All other variable costs	5
Total variable cost per case	\$17

In addition, this product incurs USD 5,000,000 of fixed costs per year.

The company inspects the product at various stages. The cost of inspecting the product and replacing components averages USD 2 per calculator, shown as the inspection and rework costs.

Management is considering purchasing better components that would both increase quality and expand the calculator's capacity. These new components would increase materials costs to USD 12.50 per calculator, but would decrease inspection and rework costs to USD 1.50 per calculator. All other variables cost would remain at USD 5 per calculator. Fixed costs would remain at USD 5,000,000 per year.

Quality Calc currently sells each A-25 calculator for USD 25 at a volume of 1 million calculators per year. Management believes it can increase the price of the calculator (which would now be called the A-25 STAR) to USD 30 per calculator because of its increased capability. Sales volume would remain at 1 million calculators per year for the improved A-25 STAR. Should Quality Calc purchase the better components?

#### Alternate problems

**Alternate problem A** The following data are for Nets Company for the current year:

Sales (20,000 units)	\$750,000
Direct materials	270,000
Direct labor cost	90,000
Variable manufacturing overhead	27,000
Fixed manufacturing overhead	36,000
Variable selling and administrative expenses	45,000
Fixed selling and administrative expenses	150,000

The company produced and sold 20,000 units.

- Prepare an income statement for the current year using the contribution margin format.
- Prepare an income statement for the current year using the traditional format.
- What additional information does the contribution margin format provide compared to the traditional format?

**Alternate problem B** The Havana Company is introducing a new product and must decide its price. An estimated demand schedule for the product is as follows:

Price	Units demanded
\$ 5	20,000
6	18,000
7	14,000
8	12,000
9	9,000
10	8,000

Estimated costs are as follows:

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Variable manufacturing costs	\$2.20 per unit
Fixed manufacturing costs	\$20,000 per year
Variable selling and administrative costs	\$1.00 per unit
Fixed selling and administrative costs	\$5,000 per year

- Prepare a schedule showing the total revenue, total cost, and total profit or loss for each selling price.
- Which price should Havana select? Explain.

**Alternate problem C** Following are sales and other operating data for the three products made and sold by Marine Enterprises:

	Product			Total
	A	B	C	
Sales	\$150,000	\$90,000	\$240,000	\$480,000
Manufacturing costs:				
Fixed	\$ 15,000	\$25,000	\$ 30,000	\$ 70,000
Variable	120,000	35,000	134,000	289,000
Selling and administrative expenses:				
Fixed	5,000	30,000	10,000	45,000
Variable	2,500	5,000	6,000	13,500
Total costs	\$142,500	\$95,000	\$180,000	\$417,500
Net income (loss)	\$ 7,500	\$(5,000)	\$ 60,000	\$ 62,500

In view of the net loss shown for Product B, company management is considering dropping that product. All variable costs are direct costs and would be eliminated if Product B were dropped; all fixed costs are indirect costs and would not be eliminated. Assume that the space used to produce Product B would be left idle.

Would you recommend the elimination of Product B? Give supporting computations.

**Alternate problem D** Sailboard Enterprises, a wind sailing board manufacturer, is currently operating at 70 per cent capacity and producing about 20,000 units a year. To use more capacity, the manager has been considering the research and development department's suggestion that Sailboard manufacture its own sails. Currently Sailboard purchases sails from a supplier at a unit price of USD 100. Estimates show that Sailboard can manufacture its own sails for a USD 40 direct materials cost and a USD 32 direct labor cost per unit. The variable factory overhead is USD 8 per sail. The company's accountants would allocate fixed manufacturing overhead of USD 30 per sail to the sail production.

- Should Sailboard Enterprises make or buy the sails?
- Suppose that Sailboard Enterprises could rent out the part of the factory that would otherwise be used for sail manufacturing for USD 8,000 a month. How would this affect the decision in (a)?

