



## Activity Resource Usage Model and Tactical Decision Making

# CHAPTER 18

### AFTER STUDYING THIS CHAPTER, YOU SHOULD BE ABLE TO:

1. Describe the tactical decision-making model.
2. Define the concept of relevant costs and revenues.
3. Explain how the activity resource usage model is used in assessing relevancy.
4. Apply the tactical decision-making concepts in a variety of business situations.

Tom and Ray Magliozzi (also known as Click and Clack, the Tappet Brothers) have a weekly radio show and newspaper column advising readers on their automotive problems. Frequently, Tom and Ray use tactical decision making to suggest possible repairs. For example, in October 2004, a reader asked what to do about his wife's 1991 **Ford** escort. The car needed its air filter replaced every six weeks due to oil buildup in the box that holds the filter. No mechanic had been able to solve the problem. Tom and Ray zoomed in the answer. They diagnosed the problem as "blowby"—a situation that occurs when combustion gases leak from inside the cylinders into the crankcase. The gas and pressure overwhelm the crankcase ventilation system, and oil is blown back into the air-filter housing, which ruins the air filter. Now, how can the problem of blowby be solved? Tom and Ray suggested two solutions. First, replace the engine. This will solve the underlying problem. However, it will cost about \$1,500. Second, just keep replacing the air filter every six weeks. They figured that, at \$10 per replacement, the reader could have a new air filter installed every six weeks for the next 17 years. The point, of course, is that placing a new engine in

a 1991 car was almost surely a waste of money—the rest of the car would give out long before the new engine wore out.<sup>1</sup>

One of the major roles of the cost management information system is supplying cost and revenue data that are useful in tactical decision making. How cost and revenue data can be used to make tactical decisions is the focus of this chapter. To make sound decisions, the user of the cost information must be able to decide what is relevant to the decision and what is not relevant.

## Tactical Decision Making

**Tactical decision making** consists of choosing among alternatives with an immediate or limited end in view. Accepting a special order for less than the normal selling price to utilize idle capacity and increase this year's profits is an example. The immediate objective is to exploit idle productive capacity so that short-run profits can be increased. Thus, some tactical decisions tend to be *short run* in nature; however, it should be emphasized that short-run decisions often have long-run consequences. Consider a second example. Suppose that a company is considering the possibility of producing a component instead of buying it from suppliers. The immediate objective may be to lower the cost of making the main product. Yet, this tactical decision may be a small part of the overall strategy of establishing a cost leadership position for the firm. Thus, tactical decisions are often *small-scale actions* that serve a larger purpose. Recall that the overall objective of strategic decision making is to select among alternative strategies so that a long-term competitive advantage is established. Tactical decision making should support this overall objective, even if the immediate objective is short run (accepting a 1-time order to increase profits) or small scale (making instead of buying a component). Thus, *sound* tactical decision making means that the decisions made achieve not only the limited objective but also serve a larger purpose. In fact, no tactical decision should be made that does not serve the overall strategic goals of an organization.

### The Tactical Decision-Making Process

With this very important qualification, it is possible to outline the tactical decision-making process. The five steps describing the process are as follows:

1. Recognize and define the problem.
2. Identify alternatives as possible solutions to the problem, and eliminate alternatives that are not feasible.
3. Identify the predicted costs and benefits associated with each feasible alternative. Eliminate the costs and benefits that are not relevant to the decision.
4. Compare the *relevant* costs and benefits for each alternative, and relate each alternative to the overall strategic goals of the firm and other important qualitative factors.
5. Select the alternative with the greatest benefit which also supports the organization's strategic objectives.

#### Step 1: Defining the Problem

To illustrate the steps of the process, consider an apple producer. Each year, approximately 25 percent of the apples harvested are small and odd-shaped. These apples cannot be sold in the normal distribution channels and have simply been dumped in the orchards for fertilizer. This approach seems costly, and the owner is not satisfied with it. What to do with these apples is the problem facing the apple producer.

## OBJECTIVE 1

Describe the tactical decision-making model.

1. *Car Talk*, <http://www.cartalk.com/content/columns/latest.html> as of October 2004.

## Step 2: Identifying Feasible Alternatives

Several alternatives are being considered:

1. Sell the apples to pig farmers.
2. Bag the apples (5-pound bags) and sell them to local supermarkets as seconds.
3. Rent a local canning facility and convert the apples to applesauce.
4. Rent a local canning facility and convert the apples to pie filling.
5. Continue with the current dumping practice.

Of the five alternatives, Alternative 1 was eliminated because there were not enough local pig farmers interested in the apples; Alternative 5 represented the status quo and was eliminated at the request of the owner; Alternative 4 was also eliminated because the local canning facility would need a major capital investment to buy fittings that would convert the equipment to pie-filling capability. The apple producer did not have the ability to raise the capital needed. However, the local facility's equipment could be used (without conversion) for producing applesauce. Thus, Alternative 3 was a possibility. Furthermore, since local supermarkets agreed to buy 5-pound bags of irregular apples and bagging could be done at the warehouse, this option was also a possibility. Thus, two alternatives were deemed feasible.

## Step 3: Predicting Costs and Benefits and Eliminating Irrelevant Costs

Suppose that the apple producer predicts that labor and materials (bags and ties) for the bagging option would cost \$0.05 per pound. The 5-pound bags of apples could be sold for \$1.30 per bag to the local supermarkets. Making applesauce would cost \$0.40 per pound for rent, labor, apples, cans, and other materials (rent is charged on a per-pound processed basis). It takes six pounds of apples to produce five, 16-ounce cans of applesauce. Each 16-ounce can will sell for \$0.78. The apple producer decides that the cost of growing and harvesting the apples is not relevant to choosing between the bagging alternative and the applesauce alternative.

## Step 4: Comparing Relevant Costs and Relating to Strategic Goals

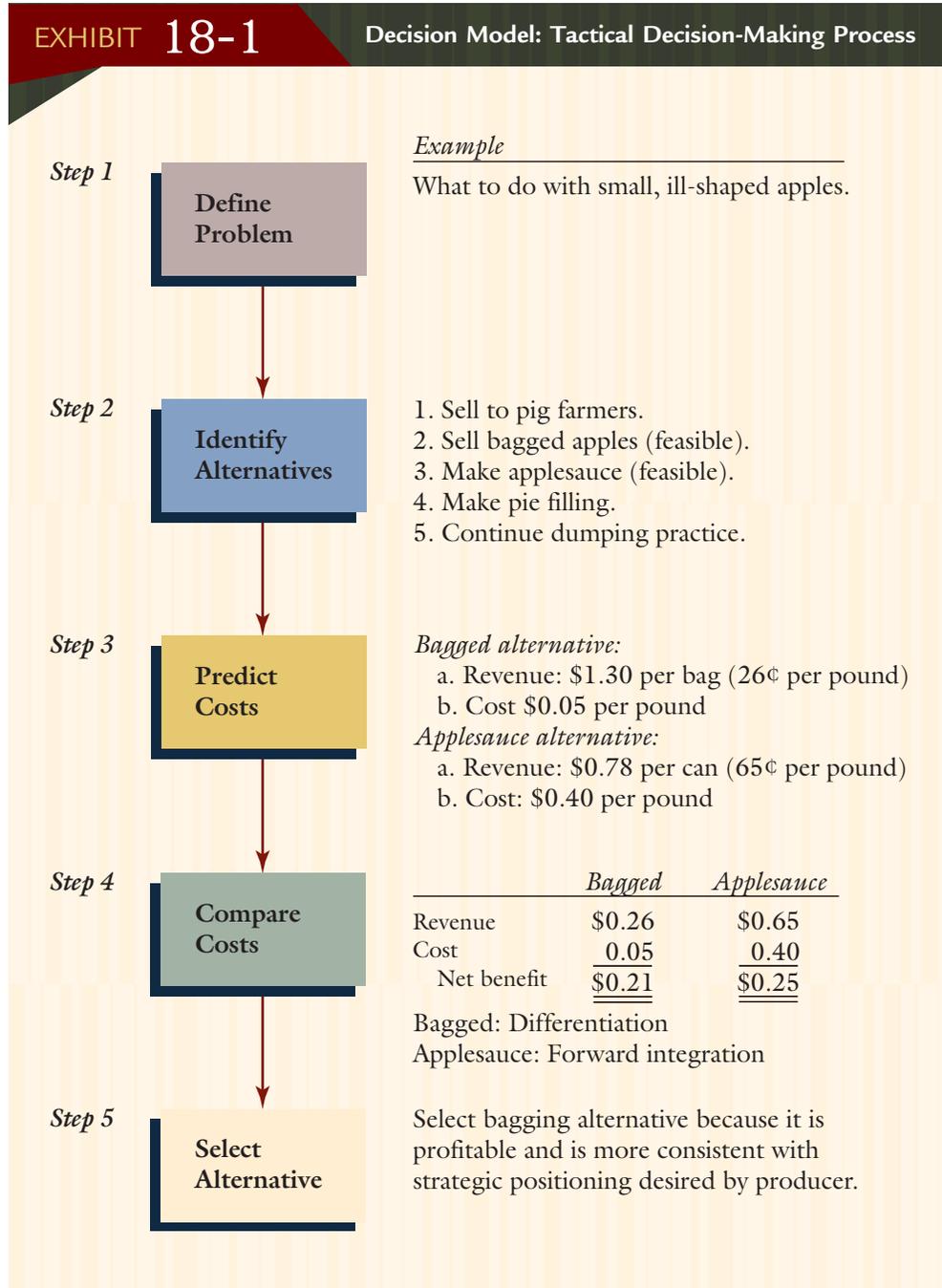
The bagging alternative costs \$0.25 to produce a 5-pound bag ( $\$0.05 \times 5$  pounds), and the revenue is \$1.30 per bag, or \$0.26 per pound. Thus, the net benefit is \$0.21 per pound ( $\$0.26 - \$0.05$ ). For the applesauce alternative, six pounds of apples produce five 16-ounce cans of applesauce. The revenue for five cans is \$3.90 ( $5 \times \$0.78$ ), which converts to \$0.65 per pound ( $\$3.90/6$ ). Thus, the net benefit is \$0.25 per pound ( $\$0.65 - \$0.40$ ). Of the two alternatives, the applesauce option offers \$0.04 more per pound than the bagging option. The applesauce alternative, from the viewpoint of the apple producer, requires a forward integration strategy. The apple producer currently is not involved in producing any apple consumer products. Moreover, the apple producer is reluctant to move into applesauce production. The producer has absolutely no experience in this part of the industrial value chain and knows little about the channels of distribution for applesauce. An outside expert would need to be hired. Finally, the rental opportunity is a year-to-year issue. In the long term, a major capital commitment would be needed. Bagging the small apples, on the other hand, is a product differentiation strategy that allows the producer to operate within familiar territory.

