

# Chapter 6

## Decision Making in the Short Term

**CULINARY CREATIONS SPECIALIZES** in catering weddings, corporate outings, and dinner parties. As most of these events take place on weekends, Culinary is booked solid Friday through Sunday. Weekdays, however, are far less active than weekends, and Culinary often cannot generate enough business to keep the staff busy Monday through Thursday.

A charity organization has just called to ask whether Culinary Creations could cater its annual fundraising dinner. The charity would like to hold the dinner either on a Wednesday or on a Saturday. The charity expects 150 people to attend if the dinner is on Wednesday and 200 people if the dinner is on Saturday. Because it has a limited budget, the charity is willing to pay only \$26 per attendee, regardless of the day scheduled.

Culinary Creations' owner, Monica, wants you to handle the details of the deal. While Monica is willing to reduce her normal

### **APPLYING THE DECISION FRAMEWORK**

<b>What Is the Problem?</b>	Should Culinary Creations cater the charity's annual fundraising dinner?
<b>What Are the Options?</b>	Culinary Creations has three options: <ol style="list-style-type: none"><li>1. Do not cater the charity event.</li><li>2. Cater the charity event on Wednesday.</li><li>3. Cater the charity event on Saturday.</li></ol>
<b>What Are the Costs and Benefits?</b>	We will directly estimate the controllable costs and benefits of each option.
<b>Make the Decision!</b>	After estimating the controllable costs and benefits, we will be able to recommend the best option for Culinary Creations.

profit markup for charitable causes, she does not want to lose money on the event. She asks you to figure out whether Culinary should cater the event, and if so, on what day.



White Packert/Getty Images

*Culinary Cuisine is a well-regarded catering service. Its owner, Monica, is preparing a bid to cater a charity dinner.*

## LEARNING OBJECTIVES

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

- 1 Understand the factors that trigger short-term decisions.
- 2 Evaluate decision options using alternate approaches.
- 3 Solve short-term decisions such as make versus buy and special-order pricing.
- 4 Determine the best use of a resource in short supply.
- 5 Consider the qualitative and longer-term aspects of short-term decisions.

In Chapter 5, we learned that the Cost-Volume-Profit (CVP) relation is useful for understanding how revenues, costs, and profit vary as the volume of business varies. Organizations use the CVP relation for many purposes: planning profit over the short-term, measuring operating risk, and analyzing short-term decision problems. However, many short-term decisions deal with specific products, customer orders, or departments. In these cases, it often is more convenient to estimate the costs and benefits of decision options directly.

We begin this chapter by discussing the central feature of short-term decision problems. We then discuss ways in which to evaluate such decisions. We illustrate these approaches in the context of Culinary's decision as well as other typical short-term decisions, including make versus buy and product promotion. Finally, we discuss some of the qualitative and longer-term considerations that often play a role in short-term decisions.



## CHAPTER CONNECTIONS

*In Chapter 7, we discuss operating budgets, which bridge the gap between short-term planning and control. One important output from budgeting is an income statement, which shows the cumulative profit effect of numerous short-term decisions.*

## Characteristics of Short-Term Decisions

### LEARNING OBJECTIVE 1

Understand the factors that trigger short-term decisions.

Most short-term decisions deal with temporary gaps between the demand and supply of available capacity. These temporary gaps result because, in the short term, businesses have a fixed supply of capacity but confront changing demand.

### FIXED SUPPLY OF CAPACITY

**Capacity** is the maximum volume of activity that a company can sustain with available resources. The **Staples Center**, where the **Los Angeles Lakers** play basketball, has the capacity to seat 18,997 persons. Commercial printing presses, such as those used at the *Chicago Sun-Times*, can produce approximately 60,000 pages per hour. A primary-care physician has the capacity to see one patient every 10 to 15 minutes.

The decision of how much capacity to put in place is a long-term decision. Organizations make capacity decisions based on the expected volume of operations over a horizon often spanning many years. They build plants, buy equipment, rent office space, and hire salaried personnel in anticipation of the demand for their products and services. Once installed, however, it is not easy to change the capacity level. It takes time, effort, and money to build a new stadium, acquire and install a commercial printing press, or hire another doctor. These actions are not easily reversible. Consequently, in the short term, businesses must do the best with the capacity that they have when dealing with fluctuations in demand.

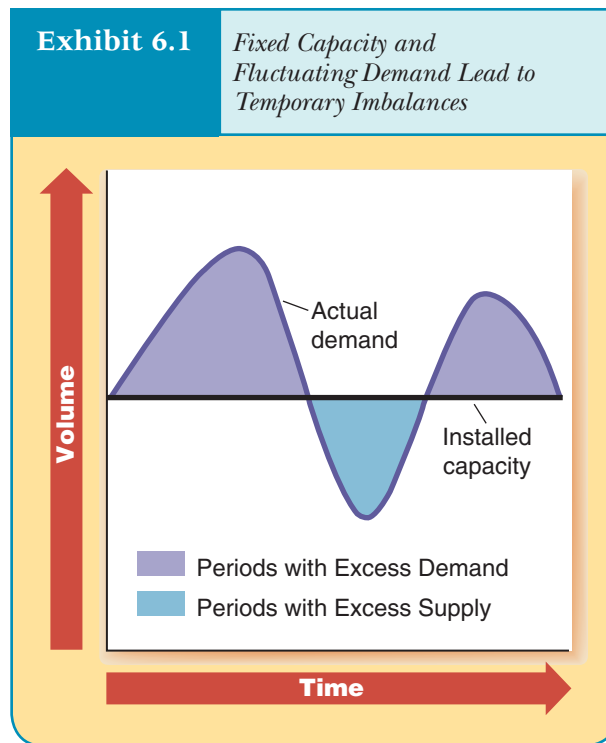
Monica has made several long-term decisions concerning Culinary Creations. For example, she considered whether she needed one, two, or three chefs to satisfy her expected long-term demand. She purchased kitchen equipment and signed a multiyear lease for the facility. Monica entered into such long-term cost commitments to provide Culinary Creations with the capacity to supply a certain level of catering service every day of the week.

### DEMAND CHANGES FREQUENTLY

Even though Culinary Creations has access to the same kitchen facilities each day of the week, most of the demand for catering service is during weekends. As a result, Culinary often does not utilize its capacity fully during weekdays. In contrast, demand exceeds supply on many weekends. Monica simply cannot accommodate all weekend business opportunities.

Exhibit 6.1 illustrates the unavoidable temporary imbalances between the demand and supply of organizational resources. This exhibit shows that we cannot change the supply of capacity in the short term and that demand varies. Sometimes demand exceeds available supply (i.e., there is **excess demand**), while at other times available supply exceeds demand (there is **excess capacity/excess supply**).

For example, **Radio City Music Hall** in New York City cannot accommodate all patrons wishing to see a popular new show even though the facility has 5,910 seats.



At other times, however, it has seats to spare. From **Radio City**'s standpoint, both situations are undesirable. The theater is foregoing profit in the first instance and has unused capacity in the second.

## CLOSING THE GAP BETWEEN DEMAND AND SUPPLY

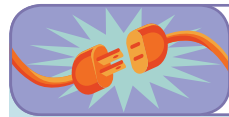
Effective managers anticipate the likelihood of such short-term gaps between supply and demand when planning for capacity. Monica knows that weekends are busier than weekdays for almost all caterers. It makes sense for her to work out an arrangement with her chefs so that they work long hours during weekends and lighter schedules during weekdays. Similarly, electric utilities such as **Ameren** have standby plants that they bring on-line only in times of peak demand. Most companies also manage demand by raising prices during such periods. Companies such as **Apple** and **Hewlett-Packard**, which sell PCs via retail outlets, anticipate demand spikes and buildup inventories. Firms such as **Toro Corporation** make snow throwers *and* lawn mowers in the same plant to deal with seasonal demand patterns for these products. Despite such adjustments, businesses can rarely match supply and demand exactly *all the time*. The core problem of having to deal with some excess capacity or some excess demand in the short term remains.

We can classify most short-term decisions into two broad categories.

- **Decisions that deal with excess supply.** Examples include reducing prices to stimulate demand, running special promotions, processing special orders, and using extra capacity to make some production inputs in-house (i.e., making parts versus purchasing them from an outside supplier).
- **Decisions that deal with excess demand.** Examples include increasing prices to take advantage of favorable demand conditions, meeting additional demand by outsourcing production, and altering the product mix to focus on the most profitable ones.



*Golf greens fees vary from season to season with demand.*  
(Eric Risberg/©AP/Wide World Photos)



## Connecting to Practice

### GOLF GREENS FEES

Golf courses have a limited capacity. With 18 holes and only so much daylight, courses can accommodate a limited number of patrons daily. In addition, the demand for golf frequently varies by the season, the day of the week, and the time of day. For example, in Myrtle Beach, South Carolina, the self-proclaimed “golf capital of the world,” demand is highest during the spring and fall seasons. Demand decreases during the summer and winter, when it is either too hot or too cold for many golfers. Because the number of courses in Myrtle Beach is fixed (currently, there are more than 100), greens fees, which influence demand, follow a similar pattern—rates are approximately 100% higher in the spring and fall than during the summer and winter.

In contrast, **Pebble Beach**, a world famous golf course located in California, experiences high demand throughout the year because the weather is California is usually suitable for golfing. As we would expect, its greens fees exhibit little variation over the year.

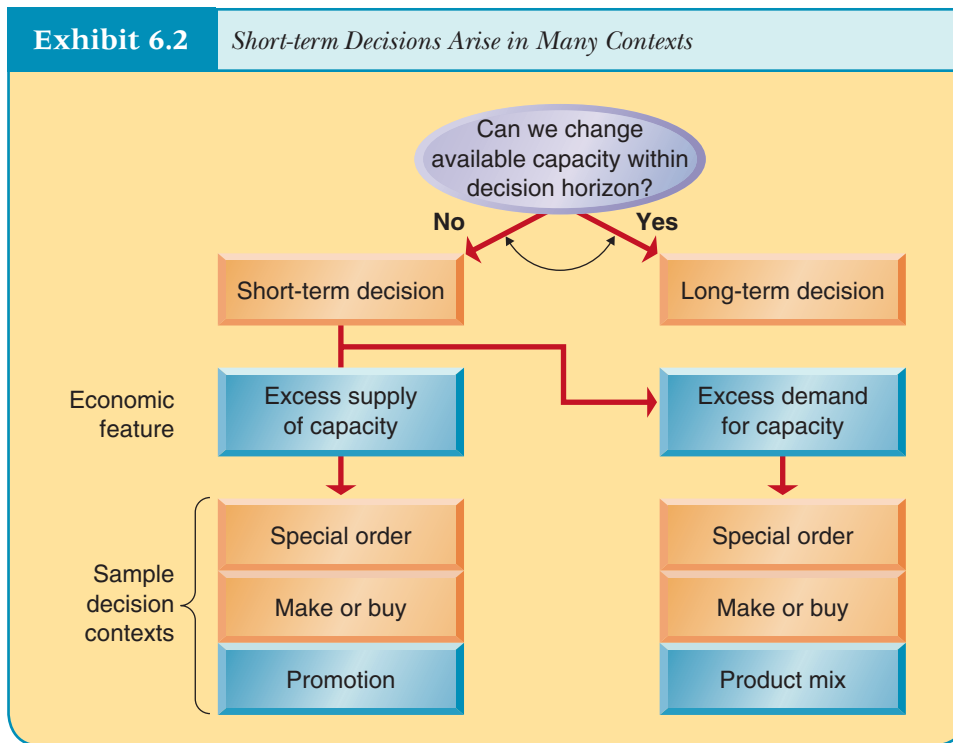
**COMMENTARY:** Similar to golf courses, hotels and airlines find it difficult to adjust available capacity. Their demand also is seasonal and varies daily. As we know, hotels and airlines routinely adjust their prices to match realized demand conditions. Airlines offer “last-minute specials” to stimulate demand and increase passenger load. Hotels in college towns charge premium rates during graduation weekend.

Recall from Chapter 2 that the opportunity cost of a decision option is the value of the next best option. The opportunity cost of *excess capacity* is zero because there is no other profitable use for it. Therefore, any use of this excess capacity that generates a positive contribution margin is worth considering. With *excess demand*, it becomes necessary to forego some profitable uses of available capacity. The opportunity cost of capacity is positive because we have to let go of some opportunity. In this case, the decision is one of which opportunities to let go.

As you go through this chapter, please keep in mind that most short-term decisions have longer-term implications. For example, a stellar catering job may not only result in a long-lasting relationship with the charity, but also lead to engagements with other charities or businesses. Because it is often difficult to measure the profit impact of these long-term effects, managers usually focus their initial analysis on the short-term costs and benefits, and then qualitatively consider any longer-term implications. We discuss these qualitative considerations in detail later in the chapter.

### CONTEXTS FOR SHORT-TERM DECISION MAKING

Exhibit 6.2 illustrates some short-term decision contexts. When available capacity exceeds demand, firms take actions to boost demand. Examples include pricing special orders aggressively, favoring making versus buying components, and executing product promotions. These actions make sense because they put capacity that is otherwise idle to productive use. Conversely, when there is excess demand, firms try to allocate capacity to the most profitable use. They set a high bar for accepting special orders and look for components that they could buy from suppliers rather



than produce internally. They also try to change their product mix to focus on the most profitable products.

As Exhibit 6.2 also shows, dealing with temporary gaps between capacity and demand is the essence of short-term decisions. However, whether we deal with excess supply or with excess demand, the principles of controllability and relevance that we discussed in Chapter 2 continue to guide us in identifying costs and benefits that we must consider in making these short-term decisions. Let us see how we can put these principles to work.

## Evaluating Options

The excess supply/excess demand classification is a helpful way for us to evaluate Culinary Creations' decision problem, a special order. Let's begin by checking whether Culinary has engagements on the charity's requested dates. Wednesday is open, and it is highly unlikely that Culinary will receive another catering request for that date. Currently, Saturday is also open. However, Culinary almost surely will receive another catering request for that date, at the average size of 120 persons. Thus, one decision option features excess supply, and another deals with excess demand.

To evaluate these options, let's start with Culinary's income statement, shown in Exhibit 6.3. Using this information, you calculate Culinary's average cost per person served as  $\$900,000/30,000 \text{ persons} = \$30$ . Because the charity will pay only \$26 per attendee, it appears at first look that accepting this proposal will result in a loss. If you based your recommendation on this information alone, you would tell Monica to decline the engagement.

However, you realize that it is premature to make this recommendation. Exhibit 6.3 is not in the contribution margin format. You know that some of the costs in this exhibit are controllable with respect to Culinary's options, but others are not. As a result, you realize you need to refine your analysis.

### LEARNING OBJECTIVE 2

Evaluate decision options using alternate approaches.

<b>Exhibit 6.3</b>		<i>Culinary Creations: Income Statement for the Most Recent Year</i>
<b>Revenues</b>		
Total number of people served = 30,000		\$1,080,000
<b>Expenses</b>		
Food and supplies		\$300,000
Utilities (gas, electricity, and water)		30,000
Wages for temporary (serving) staff		75,000
Transportation to and from engagements		45,000
Kitchen equipment and utensils		50,000
Salaried staff		325,000
Rent		75,000
<b>Total expenses</b>		<u>\$900,000</u>
<b>Profit before taxes</b>		\$180,000

The revenue portion is relatively straightforward. Dividing \$1,080,000 in revenues by 30,000 persons served, you estimate that Culinary obtains \$36 from each regular patron, compared to \$26 from each person attending the charity dinner.

To figure out controllable costs, you begin as in Chapter 4 by identifying fixed and variable costs. You also settle on using the high-low method. The accountant provides you with Culinary's income statements for the past four quarters of operations, shown in Exhibit 6.4. You observe that the fourth quarter has the highest activity level, with 9,000 people served and a corresponding total cost of \$243,750. The first quarter has the lowest activity level, with 6,000 people served and a corresponding total cost of \$206,250. Using these two cost observations, you estimate the variable cost per person served as \$12.50 and the quarterly fixed costs as \$131,250.

With these estimates in hand, you can identify the value of each of Culinary's options. Of course, one option available for Culinary is to maintain the status quo by not catering the charity event at all (option 1)—thus, the value of this option is \$0. As in Chapter 2, we define the value of the other options by calculating the incremental revenues and costs relative to the status quo. In the language of Chapter 2, these are the *controllable* costs and benefits of a decision option. Thus, relative to not catering the charity event (the status quo):

- If Culinary caters the charity dinner on Wednesday, it expects to serve 150 additional persons at a price of \$26 per person. Incremental revenues, therefore, are \$3,900. At \$12.50 per person, incremental costs for 150 persons are \$1,875. Subtracting the incremental costs from the incremental revenues, the value (change in profit) of catering the charity dinner on Wednesday is \$2,025.

### CHAPTER CONNECTIONS

*In Chapter 4, we discussed three methods—account classification, high-low, and regression analysis—to estimate the unit variable cost and total fixed costs. Recall that the high-low method uses two observations—the high activity level and the low activity level—to estimate the cost equation.*

**Exhibit 6.4** *Culinary Creations: Income Statements for the Past Four Quarters*

	Total	Quarter			
		Fourth	Third	Second	First
Total number of people served	30,000	9,000	7,000	8,000	6,000
<b>Revenue</b>	\$1,080,000	\$324,000	\$252,000	\$288,000	\$216,000
<b>Expenses</b>					
Food and supplies	\$300,000	\$90,000	\$70,000	\$80,000	\$60,000
Utilities	30,000	8,250	7,250	7,750	6,750
Wages for temporary (serving) staff	75,000	21,000	18,000	19,500	16,500
Transportation	45,000	12,000	11,000	11,500	10,500
Kitchen equipment and utensils	50,000	12,500	12,500	12,500	12,500
Salaried staff	325,000	81,250	81,250	81,250	81,250
Rent	75,000	18,750	18,750	18,750	18,750
<b>Total expenses</b>	\$900,000	\$243,750	\$218,750	\$231,250	\$206,250
<b>Profit before taxes</b>	\$180,000	\$80,250	\$33,250	\$56,750	\$9,750

**Check It! Exercise #1**

Use the following template and data for Quarters 1 and 4, to verify the estimates of the unit variable cost and quarterly fixed costs.

Difference in total costs	_____	(1)
Difference in total number of persons	_____	(2)
Unit variable cost	_____	(3) = (1) / (2)
Total costs for fourth quarter	_____	(4)
Estimated variable costs for fourth quarter	_____	(5) = (3) × number of persons
Quarterly fixed costs	_____	(6) = (4) - (5)

**Solution at end of chapter.**

- If Culinary caters the charity dinner on Saturday, it expects to serve 200 additional persons at a price of \$26 per person, generating \$5,200 in revenue. However, Culinary will also lose the business of 120 regular patrons at \$36 per person, or \$4,320. Incremental revenues are, therefore,  $\$5,200 - \$4,320 = \$880$ . Culinary would also incur additional variable costs of \$1,000, which represents the \$12.50 cost per person for the 80 *extra* meals served (200 meals it could serve at the charity dinner - 120 meals it otherwise expects to serve). Thus, the value of catering the charity dinner on Saturday is  $\$880 - \$1,000 = (\$120)$ .

Exhibit 6.5 summarizes this information. You find that catering the charity dinner on Wednesday is the best option for maximizing short-term profit. Your calculations also reveal that Culinary will realize more profit if it rejects the catering event rather than accepting it for Saturday. (Why? Because accepting the charity event for Saturday results in a *loss* of \$120 relative to the status quo of not catering the charity event.)