**Alternate problem E** Cool-Snacks Company produces and sells ice cream for ice cream shops. Management is considering purchasing better ingredients. The variable cost of producing a gallon of ice cream is as follows:

Materials (cream, containers, etc.)	\$1.40
Inspection and replacement costs	.40
All other variable costs	.70
Total variable cost per gallon	\$2.50

In addition, the company has USD 1,000,000 of fixed costs per year.

The company inspects the product at various stages. The cost of inspecting the product and replacing ice cream averages USD 0.40 per gallon, shown as the inspection and replacement costs.

Management is considering purchasing high-quality ingredients, in particular, high-quality dairy products. These high-quality ingredients would increase materials costs to USD 1.80 per gallon, but would decrease inspection and replacement costs to USD 0.30 per gallon. All other costs would remain at USD 0.70 per gallon for variable costs and USD 1,000,000 for fixed costs whether or not the high-quality ingredients are purchased. If the high-quality ingredients are purchased, the company expects to sell 1,200,000 gallons of ice cream this year at USD 4 per gallon. If the company continues to use the current low-quality ingredients, the company expects to sell 1,000,000 gallons of ice cream at USD 3.50 per gallon. Should Cool-Snacks Company buy the high-quality ingredients for its ice cream?

### Beyond the numbers—Critical thinking

**Business decision case A** Prior to 2011, Starks Wholesalers Company had not kept department income statements. To achieve better management control, the company decided to install department-by-department accounts. At the end of 2011, the new accounts showed that although as a whole the business was profitable, the dry goods department had a substantial loss. The following income statement for the dry goods department reports on operations for 2011:

<b>Starks wholesalers company</b>		
<b>Dry goods department</b>		
<b>Partial income statement for 2011</b>		
Sales		\$1,200,000
Cost of goods sold		800,000
Gross margin		\$ 400,000
Costs:		
Payroll, direct labor, and supervision	\$120,000	
Commissions of sales staff <sup>a</sup>	60,000	
Rent <sup>b</sup>	40,000	
Insurance on inventory	20,000	
Depreciation <sup>c</sup>	80,000	
Administration and general office <sup>d</sup>	80,000	
Interest for inventory carrying costs <sup>e</sup>	10,000	
Total costs		410,000
Net income (loss)		\$ (10,000)

<sup>a</sup> All sales staff are compensated on straight commission on sales.

<sup>b</sup> Rent charged to departments on a square-foot basis. The company rents an entire building, and the dry goods department occupies 15% of the building.

<sup>c</sup> Depreciation is 8.5% of the cost of the departmental equipment.

<sup>d</sup> Allocated on basis of departmental sales as a fraction of total company sales.

<sup>e</sup> Based on average inventory quantity multiplied by the company's borrowing rate for three-month loans.

Analysis of these results has led management to suggest closing the dry goods department. Members of the management team agree that keeping the dry goods department is not essential to maintaining good customer relations and supporting the rest of the company's business. In other words, eliminating the dry goods department is expected to have no effect on the amount of business done by the other departments.

Prepare a written report recommending whether or not Starks should close the dry goods department. Explain why. State your assumptions.

**Business decision case B** After working for a software company for several years, Chris and Terry quit their jobs and set up their own consulting firm called C & T Software, Inc. Major customers include corporate, professional, and government organizations that are setting up information networks.

The cost per billable hour of service at the company's normal volume of 3,000 billable hours per month follows. (A billable hour is one hour billed to a client.)

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Average cost per hour billed to client:		
Variable labor – consultants		\$50
Variable overhead, including supplies and clerical support	20	
Fixed overhead, including allowance for unbilled hours	80	
		\$150
Marketing and administrative costs per billable hour (all fixed)	40	
Total hourly cost		\$190

Treat each of the following questions independently. Unless given otherwise, the regular fee per hour is USD 200.

a. How many hours must the firm bill per month to break even? (You may need to refer to Chapter 21 to answer this question.)

b. Market research estimates that a fee increase to USD 250 per hour would decrease monthly volume to 2,000 hours. The accounting department estimates that fixed overhead costs would be USD 120 per hour, while variable cost per hour would remain unchanged. What effect would a fee increase have on profits?

c. Assume C & T Software is operating at its normal volume of 3,000 hours per month. It has received a special request from one of its long-time customers to provide services on a special-order basis. Because of the long-term nature of the contract (four months) and the magnitude (1,000 hours per month), the customer believes a fee reduction is in order. C & T Software has a capacity limitation of 4,000 hours per month. Fixed costs would not change if the firm accepts the special order. What is the lowest fee C & T Software would be willing to charge?