## Step 5: Selecting the Best Alternative

Since the apple producer is reluctant to follow a forward integration strategy, the bagging alternative should be chosen. This alternative maintains the current position in the industrial value chain and strengthens the producer's competitive position by following a differentiation strategy for the small, odd-shaped apples.

## Summary of Decision-Making Process

The five steps define a simple decision model. A **decision model** is a set of procedures that, if followed, will lead to a decision. Exhibit 18-1, on the following page, summarizes and illustrates the steps for the decision model that describe the tactical decision-making process.



Steps three and four define *tactical cost analysis*. **Tactical cost analysis** is the use of relevant cost data to identify the alternative that provides the greatest benefit to the organization. Thus, tactical cost analysis includes predicting costs, identifying relevant costs, and comparing relevant costs.

Tactical cost analysis, however, is only part of the overall decision process. Qualitative factors also must be considered.

## Qualitative Factors

While cost analysis plays a key role in tactical decision making, it does have its limitations. Relevant cost information is not all the information a manager should consider. Other information, often qualitative in nature, is needed to make an informed decision.

For example, the relationship of the alternatives being considered to the organization's strategic objectives is essentially a qualitative assessment.

Other qualitative factors are also important. For example, emergency rooms may decide to use surgical glue rather than sutures to close a child's wound. The cost of the gluing kit is roughly the same as the cost of a suture kit. However, gluing does not require an anesthetic (i.e., a shot of Novocain), it is faster and less painful for the patient, and it dries to a cool blue color—a real plus for hip elementary-age children. Parents have been known to shop for an emergency room that uses surgical glue for just these qualitative reasons.<sup>2</sup> The lesson here is that cost analysis can and should be viewed as only one input for the final decision.

How should qualitative factors be handled in the decision-making process? First of all, they must be identified. Secondly, the decision maker should try to quantify them. Often, qualitative factors are simply more difficult to quantify, but not impossible. For example, possible unreliability of the outside supplier might be quantified as the probable number of days late multiplied by the labor cost of downtime in the plant. Finally, truly qualitative factors, such as the impact of late orders on customer relations, must be taken into consideration in the final step of the decision-making model—the selection of the alternative with the greatest overall benefit.

## OBJECTIVE

## 2

Define the concept of relevant costs and revenues.

## Relevant Costs and Revenues

A significant input in choosing among the alternatives is cost. All other things being equal, the alternative with the lower cost should be chosen. In choosing between the two alternatives, only the costs and revenues relevant to the decision should be considered. Identifying and comparing relevant costs and revenues is the heart of the tactical decision model illustrated in Exhibit 18-1. Thus, it is essential to know what is meant by relevant costs and revenues. **Relevant costs (revenues)** are future costs (revenues) that differ across alternatives. The definition is the same for costs or revenues; thus, to keep things simple, our discussion will focus on relevant costs, with the understanding that the same principles also apply to revenues. All decisions relate to the future; accordingly, only future costs can be relevant to decisions. However, to be relevant, a cost must not only be a future cost, but it also must differ from one alternative to another. If a future cost is the same for more than one alternative, it has no effect on the decision. Such a cost is an *irrelevant* cost. The ability to identify relevant and irrelevant costs is an important decision-making skill.

### Relevant Costs Illustrated

To illustrate the concept of relevant costs, consider Avicom, Inc., a company that makes jet engines for commercial aircraft. A supplier has approached the company and offered to sell one component, nacelles (enclosures for jet engines), for what appears to be an attractive price. The company is now faced with a make-or-buy decision. Assume that the cost of direct materials used to produce the nacelles is \$270,000 per year (based on normal volume). Should this cost be a factor in the decision? Is the direct materials cost a future cost that differs across the two alternatives? It is certainly a future cost. To produce the component for another year requires materials which must be purchased. But does the direct materials cost differ across the two alternatives? If the component is purchased from an external supplier, no internal production is needed. The need to purchase materials for producing the nacelles can be eliminated, reducing the materials cost to zero. Since the cost of direct materials differs across alternatives (\$270,000 for the make alternative and \$0 for the buy alternative), it is a relevant cost.

2. Tara Parker-Pope, "Surgical Glue Removes Much Pain and Time from Closing Wounds," *The Wall Street Journal* (December 28, 1998): B1.

Implicit in this analysis is the use of a past cost to estimate a future cost. For example, assume that the most recent cost of materials to support production of the nacelles was \$260,000. Adjusting this past cost for anticipated price increases produced the projected cost of \$270,000. Thus, although past costs are never relevant, they are often used as the basis for predicting what future costs will be.

## Irrelevant Cost Illustrated

Avicom uses machinery to manufacture nacelles. This machinery was purchased five years ago and is being depreciated at an annual rate of \$50,000. Is this \$50,000 a relevant cost? In other words, is depreciation a future cost that differs across the two alternatives?

### Past Costs

Depreciation, in this case, represents an allocation of a cost already incurred. (The cost is being allocated to time periods.) It is a **sunk cost**, an allocation of a past cost. Thus, regardless of which alternative is chosen, the acquisition cost of the machinery cannot be avoided. It is the same across both alternatives. Although we allocate this sunk cost to future periods and call that allocation *depreciation*, none of the original cost is avoidable. Sunk costs are past costs. They are always the same across alternatives and are therefore always irrelevant. Thus, the acquisition cost of the machinery and its associated depreciation should not be a factor in the make-or-buy decision.

### Future Costs

Assume that the cost to heat and cool the plant—\$40,000 per year—is allocated to different production departments, including the department that produces nacelles, which receives \$4,000 of the cost. Is this \$4,000 cost relevant to the make-or-buy decision facing Avicom?

The cost of providing plant utilities is a future cost, since it must be paid in future years. But does the cost differ across the make-and-buy alternatives? It is unlikely that the cost of heating and cooling the plant will change whether nacelles are produced or not. Thus, the cost is the same across both alternatives. The amount of the utility payment allocated to the remaining departments may change if production of nacelles is stopped, but the level of the total payment is unaffected by the decision. It is therefore an irrelevant cost.

## Relevant Costs and Benefits in International Trade

Relevant costs and benefits are useful in decision making in the international trade arena. For example, a company may import materials for use in production. While this transaction may look identical to the purchase of materials from domestic suppliers, U.S. tariffs add complexity and cost. A **tariff** is a tax on imports levied by the federal government. Any cost associated with the purchase of materials, such as freight-in or a tariff, is a materials cost. Companies search for ways to reduce tariffs. They may restrict the amount of imported materials, alter the materials by adding U.S. resources (to increase the domestic content and gain a more favorable tariff status), or utilize foreign trade zones.