<b>Exhibit 6.5</b>		
<i>Culinary Creations: Incremental Costs and Revenues Relative to not Catering the Charity Event</i>		
	<i>Cater on Wednesday</i>	<i>Cater on Saturday</i>
Incremental revenues from catering the charity organization (= \$26 × 150; \$26 × 200)	\$3,900	\$5,200
Lost revenues from regular business (= \$36 × 0; \$36 × -120)	\$0	(\$4,320)
<b>Net incremental revenues</b>	<u>\$3,900</u>	<u>\$880</u>
Incremental costs associated with catering the charity event (= \$12.50 × 150; \$12.50 × 200)	\$1,875	\$2,500
Cost savings from regular business (= \$12.50 × 0; \$12.50 × -120)	\$0	(\$1,500)
<b>Net incremental costs</b>	<u>\$1,875</u>	<u>\$1,000</u>
<b>Incremental contribution margin</b>	\$2,025	(\$120)
Less: Avoidable fixed costs	\$0	\$0
<b>Value (incremental profit)</b>	<u>\$2,025</u>	<u>(\$120)</u>

Why is it profitable for Monica to accept the charity event for Wednesday but reject it for Saturday? The answer is that Culinary has excess capacity on Wednesday but not on Saturday. On Wednesday, Monica has no alternative use for her catering capacity. Thus, each person attending the charity dinner has a unit contribution margin of \$13.50—the revenue of \$26.00 per person less the unit variable cost of \$12.50. Culinary will increase profit by accepting the charity event. The value from using the capacity for the dinner, \$13.50 per person, exceeds its opportunity cost of \$0—that is, it is better than letting the capacity be idle.

The excess demand for Saturday changes the story. Each person attending the charity dinner still contributes \$13.50 in contribution margin. However, we have an alternate use for the capacity. Thus, the opportunity cost is \$23.50 per person, the unit contribution margin from each regular customer (\$36.00 price - \$12.50 unit

### APPLYING THE DECISION FRAMEWORK

**What Is the Problem?** Should Culinary Creations cater the charity’s annual fundraising dinner?

**What Are the Options?** Culinary Creations has three options:

1. Do not cater the charity event.
2. Cater the charity event on Wednesday.
3. Cater the charity event on Saturday.

**What Are the Costs and Benefits?** You summarize your estimates of the costs and benefits as follows:

<i>Option</i>	<i>Value (Change in profit)</i>
Do not cater the charity event	\$0
Cater charity event on Wednesday	\$2,025
Cater charity event on Saturday	(\$120)

**Make the Decision!** You recommend that Culinary Creations cater the charity event on Wednesday, as this option leads to the highest profit.

variable cost) displaced. Even after adjusting for the contribution margin from 80 additional persons served at the charity event, it is still more profitable to serve regular customers, as our calculations in Exhibit 6.5 show.

## RELEVANT COST ANALYSIS

Recall from Chapter 2 that in picking the best decision option from among a set of available decision options, we could consider *controllable* costs and benefits or *relevant* costs and benefits. As mentioned earlier, we identify controllable costs and benefits depending on the change relative to the status quo. We defined relevant costs and benefits as those costs and benefits that differ across options and showed that focusing on relevant costs, or performing **relevant cost analysis**, often simplifies the analysis.

Relevant cost analysis is particularly useful when maintaining the status quo is not feasible. In such cases, we choose *any* feasible option as a baseline or a “benchmark” against which to evaluate other options. Relevant cost analysis involves focusing on only those costs and revenues that differ from this benchmark option. For this reason, some refer to relevant cost analysis as the **incremental** or **differential method**.

*Exercise #2* lets you practice the incremental approach. After you complete this exercise, use the profit estimates in Exhibit 6.5 to verify that Monica would gain \$2,145 by catering the charity event on Wednesday rather than on Saturday.



### CHAPTER CONNECTIONS

*Recall from Chapter 2 that a cost or benefit is relevant if its amount differs for at least one decision option.*



## Check It! Exercise #2

Suppose that Culinary commits to catering the charity event—thus, the status quo is not a viable option. Show that Monica would lose \$2,145 if she were to cater the event on Saturday instead of Wednesday. Use catering the event on Wednesday as the benchmark option and calculate the relevant change in demand, costs and benefits.

	<i>Number of Persons</i>	<i>Amount per Person</i>	<i>Cater on Saturday</i>
Additional revenue from charity event	50	_____	_____
Lost revenue from regular business	_____	\$36	_____
<i>Total relevant revenues</i>			(\$3,020)
Additional variable costs from charity event	50	\$12.50	_____
Variable costs saved by not serving regular customers	120	_____	_____
<i>Total relevant costs</i>			_____
<i>Change in profit (relative to catering the event on Wednesday)</i>			_____

## AN ALTERNATE APPROACH

Relevant cost analysis uses the fewest calculations necessary to evaluate Culinary's options. However, when decision options involve numerous cost items, many managers find it more convenient to include some or even all noncontrollable costs or revenues in their calculations. This approach makes the calculations more mechanical because we do not have to decide whether a cost or benefit is controllable or relevant. Moreover, the amounts for each option correspond more closely with the actual cash flow under each option. In essence, depending on whether the manager considers some or all of the noncontrollable costs and benefits, this approach involves putting together a partial or complete contribution margin statement for each option.

Such a mechanical approach, if done correctly, does not alter the rankings of the options—the inclusion of noncontrollable costs affects the contribution margin of each option by an identical amount. Some call this method the **totals or gross approach** because it considers the gross revenues and costs associated with each option, rather than the incremental amounts relative to the benchmark option.

To illustrate the difference between this approach and relevant cost analysis, consider the item “Lost revenues from regular business” in Exhibit 6.5. As reported there, Culinary expects Saturday night revenues from its regular customers of \$4,320 if it does not cater the charity event or caters it on Wednesday. However, it expects Saturday night revenues of \$0 from its regular customers if it caters the charity event on Saturday.

Back in Exhibit 6.5, we calculated the *incremental* revenue from regular clients as \$0 for the Cater on Wednesday option. That option did not affect the amount of revenue expected during the week from regular clients. However, we calculated the *incremental* revenue from regular clients as  $-\$4,320$  for the Cater on Saturday option because Culinary would lose that amount of revenue—from regular clients—if Culinary were to cater the charity event on Saturday.

In contrast, the amounts in Exhibit 6.6 represent gross amounts associated with the different options. If Culinary chooses not to cater the event at all, or decides to cater the event on Wednesday, then the revenue from regular customers will be \$4,320. If Culinary chooses to cater the event on Saturday, then the revenue from regular customers will be \$0. You can follow the same steps in identifying the gross amounts for the variable costs.

Notice that the *ranking* of the two catering options is the same in Exhibit 6.6 as it is in Exhibit 6.5. If you compare Culinary's anticipated profit from catering the

### Exhibit 6.6

#### *Culinary Creations: Evaluating Decision Options with a (limited) Contribution Margin Statement*

	Do not Cater Event	Cater on Wednesday	Cater on Saturday
Revenue from charity organization (= $\$26 \times 0$ ; $\$26 \times 150$ ; $\$26 \times 200$ )	\$0	\$3,900	\$5,200
Revenue from regular business (= $\$36 \times 120$ ; $\$36 \times 120$ ; $\$36 \times 0$ )	4,320	4,320	0
Total Revenue	\$4,320	\$8,220	\$5,200
Less: Variable costs (= $\$12.50 \times 120$ ; $\$12.50 \times 270$ ; $\$12.50 \times 200$ )	\$1,500	\$3,375	\$2,500
Contribution margin	\$2,820	\$4,845	\$2,700
Less: Fixed costs	0	0	0
<b>Profit before taxes</b>	\$2,820	\$4,845	\$2,700

event on Wednesday, or \$4,845, to the anticipated profit of \$2,820 for not catering the event at all, the increase in profit is \$2,025 for catering the event on Wednesday. A similar comparison of the profit for catering on Saturday, or \$2,700, with the \$2,820 profit from not catering the event shows a loss, or \$120, from catering the event on Saturday. These amounts—\$2025 and (\$120)—correspond exactly to our calculations in Exhibit 6.5.

## COMPARING THE METHODS

As you can see, we get the same answer with all three approaches. As in Exhibit 6.5, we can choose by comparing the value of each option, identifying controllable costs and benefits as the items that change relative to the status quo. In *Check it! Exercise #2*, we ranked options by choosing a feasible option as the benchmark, and identifying relevant costs and benefits as the items that change relative to this benchmark. Finally, rather than focus on incremental items (relative to the status quo or any feasible option), in Exhibit 6.6, we considered some noncontrollable costs and benefits to construct a partial contribution margin statement. (The statement is partial because we do not consider costs and revenues for the entire week or consider fixed costs.) We can then directly compare the profit earned under the options.

In general, analysis that considers only controllable or relevant costs is more efficient when decision options differ only with respect to a few benefit and cost items. It allows us to pick the best option quickly by evaluating each relative to the status quo (as we did for Culinary Creations in Exhibit 6.5). The totals method might be preferable in decisions involving many costs and benefits. Ultimately, all the methods are equivalent, but certain decision problems lend themselves better to one approach relative to the other. You are also likely to encounter all of these approaches in your workplace.

## Additional Examples of Short-Term Decisions

In this section, we present two additional examples of short-term decisions. The first looks at short-term promotions to deal with excess capacity. The second considers a make-versus-buy decision in a setting with excess demand. We encourage you to work through these examples to solidify your understanding of how to approach short-term decisions.

### LEARNING OBJECTIVE 3

Solve short-term decisions such as make versus buy and special-order pricing.

## EVALUATING SHORT-TERM PROMOTION DECISIONS

Superior Cereals estimated demand for its generic breakfast cereal poorly. Therefore, it currently has more boxes of “toasted honey flakes” than it could sell at the product’s usual price. Superior normally sells toasted honey flakes to supermarkets for \$2.00 per box and earns \$0.72 in unit contribution margin.

Superior’s management has come up with the following two options to address the current inventory of 50,000 boxes:

- *Emphasize Institutional Sales:* Sell 25,000 boxes of toasted honey flakes to supermarkets for \$2 per box, and the remaining 25,000 boxes to institutional buyers (e.g., hospitals, schools) for \$1 per box.
- *Issue a Rebate:* Print a coupon in the local newspaper, offering consumers a rebate of \$0.50 for every box top of toasted honey flakes submitted to Superior.



Superior Cereals is considering the use of rebates to stimulate demand. (image100/ Age Fotostock America, Inc.)

It will cost Superior \$5,000 to advertise the campaign in local newspapers and process the rebates. Superior anticipates supermarket sales of 45,000 boxes and paying out the rebate on 22,000 boxes. Superior will sell the remaining 5,000 boxes for \$1 per box to institutional buyers.

Our first step is to figure out the status quo. How many boxes would Superior sell if it did nothing? We do not have this information. However, not having this information does not hinder our analysis. We can address Superior’s issue using relevant cost analysis where we use either of the options as the benchmark. We also could make the decision using the totals or gross approach where we calculate gross revenues and costs.

Exhibit 6.7 presents the calculations for Superior’s decision under the gross approach. *Check It! Exercise #3* asks you to make the decision using relevant cost analysis.

In Exhibit 6.7, we set the variable costs for each decision option to equal \$0. Why? Because Superior has already incurred the variable costs for making the 50,000 boxes, these costs are *sunk*. Thus, we exclude them from the analysis. However, we could have included variable costs, noncontrollable for this decision, in our analysis. Including this item does not change the rank ordering of options, or the *difference* in profits between options, meaning that our decision would not change as well.

Exhibit 6.7 shows that Superior maximizes its short-term profit by issuing a rebate. This option increases profit by \$4,000 over the “emphasize institutional sales” option.

## MAKE-VERSUS-BUY DECISIONS

Precision Piston Rings manufactures piston rings for automobile engines. The company anticipates that it will produce 470,000 piston rings in the coming year and earn a contribution of \$5 per ring. At this level of production, Precision will operate at 94% of its available capacity of 500,000 piston rings. Equivalently, because Precision produces eight rings per hour, the anticipated production will consume 58,750 of its available 62,500 machine hours.

**Exhibit 6.7** Superior Cereals: Evaluating Options Using the Gross Approach

	Emphasize Institutional Sales	Issue Rebate
Supermarket sales—full price	25,000 boxes	23,000 boxes
Supermarket sales—rebate	—	22,000 boxes
Institutional sales	25,000 boxes	5,000 boxes
Wholesale price per box	\$2.00	\$2.00
Price per box with rebate	—	\$1.50
Institutional price per box	\$1.00	\$1.00
Supermarket sales—full price	\$50,000	\$46,000
Supermarket sales—rebate	—	33,000
Institutional sales	25,000	5,000
<b>Total revenues</b>	<b>\$75,000</b>	<b>\$84,000</b>
Variable costs	0	0
<b>Contribution margin</b>	<b>\$75,000</b>	<b>\$84,000</b>
Advertising and processing costs	0	5,000
<b>Profit</b>	<b>\$75,000</b>	<b>\$79,000</b>



## Check It! Exercise #3

Verify that the incremental profit from the “issue a rebate” option relative to “emphasize institutional sales” option is \$4,000.

	<i>Incremental Boxes Relative to “Emphasize Institutional Sales”</i>	<i>Incremental Cost or Benefit for “Issue Rebate”</i>
Incremental revenues		
Supermarket sales—full price	-2,000 (= 23,000 - 25,000)	_____
Supermarket sales—rebate	+22,000 (= 22,000 - 0)	_____
Institutional sales	-20,000 (= 5,000 - 25,000)	_____
<i>Total incremental revenues</i>		_____
Less: incremental variable costs		_____
<i>Incremental contribution margin</i>		_____
Less: incremental fixed costs		\$5,000
<i>Incremental profit</i>		_____

Solution at end of chapter.

Patrick O’Toole, the owner of Precision Piston Rings, notes that Precision has unused capacity of 3,750 machine hours (62,500 - 58,750). Thus, he wonders if he could increase profit by using this capacity to make the jigs and fixtures he needs and not buy them from a supplier. Currently, Precision pays an outside supplier \$162,500 for 25 jigs, or \$6,500 per jig. (Jigs and fixtures, which wear out on a regular basis, hold the ring in place during machining operations.)

Making the jigs in-house will cost \$25,000 per year in additional fixed costs (for new tools and equipment), \$4,000 per jig in materials and labor costs, and consume 200 hours of machine time per jig. Because of design and quality considerations, Patrick believes that he should either make *all* of the jigs or buy all of the jigs (i.e., he is not interested in making some jigs and buying the rest).

We can therefore summarize Patrick’s two options as follows:


- *Buy jigs:* Continue to buy the 25 jigs from an outside vendor at a price of \$6,500 per jig.
- *Make jigs:* Make the jigs in house using 200 machine hours per jig, spending \$25,000 per year in fixed costs for tools and \$4,000 per jig for materials and labor.

Buying 25 jigs at \$6,500 per jig costs \$162,500. At first look, making 25 jigs at \$4,000 each plus \$25,000 in fixed costs will total \$125,000. Thus, you might conclude that Patrick should make the jigs, as doing so saves \$37,500.

This conclusion is incorrect, however. When you calculate incremental revenues and costs, you see that Precision’s annual profit will *decrease* by \$12,500 if it makes the jigs in-house, as Exhibit 6.8 shows.

Why is our initial calculation of a savings of \$37,500 incorrect? Precision’s plant is operating near capacity. Therefore, it cannot make all of the jigs *and* all of the rings using its current facilities. Making all of the jigs requires that Patrick cut back on the number of rings, as he will have to divert some machine hours from making piston rings. This excess demand means that capacity has a positive opportunity cost. For Precision, this cost is the loss in contribution margin of \$50,000 (10,000 rings × \$5 per ring) that Precision could have otherwise generated. Consequently, it is *relatively* more profitable for Precision to use the capacity for its primary product, piston rings, and purchase the needed jigs from its supplier. Relative to making jigs, profit in this case would improve by \$12,500 (\$50,000 - \$37,500).

Exhibit 6.8		<i>Precision Piston Rings: Evaluating Options Using the Incremental Approach</i>	
	Detail	Buy (status quo)	Make
Jigs per year		25	25
Machine hours needed to make jigs	200 hours/jig × 25 jigs	—	5,000
Machine hours available	62,500 – 58,750 hours	3,750	3,750
Machine hours diverted from making rings	5,000 – 3,750 hours	0	1,250
Piston rings that could be made with diverted machine hours	8 rings/hour × 1,250 hours	0	10,000
			<b>Incremental Due to Make</b>
Saved payments to outside vendor	\$6,500/jig × 25 jigs		\$162,500
Materials and labor costs to make jigs	\$4,000/jig × 25 jigs		(100,000)
Tools and equipment	Given		(25,000)
Apparent savings from Make			\$37,500
Lost contribution from using machine hours to produce jigs in house	10,000 rings × \$5/ring		(\$50,000)
<b>Incremental profit (value)</b>			<b>(\$12,500)</b>



## Check It! Exercise #4

Verify that the total cost of buying the jigs is \$112,500 and that the total cost of making the jigs is \$125,000. Our analysis focuses on costs because there are no revenues under the buy option, and the make option leads to a reduction in revenues (a cost). The answer does not change whether we classify the contribution margin from the 10,000 rings as “lost” under the make jigs option or as “gained” under the buy jigs option.

	<i>Buy Jigs</i>	<i>Make Jigs</i>
Contribution margin on 10,000 rings	_____	0
Payment to outside vendor	_____	_____
Materials and labor to make jigs	_____	_____
Tools and equipment	_____	_____
Total effect on profit	(\$112,500)	(\$125,000)

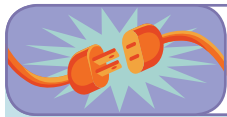
Solution at end of chapter.

## Determining the Best Use of a Scarce Resource

**LEARNING OBJECTIVE 4**  
 Determine the best use of a resource in short supply.

So far in this chapter, we have evaluated short-term decisions that have a *limited* number of options. We identify all of the options and then evaluate them either by performing incremental analysis or by constructing a (partial) contribution margin statement for each option, then comparing the contribution margins.

In some cases, however, the number of available options can be very large. Consider a company that is deciding how best to use 1,000 hours of machine time to make its



## Connecting to Practice

### PRICE-GOUGING WHEN DEMAND IS HIGH

The **Federal Energy Regulatory Commission**'s report on the 2001 power crisis in California provides an example of price gouging and its consequences. The report alleges that a firm prolonged an outage at a power plant to take advantage of higher prices the state was paying at the height of the crisis. That is, the firm reduced capacity in a period with peak demand, driving up prices for the capacity that stayed on line. The report estimates that the firm earned more than \$10 million extra in energy sales from its other plants. The investigation ended when the firm agreed to refund the state \$8 million, without any admission of guilt.

**COMMENTARY:** Price gouging occurs when a firm exploits temporary excess demand to raise prices to unreasonable levels. Such excess demand frequently stems from natural disasters such as floods and hurricanes.

*Source:* FERC report, CNN, November 17, 2002; *Atlanta Business Journal*, March 3, 2003; WSWs.org, September 28, 2002.

three products. The problem is that 1,000 machine hours are not enough to meet the demand of *all* three products.