**Business decision case C** Refer to "A broader perspective: Differential analysis in sports". In a memorandum to your instructor identify which costs and revenues you think would be differential for a sports team acquiring a major star like Bonds. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter.

**Group project D** In teams of two or three students, visit a local department store and imagine the types of costs that it would save if it closed a significant department (for example, the housewares department). List the types of costs that would be saved, but do not attempt to assign numbers to those costs. For example, would rent be saved? Would security be saved? What about taxes on inventories? Consider the effects of closing the department on the people who work there. As a team, write a memorandum describing the costs saved and the effects of closing a department in a local department store. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter.

**Group project E** A manager in your organization just received a special order at a price that is "below cost". The manager points to the document and says, "These are the kinds of orders that will get you in trouble. Every sale must bear its share of the full costs of running the business. If we sell below our full cost, we will be out of business in no time." In groups of two or three students, write a memorandum to your instructor stating whether you agree with this comment or not and explain why. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter.

**Group project F** Form a group of two or three students. Assume you are considering driving to a weekend resort for a quick break from school. What are the differential costs of operating your car for the drive? Write a

memorandum to your instructor addressing this question. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter.

#### Using the Internet—A view of the real world

Visit the website for Intel Corporation, a high technology manufacturing company.

<http://www.intel.com>

Go to the company's most recent financial statements and review the consolidated statement of income. Looking at the most recent year on the statement of income, assume 70 per cent of the cost of sales are variable costs and the remaining 30 per cent are fixed costs. Furthermore, assume all other costs and expenses (research and development, marketing, general and administrative, interest, taxes, etc.) are 60 per cent variable and 40 per cent fixed. Prepare an income statement using the contribution margin format. Be sure to submit a copy of Intel's consolidated statement of income with the contribution margin income statement.

Visit the following website for Wal-Mart, a retail company.

<http://www.walmart.com>

Go to the company's most recent financial statements and review the statement of income. Looking at the most recent year on the statement of income, assume 45 per cent of the cost of sales are variable costs and the remaining 55 per cent are fixed costs. Furthermore, assume all other costs and expenses (research and development, marketing, general and administrative, interest, taxes, etc.) are 30 per cent variable and 70 per cent fixed. Prepare an income statement using the contribution margin format. Be sure to submit a copy of Wal-Mart's income statement with the contribution margin income statement.

#### Answers to self-test

##### **True-false**

**False.** Opportunity costs are not recorded in the accounting records. However, opportunity costs are relevant costs in many decisions because they represent real sacrifices that come about because one alternative is chosen instead of another.

**False.** Fixed costs also can be differential costs. For example, the differential cost between operating at a production level of 40,000 units compared to 60,000 units might include increases in both variable and fixed costs.

**True.** The contribution margin is often more important to management because it is needed to calculate break-even points and make decisions.

**False.** Sunk costs are not relevant for decision making.

**True.** Petroleum companies make this decision; for example, they might decide whether to sell crude oil or refine it further into gasoline or other petroleum products.

**True.** A decision to make the soup from scratch is a make decision; deciding to make the soup from purchased mix is a buy decision.

##### **Multiple-choice**

**d.** Differential analysis estimates future revenues and costs that differ depending on the course of action.

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**b.** This is the best answer. Assuming fixed costs remain the same for each price-quantity combination, maximizing the total contribution margin maximizes net income. We did not choose (c) because it does not result in net income maximization, merely that net income be greater than zero.

**d.** All of these decisions involve differential analysis.

**d.** The president's salary would be a committed fixed cost. (Those who believe the salary should be a discretionary fixed cost have a good point.)