### Foreign Trade Zones

The U.S. government has set up **foreign trade zones (FTZs)**, or areas that are physically on U.S. soil but considered to be outside U.S. commerce. Companies in FTZs can engage in warehousing and/or manufacturing. If the items leave the FTZ bound for non-U.S. destinations, then no tariff is due. If they leave the zone for U.S. destinations, then the tariff is due. Because foreign trade zones must be located near a customs port of entry, they are often located near seaports or airports. San Antonio, New

Orleans, and Oklahoma City are examples of cities with foreign trade zones. Goods imported into a foreign trade zone are duty-free until they leave the zone. This has important implications for manufacturing firms that import materials. Some U.S. companies set up manufacturing plants within the foreign trade zones. Since tariffs are not paid until the imported materials leave the zone, as part of a finished product, the company can postpone payment of duty and the associated loss of working capital. Additionally, the company does not pay duty on defective materials or inventory that has not yet been included in finished products.

An example may help to illustrate the potential cost advantages. Suppose that Roadrunner, Inc., operates a petrochemical plant located in a foreign trade zone. The plant imports volatile materials (i.e., chemicals that experience substantial evaporation loss during processing) for use in production. Wilycoyote, Inc., operates an identical plant just outside the foreign trade zone. Consider the impact on duty and related expenditures for the two plants for the purchase of \$400,000 of crude oil imported from Venezuela. Both Roadrunner and Wilycoyote use the oil in chemical production. Each purchases the oil about three months before use in production, and the finished chemicals remain in inventory about five months before sale and shipment to the customer. About 30 percent of the oil is lost through evaporation during production. Duty is assessed at 6 percent of cost. Each company faces a 12 percent carrying cost.

Wilycoyote pays duty, at the point of purchase, of \$24,000 ( $0.06 \times \$400,000$ ). In addition, Wilycoyote has carrying cost associated with the duty payment of 12 percent per year times the portion of the year that the oil is in materials or finished goods inventory. In this case, the months in inventory equal 8 ( $3 + 5$ ). Total duty-related carrying cost is \$1,920 ( $0.12 \times 8/12 \times \$24,000$ ). Together, duty and duty-related carrying cost totals \$25,920. Roadrunner, on the other hand, pays duty at the time of sale because it is in a foreign trade zone. Imported goods do not incur duty until (unless) they are moved out of the zone. Since 70 percent of the original imported oil remains in the final product, duty equals \$16,800 ( $0.7 \times \$400,000 \times 0.06$ ). No carrying cost is associated with the duty. The duty-related costs for the two companies are summarized as follows:

	<i>Roadrunner</i>	<i>Wilycoyote</i>
Duty paid at purchase	\$ 0	\$24,000
Carrying cost of duty	0	1,920
Duty paid at sale	<u>16,800</u>	<u>0</u>
Total duty and duty-related cost	<u>\$16,800</u>	<u>\$25,920</u>

Clearly, Roadrunner has saved \$9,120 ( $\$25,920 - \$16,800$ ) on just one purchase of imported materials by locating in the foreign trade zone.

In the above example, the underlying business decision involves whether or not to locate in a foreign trade zone. Relevant costs include the cost of duty and the carrying cost of duty for plants located inside and outside the zone. Additional potential for cost reduction inside the zone occurs when goods that do not meet U.S. health, safety, and pollution control regulations are subject to fine. Noncomplying foreign goods can be imported into foreign trade zones and modified to comply with the law without being subject to the fine. Another example of the efficient use of foreign trade zones is the assembly of high-tariff component parts into a lower-tariff finished product. In this case, the addition of domestic labor raises the domestic content of the finished product and makes the embedded foreign parts eligible for more favorable tariff treatment.<sup>3</sup>

3. These examples are taken from James E. Groff and John P. McCray, "Foreign-Trade Zones: Opportunity for Strategic Development in the Southwest," *Journal of Business Strategies* (Spring 1992): 14-26.

A qualitative factor is that logistics may be streamlined by using foreign trade zones, leading to quicker and more efficient clearance of customs.

## Relevancy, Cost Behavior, and the Activity Resource Usage Model

Understanding cost behavior is basic in determining relevancy. When costs were primarily unit-based, a simple distinction between fixed and variable costs could be made. Now, however, the ABC model has us focusing on unit-level, batch-level, product-level, and facility-level costs. The first three are variable, but with respect to different types of activity drivers. The activity resource usage model can help us sort out the behavior of various activity costs and assess their relevance.

The activity resource usage model has two resource categories: (1) flexible resources and (2) committed resources. Recall from Chapter 3 that flexible resources are those that are acquired as used and needed. Committed resources are acquired in advance of usage. These categories and their usefulness in relevant costing are described in the following sections.

### Flexible Resources

Resource spending is the cost of acquiring activity capacity. The amount paid for the supply of an activity is the activity cost. For flexible resources, the activity resources demanded (used) equal the resources supplied. Thus, for this resource category, *if the demand for an activity changes across alternatives*, then resource spending will change and the cost of the activity is relevant to the decision. For example, electricity supplied internally uses fuel for the generator. Fuel is a flexible resource. Now, consider the following two alternatives: (1) accept a special, 1-time order and (2) reject the special order. If accepting the order increases the demand for kilowatt-hours (power's activity driver), then the cost of power will differ across alternatives by the increase in fuel consumption (assuming fuel is the only resource acquired as needed). Therefore, power cost is relevant to the decision.

### Committed Resources

Committed resources are acquired in advance of usage through implicit contracting, and they are usually acquired in lumpy amounts. Consider an organization's salaried and hourly employees. The implicit understanding is that the organization will maintain employment levels even though there may be temporary downturns in the amount of an activity used. This means that an activity may have unused capacity available. Thus, an increase in demand for an activity across alternatives may not mean that the activity cost will increase (because all the increased demand is absorbed by the unused activity capacity). For example, assume a company has five manufacturing engineers who supply a capacity of 10,000 engineering hours (2,000 hours each). The cost of this activity capacity is \$250,000, or \$25 per hour. Suppose that this year the company expects to use only 9,000 engineering hours for its normal business. This means that the engineering activity has 1,000 hours of unused capacity. In deciding to reject or accept a special order that requires 500 engineering hours, the cost of engineering would be irrelevant. The order can be filled using unused engineering capacity, and the resource spending is the same for each alternative (\$250,000 will be spent whether or not the order is accepted).

However, *if a change in demand across activities produces a change in resource supply*, then the activity cost will change and be relevant to the decision. A change in re-

## OBJECTIVE 3

Explain how the activity resource usage model is used in assessing relevancy.

source supply means a change in resource spending and consequently a change in activity cost. A change in resource spending can occur in one of two ways: (1) the demand for the resource exceeds the supply (increases resource spending) and (2) the demand for the resource drops permanently and supply exceeds demand enough so that activity capacity can be reduced (decreases resource spending).

To illustrate the first change, consider once again the engineering activity and the special order decision. Suppose that the special order requires 1,500 engineering hours. This exceeds the resource supply. To meet the demand, the organization would need to hire a sixth engineer or perhaps use a consulting engineer. Either way, resource spending increases if the order is accepted; thus, the cost of engineering is now a relevant cost.

To illustrate the second type of change, suppose that the company's manager is considering purchasing a component used for production instead of making it in-house. Assume the same facts about engineering capacity: 10,000 hours available and 9,000 used. If the component is purchased, then the demand for engineering hours will drop from 9,000 to 7,000. This is a permanent reduction because engineering support will no longer be needed for manufacturing the component. Unused capacity is now 3,000 hours, 2,000 permanent and 1,000 temporary. Furthermore, since engineering capacity is acquired in chunks of 2,000, this means that the company can reduce activity capacity and resource spending by laying off one engineer or reassigning the engineer to another plant where the services are in demand. Either way, the resource supply is reduced to 8,000 hours. If an engineer's salary is \$50,000, then engineering cost would differ by \$50,000 across the make-or-buy alternatives. This cost is then relevant to the decision. However, if the demand for the engineering activity drops by less than 2,000 hours, the increase in unused capacity is not enough to reduce resource supply and resource spending; in this case, the cost of the engineering activity would not be relevant.

Often, committed resources are acquired in advance for multiple periods—before the resource demands are known. Leasing or buying a building are examples. Buying multiperiod activity capacity is often done by paying cash up front. In this case, an annual expense may be recognized, but no additional resource spending is needed. Up-front resource spending is a sunk cost and thus never relevant. Periodic resource spending, such as leasing, is essentially independent of resource usage. Even if a permanent reduction of activity usage is experienced, it is difficult to reduce resource spending because of formal contractual commitments.

For example, assume a company leases a plant for \$100,000 per year for 10 years. The plant is capable of producing 20,000 units of a product—the level expected when the plant was leased. After five years, suppose that the demand for the product drops and the plant needs to produce only 15,000 units each year. The lease payment of \$100,000 still must be paid each year even though production activity has decreased. Now, suppose that demand increases beyond the 20,000-unit capability. In this case, the company may consider acquiring or leasing an additional plant. Here, resource spending could change across alternatives. The decision, however, to acquire long-term activity capacity is not in the realm of tactical decision making. This is not a short-term or small-scale decision. Decisions involving multiperiod capabilities are called capital investment decisions and are covered in Chapter 20. Thus, for the multiperiod resource category, changes in activity demands across alternatives rarely affect resource spending and are therefore not usually relevant for tactical decision making. When resource spending does change, it means assessing the prospect of a multiperiod commitment, which is properly treated using capital investment decision models. Exhibit 18-2, on the following page, summarizes the activity resource usage model's role in assessing relevancy.