How should the company decide how much of each product to produce? When demand is high and a resource is in short supply, we should rank products by the contribution margin *per unit of the resource* and not by the contribution margin *per unit of the product*. This is a general rule for solving problems with excess demand. The logic is that, for a resource in short supply, the opportunity cost of the resource is positive (as we saw in the Precision Piston Rings example). Consequently, we put the resource to its *best* possible use. This means ensuring that the contribution margin per unit of the resource from this use exceeds that foregone by putting it to the next best use.

To illustrate this rule, let's consider an example—Aero Toys, which manufactures and sells toy airplanes. Aero, owned and operated by Amelia Hart, has a factory in Boston, Massachusetts, and manufactures three different kinds of toy planes: FighterJet, JumboJet, and SuperJet. The demand for Aero's planes is highest during the months of October and November, when retailers want a large stock available for holiday shopping. Expecting this trend to continue, Amelia wonders about how best to utilize her available capacity. What combination of toy planes should she produce? Exhibit 6.9 presents key operating data.

As Exhibit 6.9 shows, Aero has 9,000 production hours available for November. At a production rate of 50 per hour, Aero could produce a maximum of 450,000 units of FighterJet if it uses all of its production capacity to make this product. At a rate of 25 units per hour for JumboJet and 15 units per hour for SuperJet, Aero could produce a maximum of 225,000 units of JumboJet and 135,000 units of SuperJet, respectively. Thus, Aero could meet the *individual* demand for any one of the product comfortably.

Unfortunately, meeting the demand for *all* the jets is impossible. Producing 200,000 FighterJets at 50 units per hour would require 4,000 hours. Similarly, producing 100,000 JumboJets at 25 units per hour and 60,000 SuperJet at 15 units per hour would require 4,000 hours for each line. Thus, producing all the Jets at full demand requires 12,000 total production hours. Amelia does not have that much



**Exhibit 6.9** Aero Toys: Key Operating Data

	FighterJet	JumboJet	SuperJet
Demand (in units) for November	200,000	100,000	60,000
Unit price	\$40	\$60	\$80
Unit variable cost	\$25	\$35	\$40
Unit contribution margin	\$15	\$25	\$40
Production rate (units per hour)	50	25	15
Available production hours in November			9,000
Total monthly fixed costs			\$4,000,000

capacity at her disposal. She has only 9,000 hours, not 12,000 hours. The question then is how many of each plane should Amelia produce to maximize the profit for November?

To answer this question, Amelia carefully studies the profitability of each toy plane. Looking again at Exhibit 6.9, Amelia notices that the high-priced SuperJet has the highest unit contribution margin (\$40), followed by the JumboJet (\$25), and the FighterJet (\$15). Based on this information, Amelia decides to give the highest priority to the SuperJet and meet its demand. If any unused capacity remains, she will consider the JumboJet and, finally, the FighterJet.

If Amelia implements this decision rule, meeting all of the SuperJet's demand of 60,000 units will require 4,000 production hours. Of the 5,000 production hours that remain, Amelia will use 4,000 to meet all of the demand for the JumboJet. The company will then have 1,000 production hours available for FighterJet, which will allow Amelia to produce only 50,000 units. Although uncomfortable with losing a sizeable portion of the demand for FighterJet, Amelia believes that she will be doing the best she can with the available capacity.

Let us calculate Amelia's expected profit from this decision. The contribution margin from making and selling 60,000 units of SuperJet, 100,000 units of JumboJet, and 50,000 units of FighterJet is  $(60,000 \times \$40) + (100,000 \times \$25) + (50,000 \times \$15) = \$5,650,000$ . Subtracting the \$4,000,000 in fixed costs, we therefore estimate Amelia's profit before taxes as \$1,650,000. Amelia is pleased with this profit estimate.

After a couple of sleepless nights, Amelia realizes how she can do even better. From an Executive MBA program she had attended some time ago, Amelia recalls the general rule that we described earlier: To maximize profit when capacity is in short supply, *maximize the contribution margin per unit of capacity*. Amelia quickly revises her analysis of each jet's profitability. Exhibit 6.10 presents her findings.

Notice from panel A of Exhibit 6.10 that for the FighterJet, a production hour yields a contribution margin of \$750, which equals 50 units produced times the \$15 unit contribution margin. Similarly, a production hour devoted to making JumboJet yields a contribution margin of \$625, and a production hour devoted to making SuperJet yields a contribution margin of \$600. Thus, giving top priority to FighterJet makes the most sense. JumboJet is the next ranked product, with SuperJet taking up any residual capacity.

Panel B of Exhibit 6.10 shows the time allocation under Amelia's revised ranking of the products. Aero will use 4,000 hours each (or 8,000 production hours in total) to meet all of the demand for FighterJet and JumboJet, yielding a combined contribution margin of \$5,500,000. With the remaining 1,000 hours, Aero will produce and sell 15,000 units of SuperJet, earning an additional contribution margin of \$600,000. This product combination yields a total profit before taxes of \$2,100,000. This amount is \$450,000 greater than the \$1,650,000 profit before taxes from her previous choice.

**Exhibit 6.10** *Aero Toys: Most Profitable Production Schedule for November*

**Panel A: Determine Contribution Per Unit of Scarce Resource**

	FighterJet	JumboJet	SuperJet
Demand (in units) for November	200,000	100,000	60,000
Unit price	\$40	\$60	\$80
Unit variable cost	\$25	\$35	\$40
Unit contribution margin	\$15	\$25	\$40
Production rate (units per hour)	50	25	15
Contribution margin per production hour (= unit contribution margin × production rate)	\$750	\$625	\$600
Product rank for scheduling production	1	2	3

**Panel B: Allocation of Time Among Products**

Product	Time Available (hours)	Production Rate (units /hr)	Units Made	Time Used (hours)	Unit Contribution Margin	Total Contribution
FighterJet	9,000	50	200,000	4,000	\$15	\$3,000,000
JumboJet	5,000	25	100,000	4,000	\$25	2,500,000
SuperJet	1,000	15	15,000	1,000	\$40	600,000
Total contribution						\$6,100,000
– Fixed cost						4,000,000
= Profit						\$2,100,000

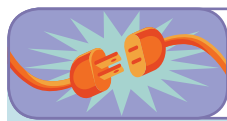
 **Check It! Exercise #5**

Assume the production rates of FighterJet, JumboJet, and SuperJet are 50, 25, and 20 units per hour, respectively (all other information is the same). Verify that the most profitable schedule calls for production of 200,000 units of FighterJet, 50,000 units of JumboJet, and 60,000 units of SuperJet. Also verify that Aero’s profit before taxes will be \$2,650,000 at these production levels.

	FighterJet	JumboJet	SuperJet		
Maximum demand (units)	200,000	100,000	60,000		
Unit contribution margin	\$15	\$25	\$40		
Production rate (units per hour)	50	25	20		
Contribution margin per production hour	_____	_____	_____		
Rank for scheduling production	_____	_____	_____		
<i>Product</i>	<i>Time Available</i>	<i>Production Rate</i>	<i>Units Made</i>	<i>Time Used</i>	<i>Contribution Margin</i>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
Total contribution margin					_____
Total monthly fixed costs					_____
Profit before taxes					_____

In the Aero example, we considered a case in which there is only one resource whose supply is limited. Often, organizations face this situation with multiple resources at the same time. Managers must therefore consider the constraints posed by all of the resources. Multiple-resource cases are similar to the one-resource case presented above. However, dealing with them requires applying the advanced methods of *linear and integer programming*, topics discussed in upper-level classes in operations management.

We have examined four contexts for short-term decisions: special order, product promotion, make or buy, and product mix. In Appendices A and B, we examine two more contexts: “sell now or process further” decisions and “product add/drop” decisions. As you will notice there, the key issue in these settings is dealing with some significant costs that are not controllable and thus not relevant for the decision at hand.



## Connecting to Practice

### THEORY OF CONSTRAINTS

Aero Toys’ solution relates to a core message of the Theory of Constraints (TOC). Eli Goldratt, who established the **Goldratt Institute**, popularized this approach to problem solving that deals with excess demand by identifying and obtaining the maximum value from the factors that constrain profitability. A key prescription is to maximize the value of the amount of production (throughput) processed in the constraining resource. TOC looks to maximize *throughput margin*, defined as unit price less materials cost, by focusing on those products that yield the largest throughput margin per capacity unit of the constraining resource.

**COMMENTARY:** In her solution, Amelia maximizes the contribution margin per unit of the scarce resource because she defines *all* variable costs (materials, labor, variable overhead, and variable selling expenses) as controllable with respect to her product-mix decision. Her solution would coincide with the TOC prescription if she defines only materials costs as controllable. The specifics of the individual situation and the decision horizon determine whether a given cost or benefit is controllable. The solution methodology is the same after classifying costs and benefits per their controllability.

## Qualitative Considerations

### LEARNING OBJECTIVE 5

Consider qualitative and longer-term aspects of short-term decisions.

In the previous sections, we focused on how managers could improve short-term profit when faced with a temporary gap between supply and demand. We illustrated how the concepts of controllability and relevance guide the proper choice from a set of options. In these analyses, however, we ignored the potential longer-term implications of these short-term actions. Because these long-term effects could vary across decision options, they might be relevant. Why then does our approach make sense? Why are we ignoring potentially *relevant* long-term costs and benefits?

The short answer is that we want to keep the decision problem as simple as possible. Such simplification frequently is the first step for many managers. Quantifying the longer-term implications of short-term actions is difficult. In many cases, qualitative assessments are the only ones possible, and large estimation errors accompany such assessments. As a result, many managers follow a “peel the onion” approach. They first estimate the short-term effects and then expand the range of considered factors.

Quantitative analysis of different decision options is extremely important, yet it constitutes just one input into decision making. Effective managers articulate and consider the longer-term implications of short-term decisions, even if only on a qualitative basis. It is important for managers to do so because of potential trade-offs between short-term and long-term interests. An option may cost the company in the short term but may be the most beneficial one from a long-term perspective. Looking out for long-term profit by not turning away loyal clients and preserving reputation in the marketplace might sway the manager from the option that maximizes short-term profit.

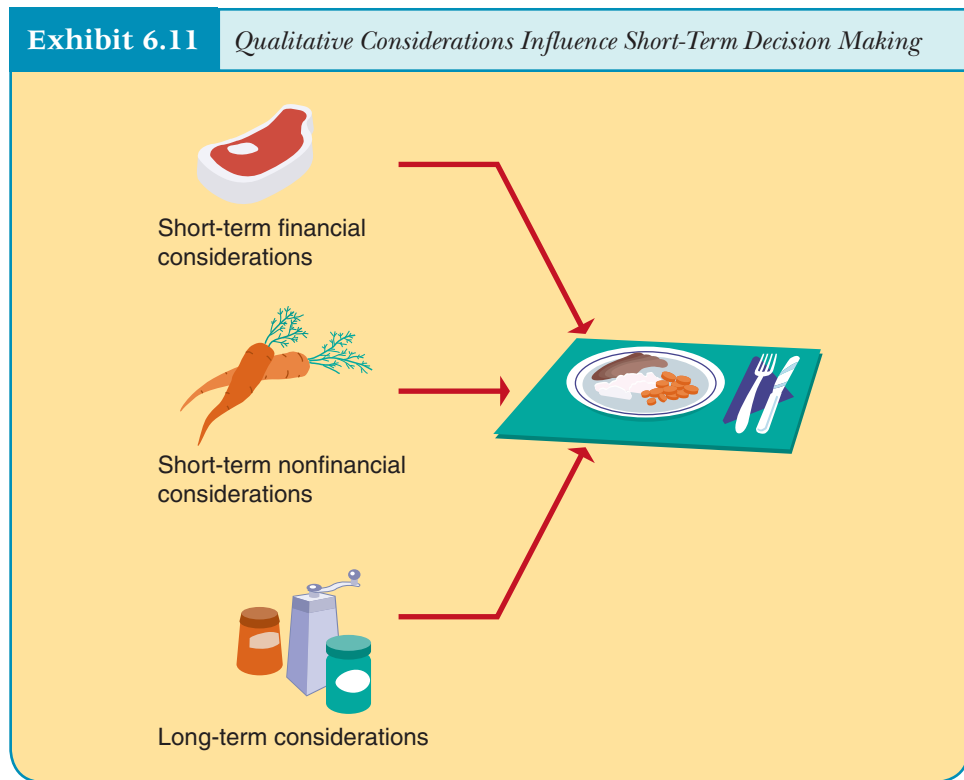
Almost every business example that we have discussed in this and the previous chapters offers us the opportunity to appreciate such a trade-off. Let us begin with the vignette in Chapters 1 through 4, Hercules Health Club. Self-sustaining classes such as yoga have long-term value because they preserve some *flexibility* with respect to future choices. If Tom and Lynda offer the yoga class and it turns out not to be attractive, they could cancel it and reconsider lowering the membership fee. Suppose they lower the membership fee now and it proves insufficient to stem defections to Apex. They may then find it hard to raise fees to the original levels and try out the yoga class as an alternate strategy. Indeed, the differential ease in lowering versus raising prices is why firms offer discounts rather than reduce the list price. It is much easier to cancel the discount program! Managers often use the term *real options* to denote the flexibility associated with different options and use advanced mathematical techniques to value the real options.

The case of Precision Piston Rings is also instructive. The quality of piston rings is extremely important to the functioning of an automobile engine. The market for piston rings is very competitive because many suppliers vie for business from the major automobile companies. It may be in Precision’s best interest to make its own jigs and fixtures and other needed machine tools *in-house* because the quality of those items determines the quality of the piston rings. The improved quality may result in Precision being better off in the end, even if the short-term costs of in-house production are higher. Of course, this decision is much easier if in-house production also lowers short-term costs.

In the case of Culinary Creations, short-term interests and long-term interests are aligned closely. In the short term, it is profitable for Culinary Creations to accept the charity engagement’s Wednesday offer. This action is probably in Culinary Creations’ long-term best interests as well. It may lead to future business with the charity organization, build community goodwill, and secure future business with individuals who are attending the charity event.

Conceptually, many long-term implications arise because people outside the firm, such as customers, suppliers, and competitors, respond to the firm’s decisions and actions. Precision’s higher quality might generate more business from its customers. Similarly, catering the charity dinner may build community goodwill for Culinary Creations. Successful managers’ choices account for how such external parties are likely to respond to the various options.

As Exhibit 6.11 illustrates, financial considerations might be the meat, but qualitative and long-term considerations provide essential ingredients that can help determine which short-term option to implement. In the case of Superior Cereals, the manager in charge of a national brand is probably well aware that local store brand manufacturers will mimic any new product introduction. They will account for this behavior when scheduling the promotion and advertising campaigns. In



turn, Superior's management will consider such intentions on the part of national brand manufacturers when taking appropriate actions. Game Theory, a branch of economics, deals with the formal study of such strategic behavior of decision makers. You may encounter this topic in your economics courses.

## SUMMARY

In this chapter, we discussed the nature of short-term decisions and developed an excess supply/excess demand "lens" with which to view such problems. We then discussed and illustrated how businesses could evaluate options for closing the gap between the supply and demand of available capacity. Our examples, which span service (Culinary Catering), manufacturing (Precision Piston Rings), and merchandising (Superior Cereal), underscore the universal applicability of these ideas. Finally, we discussed some of the qualitative and longer-term issues that invariably play a role in short-term decision making.

In the next chapter, we bridge the gap between short-term planning and control. Our primary focus is on budgeting, a subject of importance to all organizations.

## RAPID REVIEW

### LEARNING OBJECTIVE 1

#### Understand the factors that trigger short-term decisions.

- Managers choose capacity levels to match long-term expected demand and supply. However, demand realizations rarely match expectations, creating an imbalance between the supply of and the demand for capacity.
- Short-term decisions are responses to a mismatch between supply (capacity) and demand. During demand downturns, capacity utilization goes down. During demand upturns, there is a shortage of available capacity. Short-term decisions attempt to close these gaps between the supply of and demand for capacity resources.
- During demand downturns, managers may reduce prices to stimulate demand or accept special orders to

increase capacity utilization. Such actions are profitable because the opportunity cost of temporarily idle capacity is zero.

- During demand upturns, managers may increase prices to reduce demand or outsource work. These actions may be profitable because excess demand results in capacity having positive opportunity cost.

#### LEARNING OBJECTIVE 2

##### Evaluate decision options using alternate approaches.

- We could formulate short-run decisions by focusing on controllable costs or by using relevant costs.
- In either of these incremental approaches, we express the benefits and costs of the various options *relative to* one of the options. If the status quo is a viable option, we usually pick the status quo as the benchmark and focus on controllability. If the status quo is not a feasible option, then we could still apply the incremental approach by choosing any option as the basis for evaluating the remaining options. It is usually efficient to perform a relevant cost analysis by focusing only on relevant costs and benefits.
- We also could consider *all* costs and benefits associated with each regardless of whether some costs are controllable or relevant. Doing so does not change the rankings of options.

#### LEARNING OBJECTIVE 3

##### Solve short-term decisions such as make versus buy and special-order pricing.

- Superior Cereals examines the viability of short-term promotions to deal with excess supply. Superior confronted the decision of how to sell 50,000 boxes of cereal it already produced—a situation akin to a manufacturing firm that has to deal with excess capacity because of lean demand.
- Precision Piston Rings considers a make-versus-buy decision in a setting with excess demand. Precision faced excess demand on its machining capacity because it could not make all of the jigs *and* all of the rings using its current facilities. The excess demand led to a positive opportunity cost for capacity, and we found that it was more profitable for Precision to buy the jigs and devote its attention to its primary product, piston rings.

#### LEARNING OBJECTIVE 4

##### Determine the best use of a resource in short supply.

- With a limited number of options, it is possible to list them all and pick the best one. In some cases, the number of available options can be very large. In such cases, it is not feasible to list all of the options and calculate their values.
- The general rule for solving such problems when excess demand exists is: When demand is high and a resource is in short supply, rank products by the contribution margin per unit of the resource and not by the contribution margin per unit of the product.

#### LEARNING OBJECTIVE 5

##### Consider the qualitative and longer-term aspects of short-term decisions.

- Many short-term decisions have longer-term implications. These implications arise because people outside the firm, such as customers, suppliers, and competitors, respond to the firm's decisions and actions.
- Quantifying the longer-term implications of short-term actions is difficult. Frequently, only qualitative assessments are possible.
- Effective managers do consider the qualitative implications of short-term decisions. While it is possible that short-term and long-term goals coincide, the best action from a short-term perspective does not always guarantee long-term profitability.

# Appendix A

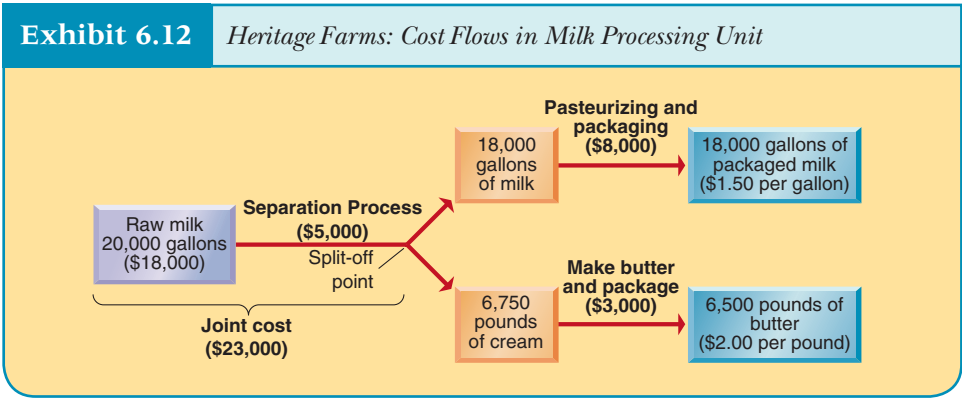
## DECISIONS INVOLVING JOINT COSTS

Heritage Farms processes raw milk to make cream and liquid milk. It processes the cream further to make butter. Heritage sells both the butter and milk to supermarkets. As with Heritage, in many companies across many industries, a single process often yields many outputs. Firms such as **BHP Billiton** process ore to extract copper and other metals such as zinc and lead from the *same* ore. Likewise, when firms such as **Amoco** refine crude oil, they obtain a number of products including aviation fuel, kerosene, oil-based resins, and automobile fuel. The unique aspect of such processes is that we cannot modify them to yield just one product or the other. The nature of the process means that we will obtain many outputs from a single input. Such processes are joint processes, and their outputs are **joint products**.

As shown in Exhibit 6.12, every week, Heritage converts 20,000 gallons of raw milk into 18,000 gallons of processed milk and 6,750 pounds of cream. It pays \$18,000 to dairy farmers. It incurs an additional \$5,000 to separate the cream. At some point in the process, Heritage can separately identify milk and cream. This step in the production process is the **split-off point**. Costs incurred before the split-off point are **joint costs** that we cannot trace to individual products. Heritage's joint costs are, therefore, \$23,000 per week.

Usually, firms process individual products further beyond the split-off point. Heritage incurs additional costs of \$8,000 to pasteurize and package milk for retail sale, and \$3,000 to process and package 6,750 pounds of cream into 6,500 pounds of butter. Unlike joint costs, we can trace these costs, which are incurred after the split-off point, to individual products, thereby eliminating any need for allocations.

Heritage sells each gallon of milk for \$1.50 and each pound of butter for \$2.00. In general, there are two broad classes of decisions in settings with joint products.



- Determine whether the entire process is profitable. This is a long-term decision.
- Determine whether we should sell any particular joint product at the split-off point, or if we should incur additional costs to process it further into a different product. Such “sell now or process further” decisions are usually short term in nature, for the decision will change based on prevailing prices.

Let us examine whether it is profitable for Heritage Farms to operate the entire process. Exhibit 6.13 provides a statement of income per week. The format for this income statement is the same as that for Office Gallery, the example we used in Chapter 4 to illustrate segmented income statements.

Notice that in calculating income, there is no need to allocate joint costs to individual products. As long as the total contribution margin from the joint products exceeds the total joint cost, the process is profitable.

Suppose Heritage Farms has the option of selling milk in bulk at the split-off point for \$1.20 per gallon and cream at the split-off point for \$1.40 per pound. Should Heritage process the bulk milk further, pasteurizing and packaging the milk for retail sale? Should it convert cream into butter for retail sale? Or should Heritage sell either the milk or the cream (or both) at the split-off point?

Exhibit 6.14 presents the calculations for these decisions. As we know from Exhibit 6.13, the contribution margin from processing 18,000 gallons of liquid milk further is \$19,000. By selling the 18,000 gallons immediately at the split-off point as bulk milk for \$1.20 per gallon, the company can generate \$21,600, and there are no additional processing costs. Heritage makes \$2,600 more by selling the milk in bulk. Similar calculations show that it is more profitable for Heritage Farms to convert cream into butter instead of selling the cream directly at the split-off point.

Each decision turns on whether the increase in revenue from additional processing exceeds the cost of additional processing. *We do not consider the joint cost of \$23,000, nor how it might be allocated between the two products, in these sell now or process further decisions.* The reason is that the joint cost is not relevant for product-related decisions *beyond* the split-off point. Heritage has no choice but to incur the joint cost regardless of its decisions regarding selling now or processing further. For these decisions, the joint cost is sunk.

<b>Exhibit 6.13</b>		<i>Heritage Farms: Product-Level Contribution Margin Statement</i>		
	<b>Milk</b>	<b>Butter</b>	<b>Total</b>	
Sales volume (in units)	18,000 gal	6,500 lb		
Revenues	\$27,000	\$13,000	\$40,000	
Traceable processing costs	8,000	3,000	11,000	
<b>Segment (product) margin</b>	\$19,000	\$10,000	\$29,000	
Joint costs			23,000	
<b>Profit before taxes</b>			<b>\$6,000</b>	

<b>Exhibit 6.14</b>		<i>Heritage Farms: Should We Sell Now or Process Further?</i>	
	<b>Milk</b>	<b>Butter</b>	
Sales volume (in units)	18,000 gal	6,500 lb	
<b>Process further</b>			
Revenue	\$27,000	\$13,000	
Traceable processing costs	8,000	3,000	
<b>Segment (product) margin</b>	\$19,000	\$10,000	
<b>Sell at split-off point</b>			
Revenue (for raw milk/cream)	\$21,600*	\$9,450**	
Traceable processing costs	0	0	
<b>Segment (product) margin</b>	\$21,600	\$9,450	
<b>Decision</b>	Sell as bulk milk at split-off point	Process further into butter	
*18,000 gallons of milk × \$1.20 per gallon			
**6,750 lb of cream × \$1.40 per lb			



# Appendix B

## ADDING/ DROPPING PRODUCT LINES

The Toys section of Fair Value stores has been losing money for several months now because a specialty store like **Toys R Us** has opened in the neighborhood. How should Fair Value evaluate whether it is profitable to close the section and reallocate the resources to, say, a bookstore?

Let us begin by considering whether the decision pertains to the short term or to the long term. The answer is ambiguous because managers might be interested in considering both the short- and long-term effects on profitability. We defer a detailed discussion of how to estimate the long-term impact to Chapter 9. Here, we present a method for evaluating the decision's short-term impact. Fortunately, the basic approach to decision making still remains the same as discussed in Chapter 2. We only consider costs and benefits controllable over the short term.

Exhibit 6.15 provides a section-level income statement for Fair Value. This income statement reflects the firm's policy of allocating its fixed costs to its various sections based on square feet of space usage. As we can tell, the Toys section appears to be unprofitable.

However, we should not rely on income statements such as that in Exhibit 6.15 to evaluate the effect on short-term profit. Why? Because they allocate common costs to product lines or sections, such statements mingle controllable and noncontrollable costs.

If Fair Value closes the Toys line, it will lose the contribution of  $\$1,225,000 - \$722,500 - \$172,500 = \$330,000$ . It also will save the  $\$95,000$  of fixed costs traceable to the Toys division. However, the statement also suggests that Fair Value will not incur the  $\$281,250$  in allocated fixed costs allocated to the Toys line if it discontinues the line. Such a reduction is not likely, at least in the short term. While the common fixed costs might decrease, the decline may not be  $\$281,250$ . A detailed account analysis of the accounting records indicates that the common fixed costs

<b>Exhibit 6.15</b>		<i>Fair Value Stores: Section-Level Income Statement</i>		
	<b>Toys</b>	<b>Other Departments</b>	<b>Total</b>	
Square feet	12,000	52,000	64,000	
Revenues	\$1,225,000	\$11,375,000	\$12,600,000	
Cost of merchandise	722,500	6,212,500	6,935,000	
Variable salaries to sales staff	172,500	509,500	682,000	
Traceable fixed costs	95,000	277,800	372,800	
Allocated fixed costs	281,250	937,500	1,218,750	
<b>Profit before taxes</b>	<b>(\$46,250)</b>	<b>\$3,437,700</b>	<b>\$3,391,450</b>	

**Exhibit 6.16** *Fair Value Stores: Department-Level Contribution Margin Statement*

	Toys	Other Departments	Total
Square feet	12,000	52,000	64,000
Revenues	\$1,225,000	\$11,375,000	\$12,600,000
Cost of merchandise	722,500	6,212,500	6,935,000
Variable salaries to sales staff	172,500	509,500	682,000
Segment contribution	\$330,000	\$4,653,000	4,983,000
Traceable fixed costs	95,000	277,800	372,800
Segment Profit	235,000	4,375,200	4,610,200
Fixed costs avoided if toys line is closed	85,500		85,500
Unavoidable fixed costs			1,133,250
<b>Profit before taxes</b>			<b>\$3,391,450</b>

would decline only by \$85,500 if Fair Value discontinues the Toys line. (Some refer to such costs as **avoidable fixed costs**.) However, Fair Value will continue to incur other costs such as the lease payment for the building. Such costs are not avoidable or controllable over the short term. Thus, they are not relevant for evaluating the profit effect from closing the line.

The segmented income statement we discussed in Chapter 3 offers a convenient way to evaluate short-term profit effects. Exhibit 6.16 presents the same data as in Exhibit 6.15, but in the familiar segmented contribution margin format.

The Toys section is generating a positive margin of \$149,500 even after deducting the avoidable fixed costs. Therefore, unless the manager can rent the space for more than \$149,500 annually, it is not advisable to close down the Toys section.

**ANSWERS TO CHECK IT! EXERCISES**

**Exercise #1:** (1)  $\$243,750 - \$206,250 = \$37,500$ ; (2)  $9,000 - 6,000 = 3,000$  persons; (3)  $\$37,500/3,000 = \$12.50$ ; (4)  $\$243,750$ ; (5)  $\$12.50 \times 9,000 = \$112,500$ ; (6)  $\$243,750 - \$112,500 = \$131,250$ .

**Exercise #2:** (1) Additional revenue from charity is  $50 \times \$26 = \$1,300$ ; (2) lost revenue is  $-120 \times \$36 = (\$4,320)$ ; (3) Additional variable costs for charity are \$625; (4) variable costs saved from not serving regular customers are \$1,500; (4) The total relevant cost is (\$875) – that is, it costs less in total variable costs if we cater on Saturday because Culinary serves 70 fewer customers; (5) Relevant profit =  $(\$3,020) - (\$875) = (\$2,145)$ .

**Exercise #3:** Incremental profit from issuing a rebate:

Incremental revenue from supermarket sales – full price	= $\$2 \times -2,000 = -\$4,000$
Incremental revenue from supermarket sales – rebate	= $\$1.50 \times 22,000 = \$33,000$
Institutional sales	= $\$1 \times -20,000 = -\$20,000$
Less	
Incremental variable costs	= \$0
Incremental fixed costs	= <u>\$5,000</u>
Incremental profit	= <u>\$4,000</u>

**Exercise #4:** Total cost of buying: Contribution of  $\$5 \times 10,000$  rings – Payment to outside vendor of \$162,500 less contribution margin from being able to make the additional 10,000 rings ( $\$5 \times 10,000$ ) =  $(\$112,500)$ ; Total cost of making =  $\$125,000 = \$4,000 \times 25$  jigs + \$25,000.

**Exercise #5:** Contribution margin per production hour = \$750, \$625, and \$800, respectively for FighterJet, JumboJet, and SuperJet. Starting with SuperJet (with the highest contribution margin per production hour): Produce 60,000 units (full demand). Requires 60,000 units/20 units per hour = 3,000 hours. Contribution = 60,000 units × \$40 per unit = \$2,400,000. Remaining hours = 9,000 – 3,000 = 6,000 hours. FighterJet has the next highest contribution margin per production hour. Produce 200,000 units (full demand). Requires 200,000 units/ 50 units per hour = 4,000 hours. Contribution = 200,000 units × \$15 per unit = \$3,000,000. Remaining hours = 6,000 – 4,000 = 2,000. With 2,000 remaining hours, Aero can produce 2,000 hours × 25 units per hour = 50,000 units of JumboJet. Contribution = 50,000 units × \$25 per unit = \$1,250,000. Total contribution margin = \$2,400,000 + \$3,000,000 + \$1,250,000 = \$6,650,000. Fixed costs = \$4,000,000. Profit before taxes = \$6,650,000 – \$4,000,000 = \$2,650,000.

## SELF-STUDY PROBLEMS

### SELF-STUDY PROBLEM #1:

#### Allocation of a Scarce Resource

Suppose you are taking an examination that contains three types of questions: (1) multiple choice, (2) short answer, and (3) essay. Your instructor informs you that the exam will contain 14 multiple-choice questions worth 2 points each (28 points total), 8 short-answer questions worth 4 points each (32 points total), and 4 essay questions worth 10 points each (40 points total). Thus, the maximum score on the exam is 100 points.

You believe that you can correctly answer 90% of the multiple-choice questions you attempt, receive 80% of the possible points on each short-answer question you attempt, and receive 70% of the possible points on each essay question you attempt. In addition, you need 4 minutes to answer each multiple-choice question, 5 minutes to answer each short answer question, and 10 minutes to answer each essay question. The exam is scheduled to last only two hours—sadly, your instructor has vastly different ideas about the amount of time students need to answer these questions.

*To maximize your expected score, which type of question should you answer first? Which type of question should you answer last? What is your expected score?*

In this problem, time is in short supply. Thus, maximizing total points requires you to maximize the points earned per available minute. Exhibit 6.17 summarizes the analysis:

**Exhibit 6.17** *Expected Points per Minute of Exam Time*

	Multiple Choice	Short Answer	Essay
Maximum points per question	2	4	10
Probability correct	0.90	0.80	0.70
Expected points if question attempted	1.8	3.2	7
Time per question in minutes	4	5	10
<b>Expected points per minute</b>	<b>0.45</b>	<b>0.64</b>	<b>0.70</b>

To maximize the expected score on the exam, you should attempt the essay questions first, followed by the short-answer questions and finish with the multiple-choice questions. Such a strategy leads to the following expected score:

**Exhibit 6.18** *Expected Exam Score*

	Allocated Time (min.)	Expected Points	Time Left (min.)
Start of exam			120
Allocated to essay questions	40	28.00*	80
Allocated to short-answer questions	40	25.60**	40
Allocated to multiple-choice questions	40	18.00***	0
<b>Expected Total Score</b>		<b>71.60</b>	

\*There are four essay questions worth 10 points each. Each question takes 10 minutes to answer, and, on average, you receive 70% of the possible points. Thus, you will take  $4 \times 10 = 40$  minutes to answer these questions and receive  $4 \times 10 \times .7 = 28.00$  points (i.e., 40 minutes  $\times$  0.70 points per minute = 28 points).

\*\*There are 8 short-answer questions worth 4 points each. Each question takes 5 minutes to answer and, on average, you receive 80% of the possible points. Thus, you will take  $5 \times 8 = 40$  minutes to answer these questions and receive  $4 \times 8 \times .8 = 25.60$  points (i.e., 40 minutes  $\times$  0.64 points per minute = 25.6 points).

\*\*\*There are 14 multiple-choice questions worth 2 points each. Each question takes 4 minutes to answer, and, on average, you will receive 90% of the possible points. With only 40 minutes remaining, however, you can answer only 10 multiple-choice questions. Thus, you spend the remaining 40 minutes on multiple-choice questions and receive  $2 \times 10 \times .9 = 18.00$  points (i.e., 40 minutes  $\times$  0.45 points per minute = 18 points).

This problem shows that even though you have a greater probability of being correct on the multiple-choice questions, they should be attempted last because they take too much time. Essentially, you will only get an average of 0.45 points per minute spent on the multiple-choice questions, whereas you can get an average of 0.70 points per minute spent on the essay questions. As you can see, the principles of short-term decision making can be applied to aspects of our daily life.

**SELF-STUDY PROBLEM #2:****Excess Supply Using Alternate Approaches**

Refer to the Superior Cereals problem in the text. Suppose Superior's managers have identified the following option, in addition to the "emphasize institutional sales" and "issue a rebate" options.

- Store Display: Offer supermarkets a sum of \$17,500 for a prominent store display. Superior anticipates that this option would result in selling 40,000 boxes of toasted honey flakes at \$2 per box. Institutional buyers would snap up the remaining 10,000 boxes at \$1 per box.

**a.** Determine the best option for Superior Cereals.

Exhibit 6.19 presents the costs and benefits associated with each of Superior's three decision options. As in the text, we consider total costs and revenues associated with each option because we do not have information on the status quo.

The option with the highest value is the issue a rebate option. While the store display option generates the highest contribution margin of the three options, the increase in fixed costs swamps the increase in contribution margin. Thus, the issue a rebate option remains the best option for Superior Cereals.

**b.** Using relevant cost analysis, determine the best option for Superior Cereals.

Exhibit 6.20 recasts the information for Superior's three decision options using relevant cost analysis and evaluates the issue rebate and store display options relative to the emphasize institutional sales option.

Notice that the relevant cost analysis does not require any information about the status quo. Our analysis confirms that the issue a rebate option is the most attractive because it offers the *largest (positive) incremental profit*.

<b>Exhibit 6.19</b>		<i>Superior Cereals: Evaluating Available Options</i>		
	<b>Detail</b>	<b>Emphasize Institutional Sales</b>	<b>Issue Rebate</b>	<b>Store Display</b>
Supermarket sales—full price		25,000 boxes	23,000 boxes	40,000 boxes
Supermarket sales—rebate		—	22,000 boxes	—
Institutional sales		25,000 boxes	5,000 boxes	10,000 boxes
Wholesale price per box		\$2.00	\$2.00	\$2.00
Price per box with rebate		—	\$1.50	—
Institutional price per box		\$1.00	\$1.00	\$1.00
Supermarket sales—full price	25,000 × \$2; 23,000 × \$2; 40,000 × \$2	\$50,000	\$46,000	\$80,000
Supermarket sales—rebate	22,000 × \$1.50	—	33,000	—
Institutional sales	25,000 × \$1; 5,000 × \$1; 10,000 × \$1	25,000	5,000	10,000
Revenues		\$75,000	\$84,000	\$90,000
Variable costs		0	0	0
Contribution margin		\$75,000	\$84,000	\$90,000
Advertising & processing costs		—	5,000	—
Display space rental		—	—	17,500
<b>Profit</b>		\$75,000	\$79,000	\$72,500

<b>Exhibit 6.20</b>		<i>Superior Cereals: Relevant Cost Analysis</i>		
	<b>Emphasize Institutional Sales</b>	<b>Increment Due to</b>		
		<b>Issue Rebate</b>	<b>Store Display</b>	
Incremental revenue				
Supermarket sales — full price (= \$2 × -2,000; \$2 × 15,000)	—	-\$4,000	\$30,000	
Supermarket sales — rebate (= \$1.50 × 22,000; \$1.50 × 0)	—	33,000	0	
Institutional sales (= \$1 × -20,000; \$1 × -15,000)	—	-20,000	-15,000	
<b>Total incremental revenue</b>	—	\$9,000	\$15,000	
Incremental variable costs	—	0	0	
<b>Incremental contribution margin</b>	—	\$9,000	\$15,000	
Incremental fixed costs (= \$5,000; \$17,500)	—	5,000	17,500	
<b>Incremental profit</b>	\$0	\$4,000	-\$2,500	

## GLOSSARY

- Avoidable fixed costs** Costs that need not be incurred if an option is not chosen. Same as controllable fixed costs.
- Capacity** The maximum volume of activity that a company can sustain with available resources.
- Excess capacity/Excess supply** A condition that obtains when available capacity exceeds realized demand.
- Excess demand** A condition that obtains when realized demand exceeds available capacity.
- Incremental (differential) approach** An approach for framing and solving decisions that involves expressing the benefits and costs of the various decision options *relative* to one of the options.
- Joint cost** A cost that is common to two or more products. Costs of a joint process.
- Joint product** Products that are produced in a joint process. It is not possible to produce one joint product without producing the others as well.
- Relevant cost analysis** See Incremental (differential) approach.
- Split-off point** Step in a joint process after which we can identify and process the joint products separately.
- Totals (gross) approach** An approach that includes non-controllable costs and benefits to construct a contribution margin statement for each decision option.