## EXHIBIT 18-2

## Resource Demand and Supply

Category	Relationships	Relevancy
Flexible	Supply = Demand a. Demand changes b. Demand constant	a. Relevant b. Not relevant
Committed	Supply – Demand = Unused capacity a. Demand increase < Unused capacity b. Demand increase > Unused capacity c. Demand decrease (permanent) 1. Activity capacity reduced 2. Activity capacity unchanged	a. Not relevant b. Relevant  1. Relevant 2. Not relevant

## Illustrative Examples of Tactical Decision Making

The activity resource usage model and the concept of relevancy are valuable tools in making tactical decisions. It is important to see how they are used to solve a variety of problems. Applications include decisions to make or buy a component, to keep or drop a segment or product line, to accept or reject a special order at less than the usual price, and to process a joint product further or sell it at the split-off point. Of course, this is not an exhaustive list. However, the same decision-making principles can be applied to other settings. Once you see how they are used, it is relatively easy to apply them in any appropriate setting. In illustrating the applications, we assume that the first two steps of the tactical decision-making model (see Exhibit 18-1) have already been done. Thus, the emphasis is on tactical cost analysis.

### Make-or-Buy Decisions

Organizations are often faced with a **make-or-buy decision**—a decision of whether to make or to buy components or services used in making a product or providing a service. For example, a physician can buy laboratory tests from external suppliers (hospitals or for-profit laboratories), or these lab tests can be done internally. Similarly, a PC computer manufacturer can make its own disk drives, or they can be bought from external suppliers.

Outsourcing of technical and professional jobs is becoming an important make-or-buy issue. **Outsourcing** is the payment by a company for a business function that was formerly done in-house. For example, some domestic companies outsource their legal needs to outside law firms rather than hiring corporate attorneys. Outsourcing refers to the move of a business function to another company, either inside or outside the United States. In the 1990s, for example, a number of companies set up design and call center operations in non-U.S. locations. **Texas Instruments (TI)** set up an engineering facility in Bangalore, India. The availability of underemployed college graduates in India meant the combination of low wage rates and high productivity. However, the underdeveloped Indian infrastructure required considerable capital investment. TI installed its own electrical generators and satellite dishes, some hauled in by oxcart, to operate efficiently. Then, the company's engineers in Dallas and in Miho, Japan, designed parts of a memory chip and forwarded their work via computers and satellites to engineers at Bangalore for completion.

### OBJECTIVE 4

Apply the tactical decision-making concepts in a variety of business situations.

Of course, qualitative considerations also play into the outsourcing decision. Time is a valuable resource, and many companies have found that a global presence leads to time and quality enhancement. For example, software companies have found that locating call centers in Ireland and the United States increases the number of hours of available customer service each day. A customer in New York who needs an answer to a question may not get help from a California-based call center but will get help from a Dublin-based center. On the negative side, the political ramifications of outsourcing, with its overtones of “exporting jobs,” have led companies to weigh the decision more carefully.

Make-or-buy decisions are not short run in nature but fall into the small-scale tactical decision category. For example, the decision to make or buy may be motivated by cost leadership and/or differentiation strategies. Making instead of buying or buying instead of making may be one way of reducing the cost of producing the main product. Alternatively, choosing to make or buy may be a way of increasing the quality of the component and thus increasing the overall quality of the final product (differentiating on the basis of quality).

### Cost Analysis: Activity-Based Cost Management System

To illustrate the cost analysis for a make-or-buy problem, assume that Talmage Company produces a mechanical part used in one of its engines. (Talmage produces engines for snowblowers.) An outside supplier has offered to sell a part (Part 34B) for \$4.75. The company normally produces 100,000 units of the part each year. The activities associated with producing the part and other useful information are listed in Exhibit 18-3. The cost formulas that use units as the activity driver refer to units of Part 34B. The remaining activity cost formulas are more general and reflect all demands made on the activity. All activity capacities are annual capacity measures. The cost of providing space includes annual plant depreciation, property taxes, and annual maintenance. This cost is allocated to the products based on the square feet of space occupied by the product’s production equipment. The variable component of each activity represents the cost of flexible resources. The fixed cost component represents the cost of committed resources. Whenever there is a fixed component, the activity capacity refers to the capacity acquired by spending in advance of usage. Units of purchase indicate how many units of the activity (as measured by its driver) must be acquired at a time (if more than

## EXHIBIT 18-3

### Activity and Cost Information

Activity	Cost Driver	Cost Formula	Activity Capacity	Expected Activity Usage	Part 34B Activity Usage	Units of Purchase
Using materials	Units	$Y = \$0.50X$	As needed	100,000	100,000	1
Using direct labor	Units	$Y = \$2X$	As needed	100,000	100,000	1
Providing supervision	Number of lines	$Y = \$300,000$	15	15	3	3
Moving materials	Number of moves	$Y = \$250,000 + \$0.60X$	250,000	240,000	40,000	25,000
Providing power	Machine hours	$Y = \$3X$	As needed	30,000	30,000	1
Inspecting products	Inspection hours	$Y = \$280,000 + \$1.50X$	16,000	14,000	2,000	2,000
Setting up equipment	Setup hours	$Y = \$600,000$	60,000	58,000	6,000	2,000
Providing space	Square feet	$Y = \$1,000,000$	50,000	50,000	5,000	50,000
Equipment depreciation	Units	$Y = \$0.50X$	120,000	100,000	100,000	15,000

one, it is called a “lumpy” amount). For committed resources, the cost of acquiring the lumpy amount is obtained by dividing the activity fixed cost by activity capacity and then multiplying this amount by the units of purchase. For example, the cost of acquiring three units of supervision is \$60,000 [ $(\$300,000/15) \times 3$ ].

From the perspective of tactical cost analysis, whether or not Talmage should continue making Part 34B or buy it from an external supplier depends on how much *resource spending* can be reduced because of the ability to reduce resource usage (by buying instead of making). If Talmage buys Part 34B instead of making it, *resource usage* decreases for each of the nine activities (by the amount indicated in the Part 34B Activity Usage column). Thus, for activities associated with committed resources—providing space and equipment depreciation—spending will not change, and so the cost is not relevant (see Exhibit 18-2). For activities associated with flexible resources, activity demand changes, and so the cost of these resources is relevant to the decision (see Exhibit 18-2). These activities include using materials, using direct labor, providing power, and the variable components of moving materials and inspecting products. The change in resource spending is simply the cost per unit of driver multiplied by the variable rate in the cost formula. For example, for materials, resource spending decreases by \$50,000 if Part 34B is purchased rather than made ( $\$0.50 \times 100,000$ ). The variable cost of moving materials, on the other hand, decreases by \$24,000 ( $\$0.60 \times 40,000$  moves). The changes in costs for the five activities with variable components (resources acquired as needed) are as follows:

<i>Activity</i>	<i>Make<sup>a</sup></i>	<i>Buy<sup>b</sup></i>	<i>Differential Cost<sup>c</sup></i>
Using materials	\$ 50,000	\$ 0	\$ 50,000
Using direct labor	200,000	0	200,000
Moving materials	144,000	120,000	24,000
Providing power	90,000	0	90,000
Inspecting products	21,000	18,000	3,000

<sup>a</sup>Variable rate  $\times$  Expected activity usage.

<sup>b</sup>Variable rate  $\times$  (Expected usage – Part 34B usage).

<sup>c</sup>Make activity cost – Buy activity cost.

Some committed resources are more difficult to analyze. These include providing supervision, moving materials, inspecting products, and setting up equipment.

For the make-or-buy decision, all four activities experience a permanent decrease in activity demand. The issue is whether or not activity capacity can be reduced so that resource spending can be reduced (see Exhibit 18-2). Assume that any current unused capacity (Capacity – Expected usage) is temporary. The permanent demand decrease is measured only by the drop in Part 34B activity usage. Resource spending can be reduced if activity capacity can be decreased because of the permanent drop in resource usage. For example, providing supervision must be purchased in units of three. The decrease in demand for this activity by dropping Part 34B is three units. Thus, the cost of providing supervision is relevant because resource spending on supervision can be decreased by \$60,000 [ $(\$300,000/15) \times 3$ ]. The analysis for moving materials provides additional insight. If Part 34B is no longer made, the demand for this activity will decrease by 40,000 units. However, since capacity for moving materials is purchased in units of 25,000, activity capacity can only be decreased by 25,000 units. The reduction in resource spending is \$25,000 [ $(\$250,000/250,000) \times 25,000$ ]. The cost is relevant, but the difference in cost between the two alternatives is less than the reduction of the cost of resource usage because of the lumpy nature of the resource. Similar analyses can be done for the inspections and setup activities. The changes in activity cost for short-term resources acquired in advance are as follows:

<i>Activity</i>	<i>Make<sup>a</sup></i>	<i>Buy<sup>b</sup></i>	<i>Differential Cost<sup>c</sup></i>
Providing supervision	\$300,000	\$240,000	\$60,000
Moving materials	250,000	225,000	25,000
Inspecting products	280,000	245,000	35,000
Setting up equipment	600,000	540,000	60,000

<sup>a</sup>Fixed activity cost.