## REVIEW QUESTIONS

- 6.1 **LO1.** What do short-term decisions deal with in most business environments?
- 6.2 **LO1.** What does the term “capacity” mean?
- 6.3 **LO1.** Why is the decision of how much capacity to put in place a long-term decision?
- 6.4 **LO1.** What are the two broad classifications of short-term decisions? List two examples of each.
- 6.5 **LO2.** Briefly describe the incremental or differential method approach to making short-term decisions.
- 6.6 **LO2.** Briefly describe the totals or the gross approach to making short-term decisions.
- 6.7 **LO2.** Which approach, incremental or totals, requires more computations? Why?
- 6.8 **LO2.** When might the gross approach be preferable to the incremental approach for making short-term decisions?
- 6.9 **LO3.** Are sales promotion decisions typically responses to an excess supply situation or an excess demand situation?
- 6.10 **LO3.** What is a make-or-buy decision?
- 6.11 **LO4.** When does it make sense to compute the contribution margin per unit of a particular resource in making short-term decisions?
- 6.12 **LO4.** What is the general rule for allocating a scarce resource to making multiple products?
- 6.13 **LO5.** How might managers deal with the possible long-term implications that may arise from short-run decisions?

## DISCUSSION QUESTIONS

- 6.14 **LO1.** The definition of “short-term” depends on the business context. What would General Motors consider as short-term? Is this period longer than what a bakery would consider as short-term? Why?
- 6.15 **LO1.** Automobile dealers frequently advertise sales because their lots are “overflowing.” The ads suggest a shortage of storage capacity but the price-cutting action indicates a demand shortfall. How can you reconcile these seemingly contradictory inferences? (*Hint:* Think about defining capacity in terms of vehicles sold per day.)
- 6.16 **LO1, LO5.** After a heavy snowfall, hardware stores often experience a run on snow shovels and other snow removal equipment. However, they rarely raise prices even though there is a temporary spike in demand. What considerations, legal and otherwise, do you think govern their actions? (*Hint:* Do an Internet search on the phrase “price gouging” for some provocative articles.)
- 6.17 **LO1.** Identify the one resource whose daily supply is fixed for each person. How could we improve the effectiveness with which we consume this resource?
- 6.18 **LO2.** Some people argue that the gross method is also, at some level, “incremental.” Evaluate this argument. (*Hint:* Think about how the gross method treats Superior Cereal’s other costs and revenues.)
- 6.19 **LO3, LO5.** When faced with a sudden spurt in demand, why does it sometimes make sense for a company to increase prices? For example, why do airlines raise fares during peak travel periods? Why might it not be a good idea for consulting companies?
- 6.20 **LO3.** In periods of excess capacity, does it make sense for a manufacturing company to produce some products to stock (i.e., build up inventory) for sale in future periods of high demand? Give two examples of industries where this might be a good idea. Give two examples where it might be a bad idea.

- 6.21 LO3.** How does holding inventory help reduce the expected gap between available capacity and uncertain demand?
- 6.22 LO3 (Advanced).** Inventory is one mechanism that a firm could use to protect itself from the impact of fluctuating demand. What are other long-term strategies a company could adopt to insulate itself against uncertain demand?
- 6.23 LO4.** Often, the capacity of the most expensive machine defines a plant's capacity. That is, firms will deliberately install excess capacity in "cheap" resources. Why might this practice be optimal?
- 6.24 LO4 (Advanced).** The general allocation procedure in the text assumes few constraints on how we could use resources. Why might this general rule not hold when individual uses require a *minimum* amount of the resource? (For example, if we are allocating space, each use might need a minimum of 10 units of space.) How might we modify our approach to incorporate lumpy uses of capacity?
- 6.25 LO4.** How does the notion of maximizing the contribution per unit of the scarce resource apply when some products have *minimum* production quantities?
- 6.26 LO5.** Outsourcing is the practice of having an external party take over some business and/or manufacturing processes. How does outsourcing change a firm's cost structure and, therefore, its ability to be nimble in responding to competition? What are some long-term costs and benefits of outsourcing?
- 6.27 LO5.** We often dip our toes in the water to check the temperature before jumping in. How might this analogy pertain to a firm introducing a new product? How does test marketing provide greater flexibility to the firm relative to a national launch?
- 6.28 LO5.** Suppose that buying a component is estimated to save \$50,000 annually over making it in-house. However, outsourcing the component means that 20 long-term employees would be laid off, adversely affecting employee morale. How might a manager trade off these two factors?

## EXERCISES



- 6.29 Framing and solving short-term decisions using controllable cost and gross approaches (LO1, LO2).** Ajay Singh offers gift-wrapping services at the local mall. Ajay wraps each package, regardless of size, in the customer's choice of wrapping paper and bow for a price of \$3. Ajay's variable costs total \$1 per package wrapped, and his fixed costs amount to \$600 per month.

Due to the anticipated increase in demand over the holiday season, Ajay is considering hiring a helper, at a cost of \$8.50 per hour, to help him wrap packages. With the helper, Ajay estimates that he can wrap 110 packages in a 10-hour day. Without the helper, Ajay estimates that he can wrap 60 packages in a 10-hour day. Ajay plans on operating his business for thirty 10-hour days during the holiday season.

*Required:*

- Does Ajay's decision deal with excess supply or excess demand?
  - Using the gross approach, determine whether Ajay should hire the helper.
  - Using controllable cost analysis, determine whether Ajay should hire the helper.
  - Assume Ajay's fixed costs were \$1,000 rather than \$600. Would this affect Ajay's decision to hire a helper?
- 6.30 Special-order pricing using the controllable cost analysis (LO2, CIMA Adapted).** Magic Maids is one of England's largest commercial office cleaning services. The company has set a price of £120 for cleaning the "standard" business office. (£ = British Pound, the official currency of the United Kingdom). Magic Maids derived this price as follows:

Cleaning materials	£12.50 <sup>1</sup>
Labor (3 hours @ £15 per hour)	45.00 <sup>2</sup>
Variable overhead	7.50 <sup>3</sup>
Fixed overhead (3 hours @ £5 per hour)	15.00 <sup>4</sup>
Total cost	80.00
Profit markup (50%)	40.00
Price	<u>£120.00</u>

<sup>1</sup> Magic Maids provides all of the cleaning supplies.

<sup>2</sup> All Magic Maids employees receive a fixed salary. Magic Maids computes the "hourly" rate of £15 per hour by dividing the total salary by the total number of hours available.

<sup>3</sup> Variable overhead consists of costs such as scrub brushes and vacuum bags that depend on the number of offices cleaned.

<sup>4</sup> Magic Maids arrived at this estimate by dividing its total fixed overhead of £150,000 (which is comprised mainly of office rent and administrative salaries) by the total number of available labor hours, or 30,000.

A local conglomerate based in London approached Magic Maids about the possibility of cleaning 150 standard business offices next week. The conglomerate needs the work done on a rush basis due to an unexpected visit by a dignitary. Magic Maids has all of the requisite supplies in stock. It believes that it could complete 60% of the job during normal business hours. To complete the remaining 40%, however, some employees will have to work overtime; these employees receive £22.50 per hour, or 1.5 times the hourly rate, for their overtime hours.

*Required:*

- a. Does Magic Maids' decision deal with excess supply or excess demand?
- b. What is the incremental cost associated with cleaning the 150 offices?
- c. How might Magic Maids use the incremental cost number you calculated in part b for decision making?

**6.31 Special-order pricing, time-based pricing (LO1, LO2, LO3).** Erin and Kyle Kouri operate a highly regarded Bed & Breakfast inn located in the historic district of Montpelier, Vermont. The inn has six rooms—each room has its own theme and rents for \$180 per day. While the rooms are usually occupied on weekends (Friday, Saturday, and Sunday), it is rare for more than two rooms to be occupied during the week.

This past week, Erin received a telephone call from a customer who wishes to rent four rooms from Monday afternoon through Thursday morning (three nights). The customer and her three friends are planning a vacation and picked Montpelier for its recreational and cultural activities. However, the customer indicated that \$180 a day was beyond their budget. She suggested a flat sum of \$200 per person for the entire stay. She also requested that each person be accommodated in a separate room.

Erin and Kyle are not quite sure what to do. If they do not accept the customer's offer, then the rooms will remain empty. In addition, Erin and Kyle figure that it only costs them \$10 per day to clean a room and change the linens. On the other hand, Erin and Kyle are concerned about renting the rooms for less than 50% of the standard rate.

*Required:*

- a. Does Erin and Kyle's decision deal with excess supply or excess demand?
- b. What should Erin and Kyle do?

**6.32 Make versus buy (LO1, LO2, LO3).** Jen Ahrens is a part-time artist who produces exquisite Japanese calligraphy prints on rice paper. Jen typically makes 50 prints per month and sells most of the prints for \$75 each. Jen estimates that the variable cost of the paper and supplies amount to \$8 per print and that her monthly fixed costs (the studio and utilities) amount to \$250. (Jen's fixed costs are low because she works in a small room in her home.) Finally, Jen has each print framed and pays a local framing shop \$25 per print for this service.

Due to a slowing economy, Jen's sales have slumped. Jen has only sold 30 prints in each of the past three months, and she believes that the demand for her prints will remain at 30 a month for the foreseeable future. Accordingly, Jen has reduced her production to 30 prints per month. Jen ruled out lowering her price because it will take her below the "price point" for her target audience, and she worries that reducing the price would lead customers to believe that her work is of low quality. Rather, Jen seeks your advice regarding doing her own framing. Jen believes that it would only cost her \$10 per print to frame her own work and that she could do as good a job as the framing shop.

*Required:*

- a. Does Jen's decision deal with excess supply or excess demand?
- b. What is the cost of Jen doing her own framing versus having it done by a framing shop?
- c. Assume that Jen will only be able to produce 15 prints a month if she does her own framing. How does this information affect your answer to part (b)? For simplicity, assume that Jen either frames all or none of her prints.

**6.33 Product promotion, excess capacity (LO2).** Tom and Lynda, owners of Hercules, are considering whether to offer valet parking as an optional feature of membership. They estimate that offering the service would increase monthly costs by \$2,500 for salaries paid to attendants, increase in insurance rates, and so on. They also estimate that 400 members would use the service if it were priced at \$5 per month. At this price, the club would also attract 20 new members. The number using the service would be 300





and the number of new members would be 10 if valet parking were priced at \$10 per month. You estimate membership fees at \$100 per month and variable costs at \$35 per month.

*Required:*

- a. At what price, if at all, should Tom and Lynda offer valet parking as an optional feature of the membership? Justify with supporting calculations.
- b. What other factors might Tom and Lynda consider in their decision?



**6.34 Excess capacity & excess demand (LO1, LO2).** Marjorie Myers, a nurse, has approached Tom and Lynda, owners of Hercules, with an intriguing proposal. Marjorie wishes to offer specialized classes to small groups of expectant mothers. She believes that the exercise room at Hercules is perfect for her service, guarantees that she will not use any other part of the gym, will bring her own supplies, and promises not to interfere with the gym's operation in any way.

*Required:*

- a. Marjorie is willing to pay \$600 per month for use of the room, three days per week. She is willing to hold the class between 1 and 3 P.M. on weekdays. During this time, the gym is usually deserted and no classes are scheduled. Should Tom and Lynda accept Marjorie's offer?
- b. Assume the same facts as in part (a) except that Marjorie wishes to hold one of her classes from 6 to 7 P.M. for three weekdays. She will increase payment from \$600 to \$700 per month. (She will schedule the other class from 1 to 2 P.M.) This schedule will disrupt the current schedule and make some of Hercules' current classes less convenient. Tom and Lynda anticipate losing eight members as a consequence. You know that monthly membership is \$100 and monthly variable costs are \$35 per member. Should Tom and Lynda accept Marjorie's offer? Assume that Marjorie will not accept a deal that does not include the requested evening time slot.
- c. Suppose Marjorie is willing to accept the terms in part (a) or in part (b). Using the situation in part (a) as the base, calculate the *incremental* profit from scheduling evening classes.

**6.35 Working with unit-level data, pricing (LO2).** The Déjà Vu Card Company offers greeting cards for every occasion at unmatched prices. The following information comes from Déjà Vu's accounting records for December of the most recent year:

Greeting cards sold	100,000 cards
Selling price	\$1.00 per card
Fixed costs:	
Manufacturing	\$0.30 per card
Marketing & administrative	\$0.21 per card
Variable costs:	
Manufacturing	\$0.15 per card
Marketing & administrative	\$0.08 per card

*Required:*

Déjà Vu has an extra stock of 5,000 holiday greeting cards. The company is considering two options: (1) holding a 50% off sale and (2) holding an 80% off sale. Déjà Vu expects to sell 1,500 cards if it holds a 50% off sale and 4,000 cards if it holds an 80% off sale. The remaining cards would be discarded. Which option should Déjà Vu pursue?

**6.36 Effect of cost structure on decision making, gross approach (LO2).** You and your four closest childhood friends ("The Fab Five," as you like to call yourselves) all attend the same university. Collectively, you are trying to determine the best way to organize transportation to and from your home town over the winter break; you have come up with two options:

1. *Drive.* While it will be cramped, your car can accommodate all five people. Operating your car will cost \$0.30 per mile driven (in oil, gas, expected wear and tear of car, etc.), but this cost will be split five ways. In addition, because the 800-mile, one-way trip home will take more than 12 hours, you expect that each person will spend \$20 on food and refreshments each way (i.e., the \$20 cost will be incurred twice—on the trip home and on the return trip).

2. *Fly.* One of your friends, Amy, has found a cheap, round-trip, Internet-only fare for \$169 per person. You can use the mass-transit system for transportation to and from the airport—this will cost \$6 per person each way. Your parents will pick you up and drop you off at the other end. Finally, because the airline schedule calls for the trip to last 4 hours and 19 minutes (this estimate does not include travel time to and from the airport), you expect that each person will spend \$5 on refreshments each way.

*Required:*

- What is the per-person, round-trip cost for each option? Which option is cheaper?
- Suppose it was just you and one friend (the “Terrific Two”) rather than you and four friends. How does this information change your answer to part (a) above? That is, what is the per-person, round-trip cost for each option? Which option is cheaper?
- What other factors would you consider in deciding whether to drive or to fly?
- Is this a problem of excess demand or excess supply?

- 6.37 Joint cost allocation (Appendix A).** Myers Quarry produces coarse gravel and sand in an 8:2 ratio. Joint costs for a month (volume = 9,000 tons of rocks input) amount to \$225,000. Values at the split-off point are \$30 per ton for gravel and \$40 per ton for sand.

*Required:*

- Allocate joint costs to the two products using the relative sales value at split off as the allocation basis.
- Suppose Myers can run the sand through a sieve to remove small rocks and make fine sand used to fill sandboxes. The process will, however, reduce the yield of sand from 1,800 tons to 900 tons. This superior grade of sand (“sandbox” quality) retails for \$160 per ton. However, Myers will incur \$18,000 to process the sand into “sandbox” quality. Should Myers sell the coarse sand as is or process it further into sandbox quality sand?

- 6.38 Calculating incremental costs and revenues, special promotion (LO2, LO3).** Mihir Patel is in charge of a multiplex operated by Majestic Cinema. In an attempt to boost profit, Mihir is considering a two-for-one promotion. Under this scheme, any customer attending a matinee show can exchange their ticket stub for a free pass at the end of the matinee. The pass is valid for the next seven days on any matinee show in any of the screens in the multiplex. Mihir believes the scheme is a winner because just about every matinee has empty seats, and the cost of showing a movie (e.g., projection, utilities) will not change if a matinee attracts a few more patrons.

Mihir estimates that running the promotion will increase overall weekly attendance at matinee shows from 2,000 to 2,500 persons. However, Mihir expects that running the promotion actually will decrease matinee ticket sales from 2,000 to 1,800 (in other words, Mihir expects 700 people to take advantage of the promotion and actually use their free pass). Mihir does not expect the promotion to affect attendance and sales on nonmatinee shows. The average matinee ticket sells for \$3.95. Mihir believes that the lost matinee ticket revenue would be offset by increased sales at the concession stand. Moreover, Mihir figures that roughly half of his customers patronize the concession stand. The average moviegoer who visits the concession stand spends a total of \$6 on drinks, popcorn, and candy. Variable costs in the concession stand amount to 15% of concession revenue, and weekly fixed costs for the concession stand equal \$2,000.

*Required:*

Calculating controllable costs and benefits, determine the value of the promotion.

- 6.39 Product interdependencies, incentive conflict (LO3, Appendix B).** Greg Gordon manages the 10,000-square-foot multilevel laser tag arena at LazerLite. This arena combines cutting-edge computer technology with action-oriented team play; in a futuristic environment with boggling mazes, fantastic fog swirls, and adrenaline-pumping music, players attempt to score points by “tagging” opponents and targets with a laser phaser. LazerLite charges its customers \$7.50 to play a 10-minute game of laser tag. The fixed costs associated with operating the laser tag arena amount to \$2,500 per week, with variable costs equaling \$3.00 per person per game. On average, 1,400 persons visit LazerLite per week, each playing one game of laser tag.

LazerLite also offers its customers a fully stocked video arcade. When not playing laser tag, customers can enjoy some of the hottest video games and coolest simulator rides. Approximately 75% of all customers who play laser tag each week patronize the video arcade. Once inside the arcade, customers spend approximately \$6 on video games and rides. The variable costs of running the video arcade equal 10% of video arcade revenue, while the fixed costs of running the video arcade total \$2,000 per week.

The owners of LazerLite are considering running an after-school special Monday through Thursday from 3:30 P.M. to 5:30 P.M. The after-school special will reduce the price of a laser tag game from \$7.50 per person to \$5.00 per person (thus, there will be a \$2.50 savings per game of laser tag during this time). Management expects that 500 people, each playing one game of laser tag, will take advantage of the special each week. However, management also expects that, because of the special, weekly demand for laser tag games at the normal price of \$7.50 per game will decrease by 300 (thus, the special will attract a net of 200 additional people). The incremental fixed costs associated with running the after-school special are expected to equal \$150 per week (for advertising).

*Required:*

- a. From Greg's perspective, is the after-school special desirable? Assume that as the manager of the laser tag arena, Greg receives an annual bonus tied to the profitability of the laser tag arena.
- b. From the perspective of LazerLite, is the after-school special desirable?

**6.40 Discontinuing a product line, incremental approach, qualitative considerations (LO2, LO3, LO5, Appendix B).**

Gerry's Guitar Shack is the "happening" place in Wichita, Kansas. Gerry has 400 square feet of usable retail space on the first (ground) floor and an additional 200 square feet upstairs. The first floor is stocked with guitars, amps, music books, and other related items. Currently, the second floor is comprised of six 6-foot by 4-foot sound-proof cubicles and 80 square feet of common space. The cubicles are used by local musicians to give lessons.

Gerry figures that he generates \$5,000 of revenue per year per square foot from the ground floor. His typical markup is such that he makes \$0.25 in contribution margin per dollar of revenue. Gerry also figures that each of his four salespersons costs him \$50,000 annually, with additional fixed costs (rent, etc.) amounting to \$100,000 a year.

The upstairs music cubicles also generate some revenue. Each ½ hour rental generates a \$5 fee to the Guitar Shack. Gerry estimates that each cubicle is used 40 times a week during the 50 weeks a year the store is open. There are negligible variable costs associated with the cubicles, and traceable maintenance and other fixed expenses amount to \$7,500 per year. (These costs are included in the \$100,000 amount above.)

Gerry is getting somewhat tired of the music lessons. He believes that he spends too much time scheduling the rooms and dealing with conflicts and changes. Many of the musicians who give lessons also invariably spend time chatting with Gerry and the salespersons, and Gerry believes that such chatting does not help productivity. Given all of these factors, Gerry is considering remodeling the upstairs portion of his store to remove the cubicles and convert it to retail space. He figures that he can get 150 square feet of usable retail space, bringing the shop total to 550 square feet. Similar to the downstairs space, Gerry believes the remodeled upstairs would generate \$5,000 in revenue per year per square foot. The added sales volume, however, would also trigger the need for two more salespersons. Finally, Gerry estimates that the traceable maintenance and other expenses for the remodeled upstairs space would amount to \$10,000 per year.

*Required:*

- a. Using controllable cost analysis, compute the expected change in Gerry's annual profit associated with converting the upstairs to retail space.
- b. What additional considerations do you believe Gerry needs to consider in this decision. For example, do you believe Gerry will be able to generate the same revenue per square foot in the expanded facility?

**6.41 Excess demand, manufacturing, qualitative considerations (LO3, LO4, LO5).** Justin Brass specializes in marine pumps. Justin's monthly contribution and profit are \$125,000 and \$50,000 at its current monthly volume of 2,500 pumps. At this volume, Justin's firm fully uses its available capacity of 10,000 labor hours.

Justin's management has been trying to branch out into making valves. A buyer has contacted Justin for an order of 500 valves. Each valve will consume 3 labor hours and yield a contribution of \$30 per unit.

*Required:*

- By how much will Justin's monthly profit change if the valve order is accepted?
- Determine the price per valve at which Justin's monthly profit is the same whether it accepts or rejects the valve order.
- Discuss two qualitative considerations that might affect Justin's decision.

**6.42 Optimal allocation of scarce resource (LO4).** SuperSound Stereos sells high-end stereo equipment to specialty audio and video shops. SuperSound serves three different types of customers: small, medium, and large. Customers are placed into these categories based on the average revenue generated per visit—"small" customers yield average revenue of less than \$20,000 per visit, "medium" customers yield an average revenue of \$20,000 to \$40,000 per visit, and "large" customers yield an average revenue of over \$40,000 per visit. Data for a typical sales territory are provided below:

	<i>Customer Category</i>		
	<i>Small</i>	<i>Medium</i>	<i>Large</i>
Number of customers in the territory	50	25	10
Average sales revenue per visit	\$15,000	\$30,000	\$45,000
Average time to visit a customer	1.0 hour	2.0 hours	5.0 hours

Salespersons can realistically spend 125 hours per month visiting customers and generating orders. Salespersons' remaining time is spent in the head office filling out paperwork, learning about the company's products, and attending sales meetings. With only 125 hours available per month to visit customers and generate sales revenue, salespersons unfortunately cannot visit all of the potential customers in their territory.

*Required:*

- Traditionally, SuperSound's salespersons have given top priority to large customers because these customers generate the most revenue per visit. Calculate monthly revenue in a typical sales territory if, in a given month, a salesperson first visits all the large customers, then visits all the medium customers and, finally, squeezes in as many small customer visits as possible.
- Trey Foster is SuperSound's top salesperson. In contrast to conventional wisdom, Trey focuses first on the small and medium customers and, if time permits, the large customers. He tells anyone who will listen that large customers are not worth the bother—"You can win a game with singles" is the mantra that Trey preaches. Calculate monthly revenue using Trey's sales strategy. How do you explain Trey's success?

**6.43 Qualitative Aspects of short-term decisions (LO3, LO5).** After spending five years working for a prestigious consulting firm, Christine Kuhl enrolled in a top MBA program. Christine believes that obtaining an MBA is necessary to achieve her goal of becoming a partner in a major consulting firm. Christine is paying for her MBA (i.e., tuition, books, and living costs) with \$25,000 in savings and a \$45,000 loan. The MBA program requires four full trimesters of coursework; each trimester spans four months, including time for breaks. Most students complete the MBA program in 16 months.

Halfway into her third trimester, Christine's ex-employer called and offered her an attractive two-month assignment that perfectly meshes with her interests and expertise. Because this is a rush job, her previous employer is willing to pay Christine \$50,000 to complete the two-month assignment. Unfortunately, accepting the assignment would require Christine to drop her current classes and retake them the following trimester. Since the tuition and fees are nonrefundable, Christine will spend \$8,000 to re-register for these classes. In addition, her graduation will be delayed by four months (one trimester). Realistically, Christine estimates that she will earn a starting annual salary of

\$120,000 immediately upon graduating. Her current and future living expenses amount to \$2,000 per month.

*Required:*

- a. Based on the information provided, what is the net monetary benefit associated with accepting the assignment?
- b. In your opinion, is the net monetary benefit large enough for Christine to accept the assignment? If not, what qualitative considerations are likely to guide Christine's decision?

**6.44 Qualitative aspects of short-term decisions (LO3, LO5).** "I paid three C-notes for each ticket—I don't want to miss the game!" This was Charlie's reaction upon being informed by his assistant that a major client had unexpectedly arrived in town and wanted to have dinner with Charlie. The client was in town briefly and had a full schedule. Dinner was the only available time that the client could meet with Charlie.

Charles Watson III is the scion of a publishing family. As vice president of marketing, Charlie has propelled his company to the forefront of e-publishing. This particular client controls major magazines, and Charlie is in the thick of negotiating an important contract with her company. However, Charlie also is a die-hard Knick's fan and had worked his contacts to obtain the two center-court playoff tickets he referred to in his outburst.

*Note:* A "C-note" or just "C" is slang for \$100, as the Roman numeral system uses the letter "C" to denote a hundred. The Knicks, based in New York, are part of the National Basketball Association and a high-powered team with a loyal following.

*Required:*

- a. Does Charlie's decision deal with excess supply or excess demand?
- b. Is the price paid for the two Knicks tickets (\$600) relevant to Charlie's decision?
- b. What are the qualitative factors that are likely to guide Charlie's decision?

## PROBLEMS

**6.45 Product-line Decisions, gross approach (LO2, Appendix B).** Pete's Pets is an independent pet store located in Hoboken, New Jersey. Pete collects and reports operating data by "product line," with all revenues and costs being placed into one of three summary categories: (1) dogs, (2) cats, (3) birds & fish. For the most recent year of operations, Pete reported the following results:

	Dogs	Cats	Birds & Fish	Total
Revenue	\$218,000	\$142,500	\$92,500	\$453,000
Variable costs	87,200	42,750	46,250	176,200
Contribution margin	\$130,800	\$99,750	\$46,250	\$276,800
Traceable fixed costs	31,500	22,600	27,500	81,600
Common fixed costs*	35,000	35,000	35,000	105,000
<b>Profit</b>	<b>\$64,300</b>	<b>\$42,150</b>	<b>(\$16,250)</b>	<b>\$90,200</b>

Common fixed costs relate to rent. Since dogs, cats, and birds and fish each use one-third of the available space, Pete allocates these costs equally among the three pet-related

While pleased with his overall profit and the profit on dogs and cats, Pete is concerned about the loss on birds and fish. He is thinking about discontinuing the birds and fish product line, and using the space to expand his offering of dogs and cats and their related supplies. Pete believes this option would increase both dog and cat revenue by 12%; however, it would also increase dog-related traceable fixed costs by \$12,500 and cat-related traceable fixed costs by \$8,000.

*Required:*

- a. Using the gross approach, evaluate whether Pete should discontinue the birds and fish product line.
- b. For decision-making purposes, do you believe Pete needs more detailed information than is currently provided in his financial statements? Why?

**6.46 Incentives and sales promotions, relevant cost analysis, qualitative considerations (LO2, LO5, CMA Adapted).** The Fangorn Forest Furniture Company makes outdoor furniture from aged wood. Fangorn's two primary product lines are chairs and tables. Pippin Took, founder and owner of the Fangorn Forest Furniture Company, is somewhat dismayed that sales of tables are not going as well as planned. Data for the most recent quarter (three months) of operations are as follows:

	Chairs	Tables	Total
Quantity sold	8,000	1,500	
Revenue	\$800,000	\$375,000	\$1,175,000
Direct materials	288,000	140,625	428,625
Direct labor	192,000	46,875	238,875
Contribution margin	\$320,000	\$187,500	\$507,500
Traceable fixed costs	125,000	100,000	225,000
Common fixed costs*	75,000	75,000	150,000
<b>Profit</b>	<b>\$120,000</b>	<b>\$12,500</b>	<b>\$132,500</b>

These costs relate to space, equipment, and personnel used by both the chairs and tables product lines (e.g., costs of running the factory, administrative costs, Pippin's salary). Because these costs are common to both product lines, Pippin has allocated an equal amount to each product line.

Pippin was certain that the lagging sales on tables were due to a lack of effort on the part of his sales force (Pippin believes that his sales force is pushing the lower-priced chairs rather than the higher-priced tables). To spur sales of tables, Pippin is considering rewarding the salesperson who sells the most tables in each quarter with an all-expense paid vacation for two to Hawaii.

*Required:*

- Suppose the Hawaii vacation will cost Pippin \$6,000. How many additional tables need to be sold each quarter to justify running the sales contest?
- Pippin believes that offering the trip to Hawaii will increase table sales by 288 units per quarter. By how much is quarterly profit on the tables product line expected to increase?
- Pippin's close friend, Merry Brandybuck, mentions to Pippin that since the contest only rewards sales of tables, chair sales actually may decrease. What do you think—is this possible? By how much would sales on chairs have to decrease before it is no longer profitable for Pippin to offer the trip to Hawaii (as in part [b], assume the trip is expected to increase quarterly table sales by 288 units)?
- In addition to the consideration in part (c), what other factors should Pippin consider before running the sales contest?

**6.47 Excess supply, controllable cost analysis, pricing (LO1, LO2, LO3).** The Cottage Bakery sells a variety of gourmet breads, cakes, pies, and pastries. Although its wares are considerably more expensive than those available at supermarkets and other bakeries, the Cottage Bakery has a loyal clientele willing to pay a premium price for premium quality.

The Cottage Bakery sells a variety of fresh-baked muffins daily for \$1.50 each. The variable cost of making each muffin is \$0.90. Invariably, approximately 20 muffins are left over at day's end, and Cottage currently donates these muffins to the local homeless shelter. Joe Smart, a bright young man on Cottage's counter-staff, suggests selling the unsold muffins the next day, labeling them as "day-old" and selling them at a 50% discount. Joe believes that sales of "day-old" muffins would average 15 per day and would not affect the sales of regular muffins.

Management of Cottage Bakery likes Joe's proposal, but they were considering using the remaining counter space to sell fresh raspberry-filled croissants for \$2.00 each. The variable cost of making each croissant is \$1.20, and management expects sales to average 20 croissants per day without affecting the sales of other (e.g., chocolate) croissants. In addition, management estimates that, on average, 2 raspberry-filled croissants would be left over at day's end (i.e., Cottage plans to produce 22 croissants per day). Any left-over croissants would be donated to the local homeless shelter as there would not be

any space to sell “day-old” croissants. Moreover, if Cottage sells fresh raspberry-filled croissants, it will not have any space to sell “day-old” muffins.

*Required:*

- a. List all of the options in Cottage Bakery’s opportunity set with respect to the remaining counter space. What is the status quo? Is it a viable option?
  - b. Compared to the status quo, what is the incremental daily profit associated with Cottage Bakery’s other options?
  - c. What should Cottage Bakery do with the remaining counter space?
- 6.48 Joint cost allocation (Appendix A).** Chemco employs a joint process (cost: \$100,000) that produces two chemicals, JAV-100 and YAZ-200. At the current volumes, the value of these products at the split-off point is \$80,000 and \$40,000, respectively. Chemco has the option of spending \$25,000 to further process YAZ-200 into YAZ-400, with a sales value of \$80,000.

*Required:*

- a. Suppose Chemco does not process YAZ-200 further. Allocate joint costs to the two products using the revenue from the product as the allocation basis. Calculate the profit earned from each product, taking the allocated costs into account. (Round all numbers to the nearest dollar.)
  - b. Repeat the exercise in part (a) except assume that Chemco does process YAZ-200 into YAZ-400.
  - c. Focusing on the product level profit calculated in parts (a) and (b), should Chemco process YAZ-200 into YAZ-400? Why is this comparison suspect?
- 6.49 Special-order, unitized data, relevant cost analysis (LO2, LO3, CMA Adapted).** Award Plus manufactures medals and trophies for winners of athletic competitions and other contests. Award Plus’s manufacturing plant has the capacity to produce 10,000 medals per month. Currently, Award Plus is operating at 75% of available capacity, producing 7,500 medals per month. Pertinent data for this level of operations follows:

Medals produced and sold	7,500
Selling price	\$175 per medal
Fixed costs:*	
Manufacturing	\$46 per medal
Marketing & administrative	\$34 per medal
Variable costs:	
Direct materials	\$50 per medal
Direct labor	\$40 per medal
Profit	\$5 per medal

\*Award Plus calculates fixed costs per medal by dividing the annual fixed cost by the number of medals it expects to produce during the year.

Recently, Award Plus received an inquiry from a national Little League baseball organization about the possibility of producing 1,800 medals next month. The Little League organization plans to give the medals to the winners of the upcoming state tournaments. Since there are 50 states, 3 age brackets, and approximately 12 players per team, the organization needs 1,800 medals (i.e.,  $1,800 = 50 \times 3 \times 12$ ). The Little League organization, however, indicates that they are somewhat strapped for cash and can only pay \$100 for each medal.

*Required:*

- a. Using the following table, indicate whether each item is relevant or not relevant for computing the incremental profit on the special order. Assume that Award Plus’s relevant range of operations is between 5,000 and 10,000 medals.

Item	Relevant? (Y or N)	Reason
Regular selling price (\$175)		
Special order price (\$100)		
Direct materials cost		
Direct labor cost		
Fixed manufacturing cost		
Fixed marketing & administrative cost		

- b. By how much will Award Plus’s profit increase or decrease if it accepts the special order?

- c. Assume that Award Plus's manufacturing plant has the capacity to produce only 9,000 medals per month rather than 10,000 medals per month. This means that if Award Plus accepts the special order, it will have to forego sales of 300 medals to its regular customers (i.e., the special order cannot be partially fulfilled). How does this information affect your answer to part (b)? That is, by how much will Award Plus' profit increase or decrease if it accepts the special order when plant capacity is only 9,000 medals?

**6.50 Sales promotion, controllable costs (LO2, LO3).** Hōgyoku Tamukeyama owns and operates a successful dry cleaning business in Bangor, Maine. Summary financial data for a typical month of operations are as follows:

Revenue	\$30,000
Variable costs (40% of revenue)	<u>12,000</u>
Contribution margin	\$18,000
Fixed costs	<u>10,000</u>
Profit	<u>\$8,000</u>

Because it is the end of winter, Hōgyoku is considering running a special promotion on parkas, comforters, and other winter items. During the month-long promotion Hōgyoku plans to reduce the charge for cleaning each of these bulky winter items from \$9 to \$6. Hōgyoku plans to spend \$1,000 advertising the promotion in various print media, and she expects the promotion to increase the coming month's sales by 1,500 winter items. Hōgyoku's average monthly revenue on winter items during a typical month amounts to \$4,500.

*Required:*

By how much will Hōgyoku's profit increase or decrease in the coming month if she runs the promotion?

**6.51 Eliminating a product line, gross approach (LO2, LO3, Appendix B).** SpringFresh provides commercial laundry and dry cleaning services to local hospitals, hotels, and restaurants. Management believes that the dry cleaning business is a "loser," even though dry cleaning operations yield a high contribution margin. Moreover, based on summary financial data from the most recent year of operations (presented here) management is seriously considering getting out of the dry cleaning business.

	<u>Laundry</u>	<u>Dry Cleaning</u>	<u>Total</u>
Revenue	\$3,000,000	\$1,000,000	\$4,000,000
Variable costs	<u>1,000,000</u>	<u>200,000</u>	<u>1,200,000</u>
Contribution margin	\$2,000,000	\$800,000	\$2,800,000
Traceable fixed costs	1,000,000	500,000	1,500,000
Common fixed costs*	<u>500,000</u>	<u>500,000</u>	<u>1,000,000</u>
Profit	<u>\$500,000</u>	<u>(\$200,000)</u>	<u>\$300,000</u>

\* These costs relate to the sales force, reception, and delivery trucks that are common to both lines of business. Management has arbitrarily allocated an equal amount to each line.

*Required:*

- a. Assume that common fixed costs would decrease by \$200,000 if the dry cleaning business were closed. By how much will SpringFresh's profit increase or decrease if it closes the dry cleaning operations?
- b. Suppose that closing the dry cleaning business would increase overall laundry revenue by 10%. Specifically, while some customers would be lost because they value one-stop cleaning convenience, the sales force will be better able to focus its efforts because there will be only one product line. How does this information affect your answer to part (a)? That is, by how much will SpringFresh's profit increase or decrease if it closes the dry cleaning operations?

**6.52 Excess supply, structuring promotions (LO1, LO3).** GoGo Juice is a combination gas station and convenience store that is located at a busy intersection in a major metropolitan area. Recently, a national chain opened a similar store two blocks away, and, as a result, GoGo Juice's profits have decreased. In an effort to boost profit, GoGo Juice is considering running a special promotion. Under the special promotion, customers would receive \$0.01 in free merchandise for every \$0.20 spent on gasoline. For example, a customer purchasing \$12.60 in gasoline would receive  $(\$12.60/\$0.20) \times .01 = \$0.63$



in free merchandise (the customer could use the \$0.63 toward the purchase of a soda, candy bar, etc.).

Management of GoGo Juice believes that the special promotion will increase gasoline sales by 8% from their current levels. In addition, management believes that overall merchandise sales will increase by 12% from their current levels. Most of the increase in merchandise sales will result from persons redeeming their free merchandise money; indeed, management expects that everyone will use their free merchandise money. However, merchandise sales also are expected to increase because, in the process of using their free merchandise money, people will spend more. For example, a person receiving \$0.63 in free merchandise may decide to purchase a \$0.75 candy bar (thus, the individual will have to pay GoGo Juice \$0.12 for the candy bar). Without the free merchandise money, this same person might not have purchased the candy bar (i.e., he or she may only have purchased gasoline).

The following table provides data regarding current monthly sales and variable costs for both gasoline and merchandise:

	<i>Gasoline</i>	<i>Merchandise</i>
Sales revenue	\$150,000	\$75,000
Variable costs	\$0.75 for every \$1.00 in sales	\$0.50 for every \$1.00 in sales

GoGo Juice also incurs fixed costs of \$60,000 per month.