<sup>b</sup>(Fixed cost/Activity capacity) × Reduction in activity capacity.

<sup>c</sup>Make activity cost – Buy activity cost.

To complete the cost analysis, we need only information concerning the activity costs that are added *because* of buying rather than making. The most obvious is the acquisition cost of the part itself. For simplicity, let's assume that the procurement activities (purchasing, receiving, and paying suppliers) have sufficient unused capacity to absorb any increase in demand from acquiring Part 34B. With this assumption, the elements of the make-or-buy analysis are now complete. The cost analysis is summarized in Exhibit 18-4. The costs for each activity resource category are aggregated so that we have a total picture of the effects of making versus buying. The tactical cost analysis supports the buy alternative. This alternative provides a \$72,000 benefit over the make alternative. Based on 100,000 units, buying is cheaper by \$0.72 per unit (\$72,000/100,000). All other things being equal, Talmage should buy Part 34B instead of making it.

### EXHIBIT 18-4

#### ABC Make-or-Buy Analysis: Talmage Company

<b>Activity</b>	<b>Make</b>	<b>Buy</b>	<b>Differential Cost</b>
Using materials	\$ 50,000	\$ 0	\$ 50,000
Using direct labor	200,000	0	200,000
Providing supervision	300,000	240,000	60,000
Moving materials	394,000	345,000	49,000
Providing power	90,000	0	90,000
Inspecting products	301,000	263,000	38,000
Setting up equipment	600,000	540,000	60,000
Acquiring Part 34B	0	475,000	(475,000)
<b>Totals</b>	<b><u>\$1,935,000</u></b>	<b><u>\$1,863,000</u></b>	<b><u>\$ 72,000</u></b>

### Cost Analysis: Functional-Based Cost Management System

A functional-based cost management system would not supply detailed information about non-unit-level activities and costs; it would provide only unit-level activity data. Non-unit-level costs are all assumed to be fixed with respect to changes in production volume. A typical functional-based analysis would identify the costs of materials, labor, power, and supervision of Part 34B as relevant. (Supervision of Part 34B would be viewed as a direct fixed cost and would disappear if production of Part 34B stops; therefore, it is relevant.) All other costs would be classified as irrelevant because they would not change as production volume changes. A summary of the functional-based make-or-buy analysis is provided in Exhibit 18-5 on the following page. This analysis supports the make alternative, indicating a \$75,000 benefit to making over buying. This analysis is more limited because it has less access to activity information. The use of a more limited information set may lead to erroneous decisions.

EXHIBIT 18-5		Functional-Based Make-or-Buy Analysis: Talmage Company	
Activity	Make	Buy	Differential Cost
Using materials	\$ 50,000	\$ 0	\$ 50,000
Using direct labor	200,000	0	200,000
Providing supervision	300,000	240,000	60,000
Providing power	90,000	0	90,000
Acquiring Part 34B	0	475,000	(475,000)
Totals	<u>\$640,000</u>	<u>\$715,000</u>	<u>\$ (75,000)</u>

## Keep-or-Drop Decisions

Often, a manager needs to determine whether a segment, such as a product line, should be kept or dropped. **General Motors**, for example, decided to drop the Oldsmobile line. A **keep-or-drop decision** uses relevant cost analysis to determine whether a segment of a business should be kept or dropped. In a functional-based cost management system, segmented income statements, using unit-based fixed or variable costs, improve the ability to make keep-or-drop decisions. Similarly, by increasing traceability, segmented reporting using ABC classifications and the resource usage model offers a significant improvement in information content over the unit-based, variable-costing segmented report. JIT manufacturing offers even more capabilities. By localizing many costs (e.g., maintenance, materials handling, and inspection) that were formerly common to a variety of products and by changing the behavior of some costs (e.g., direct labor), the number of directly attributable costs has been increased. Decisions to drop or keep a segment are facilitated by the increased number of directly attributable costs in a JIT environment.

### Keep-or-Drop: Functional-Based Analysis

The logic underlying a functional-based keep-or-drop analysis is fairly straightforward. Revenues and costs that belong to a segment are identified. Directly attributable revenues, unit-based variable costs, and directly attributable fixed costs are defined as costs that belong to the segment. If the segment is dropped, then only the traceable revenues and costs should vanish; thus, the traceable revenues and costs are relevant to the decision. Furthermore, the traceable income (loss) determines whether a segment should be dropped or kept. If the segment income is positive, then the segment is kept; if negative, then the decision is to drop the segment (this assumes that the segment income is expected to persist over time). Exhibit 18-6 shows a functional-based segmented income statement, where products are defined as segments. More detail is provided on the statement than usual so that the effects of moving to an activity-based statement can be illustrated more clearly. The statement indicates that both seat covers and floor mats are providing positive product margins. It is unlikely, based on the information here, that the company would drop either product line. Yet, overall profitability for the company is not impressive—barely above the break-even point. An important issue—in fact, a critical issue in segmented analysis—is the ability to trace costs to individual segments. Improved traceability is offered by ABC classifications.

### Keep-or-Drop: ABC Analysis

Exhibit 18-7, on page 796, presents an activity-based segmented statement. The same example used for functional-based segmented reporting is used so that both keep-or-drop decisions can be compared. For the ABC approach, machine depreciation is traced to each segment using machine hours to measure usage (units-of-production

## EXHIBIT 18-6

## Functional-Based Segmented Income Statement

	Seat Covers	Floor Mats	Total
Sales	\$ 950,000	\$1,680,000	\$2,630,000
Less variable costs:			
Direct materials	(300,000)	(400,000)	(700,000)
Direct labor	(210,000)	(210,000)	(420,000)
Maintenance	(90,000)	(90,000)	(180,000)
Power	(35,000)	(25,000)	(60,000)
Commissions	<u>(30,000)</u>	<u>(40,000)</u>	<u>(70,000)</u>
Contribution margin	\$ 285,000	\$ 915,000	\$1,200,000
Less direct fixed costs:			
Advertising	(30,000)	(20,000)	(50,000)
Supervision	<u>(50,000)</u>	<u>(50,000)</u>	<u>(100,000)</u>
Product margin	<u>\$ 205,000</u>	<u>\$ 845,000</u>	\$1,050,000
Less common fixed expenses:			
Depreciation—machinery			(100,000)
Depreciation—plant			(160,000)
Inspecting products			(200,000)
Customer service			(150,000)
General administration			(180,000)
Materials handling			(140,000)
Sales administration			<u>(80,000)</u>
Operating income			<u>\$ 40,000</u>

depreciation method). Two batch-level costs—inspecting products and materials handling—are assigned to products using batch-level drivers (number of batches and moves). Assume that cost analysts have determined that these two batch-level activities have both flexible and committed resources. Flexible resources are labeled as a non-unit variable expense. The cost of committed resources is treated as a fixed expense and, where possible, is divided into two categories: *traceable fixed expenses*, representing the cost of fixed resource usage traced to each segment using activity drivers, and *unused activity expenses*, treated as a common fixed expense. Notice that the cost of facility-level activities is not traced to the two products. Two product-level costs—customer service and sales administration—are also assigned to products using the number of complaints and number of sales orders. Resources associated with these two activities are all committed resources, and the resources used by each product are labeled as traceable fixed expenses. It could also be argued that advertising and supervision are product-level activities (the cost of these activities increases as the number of products increases). There is no need, however, to use an activity driver to trace advertising or supervision costs to each product line. Advertising and supervision costs are traceable to each product using direct tracing and are labeled as direct fixed costs.

The ABC segmented statement provides a much different view of product profitability than does the functional-based segmented statement. First, we see that the company is paying for resources that are not being used, totaling \$90,000. Second, seat covers are unprofitable and are causing a significant drain on company resources. Thus, the ABC segmented income statement reveals three possible ways of increasing income: (1) reducing resource spending by exploiting the current unused activity capacities, (2) eliminating the unprofitable product line, and (3) a combination of (1) and (2).

<b>EXHIBIT 18-7</b>			
<b>ABC Segmented Income Statement</b>			
	<b>Seat Covers</b>	<b>Floor Mats</b>	<b>Total</b>
Sales	\$ 950,000	\$1,680,000	\$2,630,000
Less unit-level variable expenses:			
Direct materials	(300,000)	(400,000)	(700,000)
Direct labor	(210,000)	(210,000)	(420,000)
Maintenance	(90,000)	(90,000)	(180,000)
Power	(35,000)	(25,000)	(60,000)
Commissions	(30,000)	(40,000)	(70,000)
Contribution margin	\$ 285,000	\$ 915,000	\$1,200,000
Less traceable expenses:			
Advertising, direct fixed	(30,000)	(20,000)	(50,000)
Supervision, direct fixed	(50,000)	(50,000)	(100,000)
Machine depreciation, traceable fixed	(50,000)	(50,000)	(100,000)
Inspecting products, non-unit variable	(20,000)	(10,000)	(30,000)
Inspecting products, traceable fixed	(80,000)	(50,000)	(130,000)
Materials handling, non-unit variable	(10,000)	(14,000)	(24,000)
Materials handling, traceable fixed	(70,000)	(26,000)	(96,000)
Customer service, traceable fixed	(45,000)	(75,000)	(120,000)
Sales administration, traceable fixed	(50,000)	(30,000)	(80,000)
Product margin	<u>\$ (120,000)</u>	<u>\$ 590,000</u>	\$ 470,000
Less common expenses:			
Unused activity:			
Inspecting products			(40,000)
Materials handling			(20,000)
Customer service			(30,000)
Facility-level:			
Plant depreciation			(160,000)
General administration			(180,000)
Operating income			<u>\$ 40,000</u>

Of the three ways of increasing income, the last two consider the possibility of dropping the seat cover line. Before making a decision about keeping or dropping the unprofitable line, the manager needs to know how much resource spending will change. First, all unit and non-unit variable expenses will vanish if the line is dropped, as will direct fixed expenses. Notice, however, that machine depreciation—even though unitized—is not relevant to the decision. (Depreciation is an allocation of a sunk cost.) Dropping the unprofitable line increases the cost of unused resources from \$90,000 to \$325,000. (The total increases by the sum of the seat cover's traceable fixed expenses, excluding machine depreciation, since it's not relevant.) If seat covers are dropped, the demand for inspecting products, customer service, materials handling, and sales administration will decrease. Thus, the key to completing the keep-or-drop analysis is assessing how much of the cost of unused capacity for these activities can be eliminated. Exhibit 18-8 indicates the activity capacity, unused activity (before dropping), seat cover activity usage, and units of purchase for each of the four activities with potentially relevant traceable fixed expenses. The unused activity (before dropping) for inspecting and customer service is viewed as permanent—a result of a quality improvement program implemented last year. Unused activity for the materials handling activity is temporary.

## COST MANAGEMENT

## Technology in Action

Convenience stores constantly balance the need to offer a wide selection of products with the need to streamline offerings so that they can fit into the small-store format. In the past, the stores determined which products to stock based on each one's profitability. Profit was calculated as the difference between wholesale and retail prices. While this sounds reasonable, it completely ignores the additional costs associated with carrying and stocking each product line. In early 2001, the American Wholesale Marketers Association and the National Association of Convenience Stores presented the results of a study of new software designed to "assess each item's profitability by factoring in the operating, labor, inventory, and overhead costs of each item." In the past, the cost of handling a product was not considered

when determining per-product costs. However, handling costs are a significant part of the total cost structure.

One owner of a chain of convenience stores tested the software and learned that every auto fuse and bulb sold resulted in a loss of 50 cents. He surveyed customers and found that they were willing to pay a higher price. As a result, he raised the price by one dollar. This achieved two goals. The bulbs and fuses now make money, and customers still appreciate the opportunity to pop into the convenience store for suddenly needed products. The same chain determined that three kinds of laundry detergent were two, too many. It pared its offering to one brand and displayed it more prominently. Sales increased by 20 percent, while costs fell because the sole brand could be ordered by the case.

Source: Ann Zimmerman, "Convenience Stores Create Software to Boost Profitability and Cut Costs," *The Wall Street Journal Interactive Edition* (February 15, 2001).

## EXHIBIT 18-8

## Activity Information: Keep-or-Drop Analysis

Activity	Activity Driver	Activity Capacity	Unused Activity	Seat Cover	
				Activity Usage	Units of Purchase
Inspecting products	No. of batches	170	40	45	85
Materials handling	No. of moves	2,320	400	1,400	350
Customer service	No. of complaints	300	60	90	60
Sales administration	No. of sales orders	500	0	150	500

Using the information in Exhibit 18-8, the keep-or-drop analysis can be completed. The full analysis is presented in Exhibit 18-9 on the following page. Dropping the product saves the company \$45,000 per year. Part of the benefit comes from adding enough to already existing unused capacity so that activity capacity can be reduced, causing a reduction in resource spending. The inspecting products activity illustrates this possibility. The activity could be done by two salaried inspectors, who can each inspect 85 batches per year. Adding 45 more batches of unused activity to the existing unused activity then makes it possible to lay off one inspector.

## Special-Order Decisions

Price discrimination laws require that firms sell identical products at the same price to competing customers in the same market. These restrictions do not apply to competitive bids or to noncompeting customers. Bid prices can vary to customers in the same market, and firms often have the opportunity to consider 1-time special orders from potential customers in markets not ordinarily served. **Special-order decisions** focus on whether a specially priced order should be accepted or rejected. Special-order decisions are examples of tactical decisions with a short-term focus. Increasing short-term profits is the limited objective represented by this type of decision. Care should be taken so

## EXHIBIT 18-9

## ABC Keep-or-Drop Analysis

	Keep Alternative	Drop Alternative
Contribution margin	\$285,000	\$ 0
Advertising, direct fixed	(50,000)	0
Supervision, direct fixed	(30,000)	0
Inspecting products, <sup>a</sup> non-unit variable	(20,000)	0
Inspecting products, traceable fixed	(80,000)	0
Inspecting products, unused capacity	(40,000)	0
Materials handling, <sup>b</sup> non-unit variable	(10,000)	0
Materials handling, traceable fixed	(70,000)	0
Customer service, <sup>c</sup> traceable fixed	(45,000)	(15,000)
Total	<u>\$ (60,000)</u>	<u>\$(15,000)</u>

<sup>a</sup>Dropping seat covers will increase the unused capacity from 40 batches to 85 batches. Since activity capacity is purchased in units of 85, this allows the resource spending to be reduced by the traceable fixed expenses plus the cost of unused capacity.

<sup>b</sup>Dropping seat covers will increase the unused capacity from 400 moves to 1,800 moves; however, only 1,400 of the unused capacity is permanent (corresponding to the seat cover's activity usage). Since more capacity must be purchased in units of 350, capacity can be reduced by exactly 1,400 moves, saving all the traceable fixed activity expenses.

<sup>c</sup>Since capacity is purchased in blocks of 60, the existing unused capacity can be reduced by this amount regardless of whether the product is dropped or kept and is therefore not relevant. If the product is dropped, the effect is to create 90 more units of unused capacity. Of these 90 units, 60 units of capacity can be eliminated, reducing the cost of resource spending by \$30,000  $\{[(\$45,000 + \$75,000 + \$30,000)/300] \times 60\}$ .

that acceptance of special orders does not jeopardize normal distribution channels or adversely affect other strategic elements. With this qualification, it should be noted that special orders often can be attractive, especially when the firm is operating below its maximum productive capacity and when other activities have sufficient unused capacity to absorb any incremental demands the order may make. For this situation, the company can focus its analysis on resources acquired as needed—because this will be the source of any increase in resource spending attributable to the order. Relevance is established by assessing where activity demand increases.

Suppose, for example, that Polarcreme, Inc., an ice-cream company, is operating at 80 percent of its productive capacity. Assume a similar condition exists for non-unit-level activities. The company has a capacity of 20 million half-gallon units. The company expects to produce 8 million units each of regular and premium ice cream. The total costs associated with producing and selling 8 million units of premium ice cream are given in Exhibit 18-10.

An ice-cream distributor from a geographic region not normally served by the company has offered to buy 2 million units of premium ice cream at \$1.75 per unit, provided its own label can be attached to the product. The distributor has also agreed to pay the transportation costs. Since the distributor approached the company directly, there is no sales commission. The company estimates that the special order will increase the purchase orders by 10,000, receiving orders by 20,000, and setups by 13. Furthermore, although the order increases the demand for these and other activities, existing unused activity capacity is sufficient to absorb the increased demand. Should the company accept this order or reject it?

The offer of \$1.75 is well below the normal selling price of \$2.50; in fact, it is even below the total unit cost. Nonetheless, accepting the order may be profitable for the

**EXHIBIT 18-10****Data for Polarcreme, Inc.: Premium Ice Cream**

	Total <sup>a</sup>	Unit Cost
Unit-level variable costs:		
Dairy ingredients	\$ 5,600	\$0.70
Sugar	800	0.10
Flavoring	1,200	0.15
Direct labor	2,000	0.25
Packaging	1,600	0.20
Commissions	160	0.02
Distribution	240	0.03
Other	400	0.05
Total unit-level costs	<u>\$12,000</u>	<u>\$1.50</u>
Non-unit-level variable costs:		
Purchasing (\$8 × 40,000 purchase orders)	\$ 320	\$0.04
Receiving (\$6 × 80,000 receiving orders)	480	0.06
Setting up (\$8,000 × 50 setups)	400	0.05
Total non-unit-level costs	<u>\$ 1,200</u>	<u>\$0.15</u>
Fixed activity costs:		
Total fixed costs <sup>b</sup>	<u>\$ 1,600</u>	<u>\$0.20</u>
Total costs	<u><u>\$14,800</u></u>	<u><u>\$1.85</u></u>
Wholesale selling price	\$20,000	\$2.50

<sup>a</sup>All costs expressed in thousands.