*Required:*

- a. Does GoGo Juice’s decision deal with excess supply or excess demand?
- b. By how much is GoGo Juice’s monthly profit expected to change if it runs the special promotion?
- c. Assume that GoGo Juice is considering altering the special promotion in the following way: Rather than give \$0.01 in free merchandise for every \$0.20 spent on gasoline, management would give customers \$0.50 in free merchandise for every \$10.00 spent on gasoline. Under this scheme, a customer spending \$8.00 on gasoline would not receive any free merchandise, whereas a customer spending \$18.00 on gasoline would receive \$0.50 in free merchandise. Discuss what you perceive to be the costs and benefits of altering the special promotion in this fashion.



**6.53 Working with unit-level data, dropping a product line, gross approach (LO2, LO3, Appendix B).** Timmy N. runs a small shop that manufactures and sells battery testers and solenoid testers for quick, easy use around the home. The following information related to these two products has been gathered from Timmy’s accounting records for the most recent year:

	<i>Battery Tester</i>	<i>Solenoid Tester</i>
Sales in units	20,000	10,000
Unit selling price	\$35	\$20
Total unit cost	\$28	\$22

Furthermore, the total unit cost of each product is calculated as follows:

	<i>Battery Tester</i>	<i>Solenoid Tester</i>
Fixed costs:		
Manufacturing	\$10 per unit	\$10 per unit
Marketing & administrative	\$4 per unit	\$4 per unit
Variable costs:		
Manufacturing	\$12 per unit	\$6 per unit
Marketing & administrative	\$2 per unit	\$2 per unit
<b>Total</b>	<b>\$28 per unit</b>	<b>\$22 per unit</b>

Both fixed manufacturing and fixed marketing and administrative costs are assigned to products based on the number of units sold. That is, Timmy’s accountant takes the total fixed costs incurred and divides them by the total number of units sold to arrive at a fixed cost per unit. Moreover, Timmy expects to incur \$420,000 in total fixed costs each year regardless of production volume. Because Timmy’s shop produced 30,000 total units in the most recent year, each product was assigned  $\$420,000/30,000 = \$14$  per unit in fixed costs.

*Required:*

- a. What was Timmy's overall profit for the most recent year? What was Timmy's reported profit for each product?
- b. What was Timmy's total contribution margin for the most recent year? What was Timmy's contribution margin on each product?
- c. Since the unit cost of the solenoid tester exceeds the unit price, Timmy believes that his business would be more profitable if he stopped producing solenoid testers. Is this true? By how much will Timmy's profit increase or decrease if he stops producing and selling solenoid testers?
- d. Based on your answers to parts (a) through (c), what inferences do you draw about the value of expressing fixed costs as the amount allocated per unit rather than the total of the expenditure?

**6.54 Special-order, qualitative considerations (LO3, LO5).** Randy Quench manages the Science Station in Lansing, Michigan. One of the station's key attractions is a big-screen IMAX theater. As stated in the IMAX Web site, "The IMAX experience is the world's most powerful and involving film experience. With breathtaking images up to eight stories high and wrap-around 12,000-watt digital sound, IMAX technology takes you to places only imagined." The IMAX Theater has been very popular and has increased attendance and interest in the Science Station.

The average IMAX show at the Science Station attracts 125 patrons (50 children and 75 adults) at a ticket price of \$7.95 for children under 12 and \$9.95 for adults. Randy estimates that the variable costs per IMAX show are \$250. In addition, fixed costs of \$600 are allocated to each show, a number that is computed by dividing the annual estimate of the total fixed costs (associated with running the IMAX Theater) by the annual estimate of the number of IMAX shows.

The local middle school has approached Randy about scheduling an extra show for its eighth graders. One hundred students and five teachers are expected to attend the special screening on the International Space Station, a feature that is currently showing. The school has asked Randy for a price quote. The special screening will take place in the mid-morning hours when the IMAX is not traditionally open.

*Required:*

- a. Based on the data provided, what is the minimum amount that Randy should charge the school so that the Science Station does not incur a loss on the special screening?
- b. What other financial factors, though not listed in the problem, could be relevant to Randy's price quote?
- c. Are there any nonfinancial factors you believe Randy should consider?

**6.55 Health care, relevant cost analysis, ethics (LO2, LO3, LO5).** Quincy Heil is the chief financial officer for General Hospital, located in Port Chester, New York. General Hospital currently is experiencing some financial difficulties because of the pricing pressures created by Health Maintenance Organizations (HMOs) and Medicare. Quincy believes that aggressive cost management is the only way to improve the hospital's financial performance as there is little room for increasing prices or patient volume.

Based on a detailed cost study, Quincy estimates that the per-patient variable cost per hospital-day equals \$125. (This cost excludes the cost of any tests, medications, procedures, and other professional services.) Quincy wants the hospital to reduce the average patient length of stay (LOS) from 1.8 days to 1.5 days. Given the current annual volume of 10,000 patients, this would save the hospital 3,000 patient days. In addition, hospital revenue would not be affected because payments are based on the episode (i.e., reason for visit) and are not directly linked to length of stay.

When presented with this plan, the hospital's chief of staff concurred with the cost savings but pointed out that any pressures to reduce LOS would inevitably lead to some patients being discharged earlier than is optimal from a medical perspective. Early discharge increases the risk of patients not fully recovering and experiencing added complications and discomfort. In short, the chief of staff estimates that reducing the LOS from 1.8 days to 1.5 days will increase the readmission rate (admissions within 30 days of discharge) from 2% to 4%. Based on the current annual patient volume of 10,000 patients, this amounts to about 200 additional patients per year.

In his response to the chief of staff, Quincy pointed out that readmissions typically qualified as a new episode and triggered a new payment from the insurance company or Medicare. Moreover, Quincy indicated that, on average, insurance companies and Medicare pay the hospital \$500 per readmission, whereas the hospital's total incremental costs associated with increasing the readmission rate to 4% were likely to amount to \$50,000. The chief of staff, clearly disconcerted by Quincy's analysis, has decided to raise the issue with you, the hospital's chief executive officer.

*Required:*

As General Hospital's chief executive officer, the decision to reduce length of stay is ultimately your call. What would you do? By how much is hospital profit expected to increase if you decide to reduce length of stay? What other factors are important in this decision?

**6.56 Offering a product via the internet (LO3, LO5).** TaxPlan Solutions, a software firm, has developed a software product that enables users to electronically prepare and file their state and federal tax returns. TaxPlan traditionally has sold a stand-alone version that users install on their personal computers. This year, the firm's marketing director wants to offer a stripped-down version of the product via the Internet, in addition to offering the stand-alone version. The modified Internet version will allow users to prepare and file their tax returns using the World Wide Web. The product, which meets the needs of 75% of tax-filers, will be offered to all for free. Moreover, the marketing director feels that the Web-based product will allow TaxPlan to market itself as a company that seeks to help the "person on the street" and, hopefully, also lead to some financial benefits. TaxPlan has provided you with the following information:

- TaxPlan already has spent \$500,000 in developing the Web-based tax-filing product. If TaxPlan decides to offer the product, then it expects to spend \$420,000 each year (including this year) maintaining the servers, providing technical support, and so on.
- The marketing director believes that the free tax-filing offer will induce users to sample the convenience of electronically managing their personal finances. She believes that many users will like the process and, consequently, end up purchasing TaxPlan's software for managing personal finances. The personal finance software retails for \$25. TaxPlan incurs variable costs of \$1 per unit to produce, package, and distribute their personal finance software package. TaxPlan also incurs \$1 million in fixed costs each year to maintain and market the personal finance software package.
- The marketing director believes that the Web-based tax-filing service will allow TaxPlan to collect names and contact information to be used for marketing purposes. She estimates that 80% of the 250,000 people expected to use the free software *will not* opt out of the mailing list. (The opt-out box is buried deep in the program and takes much effort to find.) Currently, TaxPlan buys names and contact information from bulk-mailers and other sources and pays \$0.09 per usable name. Thus, the Web-based tax-filing product will allow TaxPlan to avoid paying for this service.

*Required:*

- a. How many personal-finance software packages does TaxPlan Solutions need to sell to ensure that it covers at least the incremental costs associated with offering the Web-based tax-filing software? (Also, express this number as a proportion of the number of people expected to use the free Web-based tax-filing product.)
  - b. List two other factors that TaxPlan should consider in its decision regarding whether to introduce the free Web-based tax-filing product.
  - c. TaxPlan's chief financial officer wants to lobby the Internal Revenue Service (IRS) for a grant of \$300,000 to develop and market the free Web-based tax-filing product. Do you believe the federal government has a financial interest in whether TaxPlan offers such a product? Why or why not?
- 6.57 Equipment replacement, sunk costs, reputation effects (LO3, LO5).** The Diamond Jubilee is a floating riverboat casino that operates on the Mississippi River. The casino is open 24 hours daily and offers a "full house" of gaming, including numerous slot and video poker machines and a variety of table games such as blackjack, Caribbean stud, craps, and roulette. On average, the Diamond Jubilee earns \$0.10 in contribution margin for every \$1.00 wagered. The remaining \$0.90 goes to the gamblers as winnings and to cover the casino's variable costs.

Lucy "Lucky" Johnson is in charge of the Diamond Jubilee's slot machines, which includes both mechanical and video machines. Based on Lucy's recommendation,

casino management recently replaced, at a total cost of \$1,250,000, their 250 video poker machines. The 250 machines just acquired are expected to last two years. At the end of their two-year life, the machines would have zero salvage value—their sale price would be exactly offset by the cost of dismantling the machines, packing, and shipping.

Unfortunately, days after the new machines arrived, Lucy learned from her industry contact of an even better video poker machine. Compared to the machines recently purchased, these machines have sound that is more vivid, more stunning visual effects, and other attention grabbers. Moreover, Lucy believes that the total wagered in one video poker machine would increase by \$30,000 a year if the casino had purchased 250 of these machines rather than the 250 machines actually purchased.

The better video poker machines, however, cost \$5,500 each. Similar to the machines recently purchased, these machines also last for two years and have zero salvage value at the end of their two-year life. In addition, the operating costs of the better machine and those recently purchased are identical. Finally, like new cars, once they are driven off the lot, video poker machines depreciate substantially after they are put in use. For the Diamond Jubilee, this means that each recently acquired video poker machine would only net \$1,000 if it were sold today.

*Required:*

- a. By how much will the Diamond Jubilee's profit increase or decrease over the next two years if it purchases the new video poker machines and sells the recently acquired video poker machines? Ignore tax effects and the time value of money in your analysis.
- b. A key part of Lucy's job is to keep track of trends in the gaming industry and the new products coming into the market. Suppose that only Lucy knows about the better video poker machines. The Diamond Jubilee's other managers would learn of the better machine's availability only in a year or so. Would Lucy recommend replacing the recently purchased video poker machines with the better machines?
- c. Would your answer to requirements (a) and (b) change if the Diamond Jubilee had paid \$2,500, rather than \$5,000, for each of the recently acquired video poker machines?

**6.58 Equipment replacement, sunk costs, Taxes, continuation of the previous problem (LO3, Advanced).** Suppose the Diamond Jubilee pays combined state and federal taxes equal to 25% of profit. Since the casino is highly profitable, this means that any increase in casino revenues will be taxed at the rate of 25%. It also means that depreciation on the machines is deductible for tax purposes. Finally, it means that the casino can write off the loss if it sells the recently acquired video poker machines. That is, the loss on the recently acquired video poker machines produces a benefit to the Diamond Jubilee because it shields income from being taxed.

*Required:*

- a. If taxes are ignored, does the \$1,250,000 cost of the recently acquired video poker machines affect the decision to purchase the better video poker machines?
- b. With taxes, how does the \$1,250,000 cost of the recently acquired video poker machines affect the Diamond Jubilee's taxes if the old machines are retained? How does the \$1,250,000 cost of the recently acquired machines affect the Diamond Jubilee's taxes if the old machines are sold and the new machines are purchased? In both cases, assume the Diamond Jubilee depreciates all of their gaming equipment using straight-line depreciation and zero assumed salvage value. Ignore the time value for money in your computations.
- c. Considering tax effects, by how much will the Diamond Jubilee's profit increase or decrease over the next two years if it purchases the new video poker machines and sells the recently acquired video poker machines?
- d. What do you conclude about the relevance of sunk costs?

**6.59 Equipment replacement decision, depreciation (LO3, Advanced).** Gina Matheson owns and operates a successful florist shop in Bloomington, Indiana. Two years ago, Gina purchased a refrigerated display case for \$20,000, expecting to use it for 10 years. Unfortunately, Gina's assistant recently (and accidentally) left the case's door open during the night and the motor burned out. The local repair shop has informed Gina that it will cost \$4,500 in parts and labor to fix the refrigerated display case (the case needs a new motor and wiring). On the upside, if the existing case is repaired then it will last another 10 years.

Rather than repair the existing display case, Gina is considering purchasing a new refrigerated display case. A new display case would cost Gina \$21,000 and last 10 years. In addition, the new case has better insulation than the existing case, and Gina believes that purchasing the new case will save her \$100 per month in utility bills.

Ignore the time value of money in all of the subsequent questions. Also, ignore income taxes except where instructed otherwise.

*Required:*

- a. Should Gina repair the existing case or purchase the new case? In addition to the facts above, assume that the existing case has a book value of \$16,000 but, given its current condition, cannot be sold (i.e., the existing case has a current sales value of \$0).
- b. Assume the existing display case has a book value of \$10,000 rather than \$16,000. Would this information affect your answer to part (a)?
- c. Assume the existing case has a book value of \$16,000 and can be sold in its current condition for \$5,000 (rather than \$0 as assumed in part [a]). Would this information affect your answer to part (a)?
- d. **(Advanced)**. Assume that the existing case has a book value of \$16,000 and can be sold for \$5,000. In addition, assume that Gina pays income taxes equal to 30% of profit. Finally, Gina depreciates all of her assets using straight-line depreciation and zero assumed salvage value. In light of this information, should Gina repair the existing case or purchase the new case?
- e. What other factors should Gina likely consider in her decision regarding whether to repair or replace her existing refrigerator display case?

**6.60 Special-order, capacity costs (LO2, LO3).** Bob Wright is a skilled machinist who has identified a need for specialized, custom-made containers that store and move biological materials. This market is particularly active in Bob's community because of the human genome research at the local university and the numerous biotechnology firms that operate in the area.

Recently, one of Bob's long-time customers, a professor at the local university, asked Bob for a 25% discount in the coming year. The professor has requested the discount because one of her major federal grants was canceled and it will be at least another year before she can find replacement funding. She expects to place about \$50,000 worth of orders (at the pre-discount price) in the coming year, after which she expects to pay full price. Absent a discount, she will not have the funds to place the order.

Bob knows that for each \$100 in sales, he spends \$45 on variable cost items for materials, labor, and so on. He figures that his remaining expenses are fixed at \$175,000 per year. Bob expects sales for the coming year (without the professor's order) to equal \$675,000 or 90% of capacity. Bob measures capacity in pre-discounted revenues—that is, as revenue at normal prices.

*Required:*

- a. By how much will Bob's profit increase or decrease if he gives the 25% discount to the professor?
- b. Assume that at \$675,000 in sales Bob will be operating at 96% of capacity rather than 90% of capacity. Also, assume that the professor's order cannot be partially fulfilled—it must be taken in full or rejected entirely. How does this piece of information change your answer to part (a)? That is, by how much will Bob's profit increase or decrease if he gives the 25% discount to the professor?
- c. Continue with part (b), except that at \$675,000 in sales Bob will be operating at 100% of capacity rather than 90% of capacity. How does this piece of information change your answer to part (a)? That is, by how much will Bob's profit increase or decrease if he gives the 25% discount to the professor?

**6.61 Excess supply, qualitative aspects of short-term decisions (LO3, LO5).** Edmund Heil, Jr., CPA, has his own accounting firm in Golden, Colorado. Edmund caters primarily to small businesses and, over the last 15 years, has built a loyal list of clients. Edmund offers his clients a full range of audit, tax, and business advisory services, typically charging his clients \$100 per hour plus out-of-pocket expenses. (The client pays for any direct costs related to Edmund's travel, filing tax returns, and so on.) Moreover, almost all of Edmund's costs are fixed and relate to his office operating expenses such as rent, support staff, and his own compensation.

It is now mid-August, a traditionally slow period; the busy tax and audit season is nearly five months away. Edmund normally uses this time for rest, relaxation, and recreation. Indeed, Edmund is an avid mountain and rock climber, which partly motivated his move to Colorado.

On August 15, a long-time but relatively small-volume customer approached Edmund with an interesting project. However, the client's business is in the doldrums, and the client wants Edmund to give them a 50% "loyalty" discount. Edmund is trying to decide whether he should accept the project.

*Required:*

What are the quantitative and qualitative factors Edmund should consider in deciding whether to accept the long-time client's project? Assume that the job would take 20 hours and that the client would cancel the job before paying full price.

**6.62 Product-Mix Decision with a scarce resource (LO4, Loosely adapted from HBS case 198-085, LeHigh Steel).** Sylvester's Steel Works is a mini mill that recycles shredded scrap steel into usable products such as alloy (e.g., communication equipment), coils (e.g., appliances), steel bars (e.g., reinforcing concrete), and wire (e.g., cable connectors). Sylvester's starts with a basic feed stock of shredded scrap steel and then melts and purifies the steel via its high-powered electric furnace. The molten metal is next transferred for processing in Sylvester's Cold Rolling Mill (CRM), which is the bottleneck machine in Sylvester's manufacturing process.

Management of Sylvester's has provided you with the following data regarding the company's four primary product lines, and the amount of time (in minutes) a pound of each product requires in the Cold Rolling Mill (CRM).

	<i>Alloy</i>	<i>Coils</i>	<i>Steel Bars</i>	<i>Wire</i>
Contribution margin per pound	\$1.40	\$0.45	\$0.98	\$0.75
Minutes per pound in CRM	0.10	0.03	0.35	0.30

Sylvester's fixed costs amount to \$2,400,000 per year.

*Required:*

- Suppose the Cold Rolling Mill can be operated for 24,000 minutes per month. What product(s) should Sylvester produce in the coming month? If management follows your production advice, how much profit will Sylvester earn next month?
- Do you believe the solution you arrived at in part (a) is feasible? What additional data would you require before deciding which product Sylvester's Steel Works should emphasize?

**6.63 Allocating a scarce resource (LO4, Advanced).** "Crash" Johnson manages the 1,500-square-foot video arcade and game center at a popular mall. Seeking to renovate and upgrade the arcade, Crash recently removed some old games, freeing up 300 square feet of space. Crash has narrowed his options for new games to the following:

- Install video games that simulate high-adrenaline activities such as driving a motorcycle and skiing. Each of these machines would consume 50 square feet of space and generate revenues of \$20 per fully occupied hour. Based on the expected 40% occupancy rate, each installed machine would generate maintenance costs of \$100 per week. Crash believes that, at a maximum, he could install up to five such machines.
- Install a dance game. This game allows one or two players to "dance" on pads to match the moves displayed on the screen. Because good players attract considerable numbers of bystanders, Crash budgets 75 square feet per game. While most arcades have at least one such game, Crash does not wish to have more than two games. (He does not currently have the game available.) The dance game generates \$40 in revenue per occupied hour. With estimated usage at 30%, Crash projects maintenance expenses of \$300 per week per machine.
- Install simple games (e.g., "Whack-a-Mole") aimed at pre-teens and children. These games occupy 10 square feet each and require virtually no maintenance (for all practical purposes, assume it is \$0 per week). To maintain balance in his arcade, Crash believes that he could install a maximum of six simple games. Finally, while the simple games generate \$15 in revenue per hour occupied, the occupancy rate hovers around 10%.