<sup>b</sup>The total cost of providing capacity for all activities within the firm assigned to premium.

company. The company does have idle capacity, and the order will not displace other units being produced to sell at the normal price. Additionally, many of the costs are not relevant; spending for resources acquired in advance of usage will not change regardless of whether the order is accepted or rejected.

If the order is accepted, a benefit of \$1.75 per unit will be realized that otherwise would be unavailable. However, all of the unit-level variable costs except for distribution (\$0.03) and commissions (\$0.02) will be incurred, producing a cost of \$1.45 per unit. Furthermore, the non-unit-level variable costs will also be incurred, producing a total incremental cost of \$304,000, or \$0.152 per unit (for an order of 2 million units). Therefore, the company will see a net benefit of \$0.148 (\$1.75 – \$1.602). Thus, Polarcreme's profits would increase by \$296,000 (\$0.148 × 2,000,000). The relevant cost analysis is summarized in Exhibit 18-11 on the following page.

## Decisions to Sell or Process Further

**Joint products** have common processes and costs of production up to a split-off point. At that point, they become distinguishable. For example, certain minerals such as copper and gold may both be found in a given ore. The ore must be mined, crushed, and treated before the copper and gold are separated. The point of separation is called the **split-off point**. The costs of mining, crushing, and treatment are common to both products.

Often, joint products are sold at the split-off point. But sometimes, it is more profitable to process a joint product further, beyond the split-off point, prior to selling it.

<b>EXHIBIT 18-11</b>		<b>Special-Order Cost Analysis: Polarcreme, Inc.</b>	
	<b>Accept</b>	<b>Reject</b>	<b>Differential Effect</b>
Revenues	\$ 3,500,000	\$0	\$ 3,500,000
Dairy ingredients	(1,400,000)	0	(1,400,000)
Sugar	(200,000)	0	(200,000)
Flavorings	(300,000)	0	(300,000)
Direct labor	(500,000)	0	(500,000)
Packaging	(400,000)	0	(400,000)
Other	(100,000)	0	(100,000)
Purchasing	(80,000)	0	(80,000)
Receiving	(120,000)	0	(120,000)
Setting up	(104,000)	0	(104,000)
Total	<u>\$ 296,000</u>	<u>\$0</u>	<u>\$ 296,000</u>

Determining whether to **sell or process further** is an important decision that a manager must make.

To illustrate, consider Delrio Corporation. Delrio is an agricultural corporation that produces and sells fresh produce and canned food products. The San Juan Division of Delrio specializes in tomato products. San Juan has a large tomato farm that produces all the tomatoes used in its products. The farm is divided into manageable plots. Each plot produces approximately 1,500 pounds of tomatoes; this defines a load. Each plot must be cultivated, fertilized, sprayed, watered, and harvested. When the tomatoes have ripened, they are harvested. The tomatoes are then transported to a warehouse, where they are washed and sorted. The approximate cost of all these activities is \$200 per load.

Tomatoes are sorted into two grades (A and B). Grade A tomatoes are larger and better shaped than Grade B. Grade A tomatoes are sold to large supermarkets. Grade B tomatoes are sent to the canning plant where they are processed into catsup, tomato sauce, and tomato paste. Each load produces about 1,000 pounds of Grade A tomatoes and 500 pounds of Grade B tomatoes. Recently, the manager of the canning plant requested that the Grade A tomatoes be used for a Delrio hot sauce. Studies have indicated that the Grade A tomatoes provided a better flavor and consistency for the sauce than did Grade B tomatoes. Furthermore, Grade B tomatoes are fully utilized for other products.

The hot sauce production would require using all of the Grade A output (from the San Juan farm). Grade A tomatoes are sold to large supermarkets for \$0.40 per pound. In deciding whether to sell Grade A tomatoes at split-off or to process them further and sell the hot sauce, the common costs of cultivating, spraying, watering, and so on, are not relevant. Delrio must pay the \$200 per load for these activities regardless of whether it sells the Grade A tomatoes at split-off or processes them further. However, the revenues earned at split-off are likely to differ from the revenues that would be received if the Grade A tomatoes were sold as hot sauce. Therefore, revenues are a relevant item.

The relevance of processing costs depends on the nature of the resource demands. Clearly, the demand for resources acquired as needed will increase, and these costs are relevant (for such things as labor, peppers, water, bottles, and spices). For resources acquired in advance of usage, the increase in resource spending will depend on how much existing activity capacity must be increased. For example, the receiving activity may in-

crease in capacity to handle the increased volume of tomatoes. The increased resource spending for receiving would be a relevant processing cost. However, it may be that the inspecting activity has sufficient permanent unused capacity to deal with the inspection requirements for the sauce. If so, then the cost of inspection would not be relevant. (The cost of inspection resources is the same whether or not the hot sauce is produced.)

Assume that the hot sauce sells for \$1.50 per bottle. Also assume that the additional processing costs, including only resources acquired as needed and increases in activity capacity, amount to \$1,000. Thus, the total revenues at split-off for Grade A tomatoes are \$400 ( $\$0.40 \times 1,000$  pounds). If the Grade A tomatoes are processed into hot sauce (one pound of tomatoes equals one bottle of hot sauce), the total revenues are \$1,500 ( $\$1.50 \times 1,000$  bottles). The incremental revenues from processing further are \$1,100 per half ton of Grade A tomatoes ( $\$1,500 - \$400$ ). Since revenues increase by \$1,100 and processing costs by \$1,000, the net benefit of processing the Grade A tomatoes is \$100 per half ton. The analysis is summarized as follows:

	<i>Sell</i>	<i>Process Further</i>	<i>Differential Amount to Process Further</i>
Revenues	\$400	\$1,500	\$1,100
Processing cost	—	<u>1,000</u>	<u>1,000</u>
Total	<u>\$400</u>	<u>\$ 500</u>	<u>\$ 100</u>

## Relevant Costing and Ethical Behavior

Relevant costs are used in making tactical decisions—decisions that have an immediate view or limited objective in mind. In making these decisions, however, decision makers should always keep the decisions within an ethical framework. Reaching objectives is important, but how you get there is perhaps even more important. Unfortunately, many managers have the opposite view. Part of the reason for the problem is the extreme pressure to perform that many managers feel. Often, the individual who is not a top performer may be laid off or demoted. Under such conditions, the temptation is often great to engage in questionable behavior.

For example, the price of cashmere decreased greatly during the 1990s. The lower price of cashmere fiber meant that sweaters and coats became much more affordable, and imports from China and Hong Kong more than doubled. Unfortunately, the cashmere content of the clothing was uneven, and, on occasion, misrepresented to the eventual seller. In the fall of 2000, **Lands' End** found that one of its blazers, advertised as a blend of lambswool and 30 percent cashmere, tested in the range of 10 to 30 percent cashmere. The company advised its operators to tell prospective purchasers of the variability and to offer \$20 off the price to those who still wanted the jackets. Other sellers chose to take the “low road” and continued to advertise and sell their variable mix fiber sweaters and blazers at the higher percentage of cashmere.

There can be endless debates about what is right and what is wrong. As pointed out in Chapter 1, ethical standards have been developed to provide guidance for individuals. Additionally, many companies are hiring full-time ethics officers. Often, these officers set up hot lines so that employees can call and register complaints or ask about the propriety of certain actions. However, as pointed out in an article in *Fortune*: “The old advice is still the best: Don’t do anything on the job you wouldn’t want your mother to read about with her morning coffee.”<sup>4</sup>

4. Kenneth Labich, “The New Crisis in Business Ethics,” *Fortune* (April 20, 1992): 172.

## SUMMARY

Tactical decision making consists of choosing among alternatives with an immediate or limited end in view. Tactical decisions can be short term or small scale in nature but must be made so that larger strategic objectives are served. Tactical decision making follows a 5-step process. The heart of the process is called tactical cost analysis. Tactical cost analysis includes identifying predicted costs and benefits associated with alternatives, eliminating those that are not relevant, and comparing the relevant costs and benefits. All other things being equal, the alternative with the greatest net benefit should be chosen.

An essential element of tactical cost analysis is identifying relevant costs and benefits. Costs and revenues are relevant provided they pertain to the future and differ across the alternatives being considered. All past costs are sunk and never relevant. The role of past costs in tactical decision making is predictive. Past costs can be used to estimate future costs.