Crash believes that he could deploy any combination of these three options and still maintain the overall balance of games in his video arcade.

*Required:*

- a. Determine the contribution margin per week per square foot devoted to each kind of game. Based solely on the ranking of the games as per their profitability, allocate the 300 feet in available space to maximize Crash's expected profit per week. What is Crash's expected profit with this allocation? Assume that the arcade is open for 100 hours per week.
- b. Explain why your solution in part (a) may not fully use all available capacity.
- c. Suggest an alternative configuration that might help Crash improve his expected profit per week.
- d. (Advanced) What do you conclude about the validity of the rule "allocate scarce capacity among uses to maximize the contribution margin per unit of the scarce resource?"

**6.64 Optimal allocation of a scarce resource, expected value (LO4, Advanced).** Vidya Patel operates a newspaper stand in Grand Central Station, New York. As you might imagine, space is at a tremendous premium, and Vidya uses every inch of her 300 cubic feet (think in three dimensions—length, width, and height) of available space to stock a wide selection of newspapers, magazines, and snack-food items.

Vidya estimates that her contribution margin ratios on newspapers, magazines, and snack-food items are 10%, 25%, and 20%, respectively. In addition, for equivalent sales in dollars, newspapers take up 5 times as much space as magazines and 10 times as much space as snacks. However, since newspapers are the primary draw for Vidya's customers, she believes that at least 50% of her available space, or 150 cubic feet, must be devoted to newspapers. Finally, Vidya believes that 10% of her available space is enough to stock all of the popular snack-food items (i.e., she could devote less than 10% of her space to snack-food items, but devoting more than 10% would be wasteful as it would not generate additional snack-food sales).

*Required:*

- a. What is Vidya's optimal allocation of space to newspapers, magazines, and snack-food items?
- b. Suppose that Vidya allocates space according to your recommendation in part (a). For Vidya to recover her fixed costs of \$2,700 per month, how much total sales revenue must she generate per cubic foot each month?

## MINI-CASES



**6.65 Excess supply of capacity, pricing special services (LO1, LO2).** "Cadillac" Cody operates a shuttle-bus service between the Miami, Florida International Airport and the Florida Keys. A popular vacation getaway, the Florida Keys are a string of islands located off the southern tip of Florida. The Keys offer year-round warm weather, white sandy beaches, and sunny skies. Vacationers can spend the day in a variety of water sports such as surfing, snorkeling, sailing, and scuba diving. Numerous charter boats also offer would-be anglers the opportunity to experience deep-sea fishing and snare game fish such as marlin, mahi-mahi, swordfish, and snapper.

Partly out of a desire to keep the Keys pristine, Miami is the closest large airport. The Miami International Airport is roughly 80 miles away from Key Largo, one of the nearest islands, and a bit less than 200 miles away from Key West, the southernmost island. Most individuals and families visiting the Keys rent a car at the Miami airport and drive to their final destination. Most large groups (e.g., church groups, corporate outings, senior groups), however, prefer to take a shuttle bus due to the substantial cost savings and because they generally do not need transportation after reaching their final destination (i.e., their activities are preplanned and include transportation). Cody's business is aimed at these groups; for a fixed fee Cody will meet a group at the airport and transport them to their hotel, campsite, or charter boat. Cody is, of course, delighted to offer return transportation as well.

Cody owns a mini-bus that can seat up to 24 people. His air-conditioned bus comes with many conveniences like two video monitors and DVD players. Having lived in the area his entire life, Cody also has a wealth of information about area attractions, local

celebrities, surfing, and fishing. All in all, both Cody and his customers have a blast. Cody has built a sterling reputation and has a core group of loyal clients that use his services exclusively whenever they visit the Keys. This core group also serves a valuable role in directing other groups toward Cadillac Cody.

Cody offers two primary products: A one-way trip between Miami and Key Largo (the Upper Keys), and a one-way trip between Miami and Key West (the Lower Keys). Under Cody's straightforward pricing scheme, groups are charged \$300 for a one-way trip to the Upper Keys and \$500 for a one-way trip to the Lower Keys. (Cody does not offer any discounts for booking round-trip travel. Also, the price is the same regardless of the direction of travel.) This fee entitles a group to exclusive use of Cody's mini-bus (i.e., Cody only transports one group at a time). Gratuities also are a part of Cody's business, and, without exception, clients give Cody a 15% tip (as suggested in the brochure). Rightfully, Cody views gratuities as personal income rather than business income.

A one-way trip to the Upper Keys takes about two hours of Cody's time (this includes 80 miles of driving plus time for passenger loading and drop offs). As a result, Cody believes that at best he can squeeze in two round-trips (four one-way trips) to the Upper Keys in a day. A one-way trip to the Lower Keys takes about 3 hours and 45 minutes of Cody's time (this includes 200 miles of driving plus time for passenger loading and drop-offs), and, as a result, Cody believes that only one round trip (two one-way trips) to the Lower Keys per day is feasible.

Cody's work schedule is somewhat erratic. During the peak tourist season, which lasts roughly from October 1 through March 31 (6 months), it is common for Cody to go two or three weeks without a break. Off-peak, however, it is equally common for Cody to work a three-day week. Analysis of Cody's travel log from the prior year showed that Cody made 400 paid one-way trips to the Upper Keys and 200 paid one-way trips to the Lower Keys (sometimes, Cody will only have a paid trip on the drive to or from the Keys; one-way trips where the bus is empty are called "deadhead" trips). Of these 400 and 200 one-way trips, 275 and 140, respectively, were during the peak season. Moreover, of the 100,000 miles Cody drove last year (this number includes trip mileage and business-related errands), Cody estimates that 62,500 miles were driven during the peak season and 37,500 miles were driven during the off-peak season.

The following table details Cadillac Cody's business income statement for the most recent year:

<i>Item</i>	<i>Amount</i>
Revenue <sup>1</sup>	\$220,000
Cost of bus (net of salvage value) <sup>2</sup>	(\$60,000)
Office operating expenses <sup>3</sup>	(\$45,000)
Fuel & oil costs <sup>4</sup>	(\$30,000)
Bus-related insurance & maintenance costs <sup>5</sup>	(\$25,000)
Brochures & advertising costs <sup>6</sup>	(\$5,000)
Business income	\$55,000

<sup>1</sup> \$220,000 = (400 one-way trips to the Upper Keys × \$300) + (200 one-way trips to the Lower Keys × \$500).

<sup>2</sup> Cody purchases a new bus each year. A new bus, with all of the amenities Cody desires, costs approximately \$85,000. At the end of the year, Cody sells the bus for approximately \$25,000.

<sup>3</sup> Cody has a small office at the airport and a part-time administrative assistant to help with running the business (e.g., to help with scheduling and paperwork).

<sup>4</sup> Cody spends approximately \$0.30 in gas and oil per mile: \$30,000 = (62,500 + 37,500) × \$0.30.

<sup>5</sup> Insurance costs are fixed, but maintenance costs vary with miles driven. Cody estimates that maintenance costs amount to \$0.15 per mile: \$25,000 = \$10,000 + (62,500 + 37,500) × \$0.15.

<sup>6</sup> Cody has a local advertising company put together a nice color brochure each year.

In addition to his business income, Cody earned  $\$220,000 \times 0.15 = \$33,000$  in tips last year. Thus, Cody's overall (business plus personal) income in the most recent year was  $\$55,000 + \$33,000 = \$88,000$ .

*Required:*

- a. Two groups recently contacted Cody about employing his services. Unfortunately, both groups will be arriving at the Miami airport this coming Tuesday, and one group wants to book a one-way trip to the Upper Keys while the other group wants to book a



- one-way trip to the Lower Keys. Cody already has scheduled a trip to the Upper Keys for the morning, so he will only be able to take one of the two groups. (*Note:* if he takes the group wishing to go to the Lower Keys, this will make for a long day.) On this particular Tuesday Cody will not be able to book a group for either return trip (i.e., his bus will be empty on the drive back). Which group should Cody book, and by how much will Cody's overall (business + personal) income increase by booking this group?
- Assume that if Cody books the group traveling to the Upper Keys, then he will be able to book another group for the return trip to the Miami airport. Unfortunately, Cody will not be able to book another group for the return trip if he goes to the Lower Keys. How does this piece of information affect your answer to part (a)? In other words, which group should Cody book, and by how much will his overall (business + personal) income increase by booking this group?
  - Cody and his wife are planning an upcoming vacation (their first vacation in years). They would like to take a week (7 days) off and are considering taking their vacation in either the first week in March (during Cody's peak business season) or during the second week in July (during Cody's off-peak business season). How much business and personal income would Cody expect to sacrifice if he and his wife schedule their trip for March? How much business and personal income would Cody expect to sacrifice if he and his wife schedule their trip for July? (*Hint:* Prepare a contribution margin statement segmented by trips made during the peak season and trips made during the off-peak season; consider both business and tip income).
  - One of Cody's friends mentions to him that hotels and airlines seem to offer discounts during their off-peak seasons (to spur additional demand). This friend suggests that Cody follow a similar strategy. Since most of Cody's costs are fixed, the friend believes that Cody could clean up with such a strategy. Specifically, Cody's friend believes that Cody would increase his off-peak volume by 60% if he cut his fares by 25% during the off-peak season. By how much would Cody's overall income increase if the friend's numbers are accurate (assume Cody's mileage during the off-peak season will increase by 40%, and not 60%, because he will have fewer deadhead trips). Next, evaluate the friend's advice—in particular, why might such a strategy work well for higher-priced items like airfare and hotels but not work as well for lower-priced items like a shuttle bus?



**6.66 Excess demand, LO1, LO2.** Hannah Turnbull manages Elegant Suites, a hotel in a small town 10 miles inland from Florida's beautiful gulf coast. Elegant Suites has a capacity of 320 suites and offers a small, but well managed, conference center. Since opening, Elegant Suites has established a good reputation among small and medium-sized business clients as a nice place to hold annual meetings and retreats.

Hannah currently is in a quandary regarding hotel bookings for the last weekend in February. One of Elegant's long-standing clients, Piedmont Publishing, recently called Hannah about the possibility of holding its annual three-day sales conference at the end of February. Piedmont wants to reserve 75 rooms each day (= 225 total room days). Per its usual arrangement, Piedmont would pay \$120 per day per room and \$5,000 per day for use of the convention center. Because this is a bulk booking, the room rate is lower than the normal rate of \$150 per day. Like all clients, however, the Piedmont attendees would spend additional money at the hotel. Hannah expects this miscellaneous expenditure to be \$25 per person per day.

Shortly after receiving the call from Piedmont, Hannah received a call from Capelli Fashion Designers. Capelli, a prospective first-time client, wants to hold its annual three-day fashion event at Elegant Suites at the end of February. Capelli would book 225 suites per day (for a total of 675 room days) and is willing to pay \$120 per suite per day. Also, Capelli would be willing to pay the normal daily rate of \$5,000 for use of the convention center, although it wants Hannah to construct a runway at a cost of \$3,000. Hannah was ecstatic to receive the Capelli call until she realized that the dates Capelli wants coincide with Piedmont's annual sales meeting.

Trying to figure a way out, Hannah calls both Capelli and Piedmont to see if either party would be willing to move its event to different dates. However, both Capelli and Piedmont are committed to holding their respective events at the end of February. Next, Hannah looks at her reservations chart to see if she can hold both events. She realizes that 60 suites already are committed to other individual clients during that time. Hannah believes strongly that she must honor these reservations.

Hannah provides you with the following summary financial data for a typical month of operations.

<b>Summary Financial Data for a Typical Month of Operations</b>	
Number of occupied suite-days	6,000
Average Suite rate	\$130
<i>Revenues:</i>	
Suites	\$780,000
Convention Center	75,000
Food, telephone, movies, and other incidentals	150,000
Total Revenues	<u>\$1,005,000</u>
<i>Variable costs:</i>	
Food, laundry, supplies, telephone, and movies	\$180,000
Labor (kitchen help, cleaning staff)	210,000
<b>Contribution margin</b>	<u><b>\$615,000</b></u>
<i>Fixed costs:</i>	
Labor (hotel management)	\$125,000
Building and Grounds	350,000
<b>Profit before taxes</b>	<u><b>\$140,000</b></u>

Hannah also informs you that if she stays with Piedmont, she is likely to sell another 57 suites to individual parties for each of the three days at the standard rate of \$150 per suite. If she accepts Capelli, she will be able to sell the remaining 35 suites to individual parties for each of the three days at the standard rate of \$150 per suite. However, as booking Capelli would cause an abnormally high occupancy rate (100%), Hannah anticipates the need to pay her hourly staff an overtime premium of 50% for the three-day period (i.e., the average hourly wage will be the base wage  $\times$  1.50).

*Required:*

- Identify Hannah's decision options.
- Identify Hannah's best option.
- Suppose 75 and 225 suites per day is the number of suites that Piedmont and Capelli wish to block for their conventions. However, the actual demand might be less than this estimate. While Piedmont is sure to occupy at least 60 suites, Capelli estimates that total demand might range from 150 to 225 suites. Because actual demand would not be known till late, Hannah would not be able to fill unused suites with paying guests. How might this information affect Hannah's decision?
- Considering long-term implications, what should Hannah do?

**6.67 Excess demand, real estate (LO1, LO3).** Brenda Stowers is a licensed real estate agent in the Sedona, Arizona area. Because of her affiliation with a large national real estate agency and her attention to detail, Brenda has been able to build a very successful business. In the United States, people selling their home hire an agent who "lists" the home. The agent representing the potential buyers "shows" the home. If a sale occurs, the seller pays a commission to both the agent listing the house (i.e., their own agent) and the agent representing the buyers. Each agent typically receives a commission equal to 3% of the home's selling price. On occasion, the listing agent is also the agent for the buyer. In this case, the listing agent receives both commissions; that is, as the agent for both the buyer and the seller, the agent receives a total commission of 6%.

On behalf of an owner, Brenda currently has listed a home with an asking price of \$250,000. Brenda believes that if she holds an open house this coming Sunday, the home will attract many visitors. (An open house is a designated period, say 2–4 P.M., when the house is open to visitors. Anybody can walk into the house and look around without a prior appointment). Since this is a new listing, Brenda believes that there is a 10% chance one of the visitors to the open house actually will purchase the house. The prep for the open house plus the time it takes to host the open house will consume an entire day. In addition, variable costs related to signs and ads in the local newspaper will cost Brenda \$250. Finally, almost all buyers who look at open houses are likely to be under contract with another realtor, implying that Brenda expects to receive a 3% commission if the home sells.

Alternatively, Brenda could spend this coming Sunday showing homes to some of her clients who are looking to buy a house. Brenda estimates that, on any given day that she devotes to showing homes, there is a 4% chance that she will sell a house that is not her listing (thereby receiving a 3% commission), and a 1% chance that she will sell a house that is her listing (thereby receiving a 6% commission). The average asking price of the houses Brenda shows is \$220,000. Brenda's variable costs of showing homes are negligible and, thus, can be ignored. Finally, on average, houses (including open houses) sell for 95% of the asking price.

*Required:*

- a. Does Brenda's decision deal with excess supply or excess demand?
- b. What is Brenda's expected profit from holding the open house this coming Sunday?
- c. What is Brenda's expected profit from showing homes (to some of her clients who are looking to buy a house) this coming Sunday?
- d. What should Brenda do this coming Sunday?
- e. As you might suspect, the chances of selling a home during an open house decline after the first open house. Assume Brenda's first open house does not lead to a sale. What would the chances of a sale during the second open house need to be so that Brenda prefers holding a second open house rather than showing homes to potential buyers (assume everything but the chance of sale remains the same)?

**6.68 Outsourcing, qualitative considerations (LO3, LO5).** Jackrabbit Trails is a family camp located in Kings Canyon National Park, California. Open from mid-May to Labor Day, Jackrabbit Trails offers week-long family summer vacation packages that include lodging, three meals a day, and numerous activities such as horseback riding, waterskiing, sailing, canoeing, archery, fishing, hiking, and mountain biking. To provide families with a restful experience, Jackrabbit Trails limits the number of families to 20 per week. Moreover, the camp motto is "Follow the fun without following the herd."

Jackrabbit Trails is planning on adding another activity to their repertoire—white-water rafting. Management currently is trying to decide whether to offer patrons this service via a local company, Tributary Tours, or to provide the service "in house." If Jackrabbit Trails provides its own whitewater rafting tours, then management estimates that annual fixed costs will increase by \$40,000 and that they will earn \$0.60 on each dollar of whitewater rafting tour revenue (i.e., for every dollar of whitewater rafting revenue, there would be \$0.40 in variable costs and \$0.60 in contribution margin). On the other hand, if Jackrabbit Trails routes patrons to Tributary Tours for their whitewater rafting experience, annual fixed costs will not increase and Tributary Tours will pay Jackrabbit Trails \$0.20 for each dollar of whitewater rafting tour revenue (that is, for tours booked through Jackrabbit trails). Management of Jackrabbit Trails expects gross whitewater rafting revenues to be the same under either scenario.

*Required:*

- a. Suppose Jackrabbit Trails expects whitewater rafting revenue to be \$75,000 per year. Should management outsource the whitewater rafting tours or operate them internally? Would your decision change if revenues were expected to be \$125,000 per year?
- b. What is the whitewater rafting revenue at which Jackrabbit Trails is indifferent (i.e., has the same profit) between its two choices?
- c. What other factors should Jackrabbit Trails consider in making its decision?

**6.69 Excess demand, qualitative considerations, ethics (LO1, LO5).** Robin Spurlock is the director of the Mossbank Museum of Science and Natural History in Des Moines, Iowa. The museum is housed in an architecturally renowned facility. The five-story atrium provides a magnificent place to hold gala receptions and other events. Robin currently is in a quandary and seeks your advice.

A local children's charity has talked with Robin about using the atrium for the first Saturday of October. (They have not gotten around to signing a contract yet.) The conversation occurred almost a year ago because the charity wanted to get the best rate. Robin was delighted to help out, particularly because October typically is a slow month for the museum. She only charged the charity \$500 to rent the atrium rather than the normal rate of \$2,000 per day, even though the event would have no catering or other direct monetary benefits to the museum. The children's charity plans to use the atrium

for the grand finale of a well-advertised art contest they are holding to raise money. The 100 finalists in the art contest would have their paintings showcased in the atrium, and numerous prizes would be awarded. Robin knows that the contest has spurred a great deal of interest among grade school children, including her own daughter, Emma.

It is now the middle of September, and one of the museum's corporate donors has contacted Robin about renting the atrium for the first Saturday in October. The corporate donor wishes to use the facility to hold a black tie event welcoming their new president and chief executive officer. The firm is willing to pay the full \$2,000 rental fee. In addition, Robin knows that the museum will get 10% of the catering contract in return for use of the museum's kitchen and other facilities. The catering contract is likely to be around \$15,000.

After Robin apprised the corporate donor of the conflict, she received a call from one of the corporation's directors. In a cordial conversation, the director implored Robin to consider fitting the event in because other dates and locations would not work as well. The director also took the opportunity to gently remind Robin of his corporation's past support for the museum and the board's desire to "do it right" for the reception. He also hinted that the museum might get a nice "surprise" during the event.

Robin would like to both honor her commitment to the children's charity and be responsive to the corporate donor. However, she knows that it is not physically feasible to hold both events the same day.

*Required:*

What quantitative and qualitative factors should Robin consider in her decision? Which factors do you believe are most important to Robin's decision?