Cost behavior is fundamental to understanding relevancy. The activity resource usage model is a useful tool for determining relevancy. Resources can be classified as flexible resources and committed resources. Flexible resources are acquired as needed; committed resources are acquired in advance of usage. The cost of flexible resources is relevant provided that demand changes across alternatives. The cost of committed resources is relevant provided that the demand changes across alternatives lead to a change in activity capacity. Changes in activity capacity cause resource spending to change.

Examples of tactical decisions include make-or-buy choices, keep-or-drop decisions, special-order decisions, and sell-or-process-further decisions. Special-order decisions are examples of tactical decisions with a short-term orientation. The other three are examples of small-scale tactical decisions.

## REVIEW PROBLEM AND SOLUTION

### ACTIVITY RESOURCE USAGE MODEL, STRATEGIC ELEMENTS, AND RELEVANT COSTING

Perkins Company has idle capacity. Recently, Perkins received an offer to sell 2,000 units of one of its products to a new customer in a geographic region not normally serviced. The offering price is \$10 per unit. The product normally sells for \$14. The activity-based accounting system provides the following information:

<i>Cost Driver</i>		<i>Unused Capacity</i>	<i>Quantity Demanded<sup>a</sup></i>	<i>Activity Rate<sup>b</sup></i>	
				<i>Fixed</i>	<i>Variable</i>
Direct materials	Units	0	2,000	—	\$3.00
Direct labor	Direct labor hours	0	400	—	7.00
Setups	Setup hours	0	25	\$50.00	8.00
Machining	Machine hours	6,000	4,000	4.00	1.00

<sup>a</sup>This represents only the amount of resources demanded by the special order being considered.

<sup>b</sup>Fixed activity rate is the price that must be paid per unit of activity capacity. The variable activity rate is the price per unit of resource for resources acquired as needed.

Although the fixed activity rate for setups is \$50 per hour, any expansion of this resource must be acquired in blocks. The unit of purchase for setups is 100 hours of setup servicing. Thus, any expansion of setup activity must be done 100 hours at a time. The price per hour is the fixed activity rate.

**Required:**

1. Compute the change in income for Perkins Company if the order is accepted. Comment on whether or not the order should be accepted. (In particular, discuss the strategic issues.)
2. Suppose that the setup activity had 50 hours of unused capacity. How does this affect the analysis?

SOLUTION

1. The relevant costs are those that change if the order is accepted. These costs would consist of the variable activity costs (flexible resources) plus any cost of acquiring additional activity capacity (committed resources). The income will change by the following amount:

Revenues ( $\$10 \times 2,000$ units)	\$20,000
Less increase in resource spending:	
Direct materials ( $\$3 \times 2,000$ units)	(6,000)
Direct labor ( $\$7 \times 400$ direct labor hours)	(2,800)
Setups [ $(\$50 \times 100$ hours) + $(\$8 \times 25$ hours)]	(5,200)
Machining ( $\$1 \times 4,000$ machine hours)	<u>(4,000)</u>
Income change	<u>\$ 2,000</u>

Special orders should be examined carefully before acceptance. This order offers an increase in income of \$2,000, but it does require expansion of the setup activity capacity. If this expansion is short run in nature, then it may be worth it. If it entails a long-term commitment, then the company would be exchanging a 1-year benefit of \$2,000 for an annual commitment of \$5,000. In this case, the order should be rejected. Even if the commitment is short term, other strategic factors need to be considered. Will this order affect any regular sales? Is the company looking for a permanent solution to its idle capacity, or are special orders becoming a habit (a response pattern that may eventually prove disastrous)? Will acceptance adversely affect the company's normal distribution channels? Acceptance of the order should be consistent with the company's strategic position.

2. If 50 hours of excess setup capacity exist, then the setup activity can absorb the special order's activity demands with no additional resource spending required for additional capacity. Thus, the profitability of the special order would be increased by \$5,000 (the increase in resource spending that would have been required). Total income would increase by \$7,000 if the order is accepted.

**KEY TERMS**

Decision model 783

Foreign trade zones (FTZs) 786

Joint products 799

Keep-or-drop decision 794

Make-or-buy decision 790

Outsourcing 790

Relevant costs (revenues) 785

Sell or process further 800

Special-order decisions 797

Split-off point 799

Sunk cost 786

Tactical cost analysis 784

Tactical decision making 782

Tariff 786

## QUESTIONS FOR WRITING AND DISCUSSION

1. What is tactical decision making?
2. “Tactical decisions are often small-scale decisions that serve a larger purpose.” Explain what this means.
3. What is tactical cost analysis? What steps in the tactical decision model correspond to tactical cost analysis?
4. Describe a tactical decision you personally have had to make. Apply the tactical decision-making model to your decision. How did it turn out? (*Hint:* You could discuss buying a car, choosing a college, buying a puppy, etc.)
5. What is a relevant cost? Explain why depreciation on an existing asset is always irrelevant.
6. Give an example of a future cost that is not relevant.
7. Relevant costs always determine which alternative should be chosen. Do you agree or disagree? Explain.
8. Can direct materials ever be irrelevant in a make-or-buy decision? Explain. Give an example of a fixed cost that is relevant.
9. What role do past costs play in tactical cost analysis?
10. When will flexible resources be relevant to a decision?
11. When will the cost of committed resources be relevant to a decision?
12. What are the main differences between a functional-based and an activity-based make-or-buy analysis?
13. Explain why activity-based segmented reporting provides more insight concerning keep-or-drop decisions.
14. Should joint costs be considered in a sell-or-process-further decision? Explain.
15. Why would a firm ever offer a price on a product that is below its full cost?

## EXERCISES

### 18-1 IDENTIFYING PROBLEMS AND ALTERNATIVES, RELEVANT COSTS

**LO1, LO2** Norton Products, Inc., manufactures potentiometers. (A potentiometer is a device that adjusts electrical resistance.) Currently, all parts necessary for the assembly of products are produced internally. Norton has a single plant located in Wichita, Kansas. The facilities for the manufacture of potentiometers are leased, with five years remaining on the lease. All equipment is owned by the company. Because of increases in demand, production has been expanded significantly over the five years of operation, straining the capacity of the leased facilities. Currently, the company needs more warehousing and office space, as well as more space for the production of plastic moldings. The current output of these moldings, used to make potentiometers, needs to be expanded to accommodate the increased demand for the main product.

Leo Tidwell, owner and president of Norton Products, has asked his vice president of marketing, John Tidwell, and his vice president of finance, Linda Thayn, to meet and discuss the problem of limited capacity. This is the second meeting the three have had concerning the problem. In the first meeting, Leo rejected Linda’s proposal to build the company’s own plant. He believed it was too risky to invest the capital necessary to build a plant at this stage of the company’s development. The combination of leasing a larger facility and subleasing the current plant was also considered but was rejected; subleasing would be difficult, if not impossible. At the end of the first meeting, Leo asked John to explore the possibility of leasing another facility comparable to the current one. He also

assigned Linda the task of identifying other possible solutions. As the second meeting began, Leo asked John to give a report on the leasing alternative.

**JOHN:** After some careful research, I'm afraid that the idea of leasing an additional plant is not a very good one. Although we have some space problems, our current level of production doesn't justify another plant. In fact, I expect it will be at least five years before we need to be concerned about expanding into another facility like the one we have now. My market studies reveal a modest growth in sales over the next five years. All this growth can be absorbed by our current production capacity. The large increases in demand that we experienced the past five years are not likely to be repeated. Leasing another plant would be an overkill solution.

**LEO:** Even modest growth will aggravate our current space problems. As you both know, we are already operating three production shifts. But, John, you are right—except for plastic moldings, we could expand production, particularly during the graveyard shift. Linda, I hope that you have been successful in identifying some other possible solutions. Some fairly quick action is needed.

**LINDA:** Fortunately, I believe that I have two feasible alternatives. One is to rent an additional building to be used for warehousing. By transferring our warehousing needs to the new building, we will free up internal space for offices and for expanding the production of plastic moldings. I have located a building within two miles of our plant that we could use. It has the capacity to handle our current needs and the modest growth that John mentioned. The second alternative may be even more attractive. We currently produce all the parts that we use to manufacture potentiometers, including shafts and bushings. In the last several months, the market has been flooded with these two parts. Prices have tumbled as a result. It might be better to buy shafts and bushings instead of making them. If we stop internal production of shafts and bushings, this would free up the space we need. Well, Leo, what do you think? Are these alternatives feasible? Or should I continue my search for additional solutions?

**LEO:** I like both alternatives. In fact, they are exactly the types of solutions we need to consider. All we have to do now is choose the one best for our company.

**Required:**

1. Define the problem facing Norton Products.
2. Identify all the alternatives that were considered by Norton Products. Which ones were classified as not feasible? Why? Now identify the feasible alternatives.
3. For the feasible alternatives, what are some potential costs and benefits associated with each alternative? Of the costs that you have identified, which do you think are relevant to the decision?

## 18-2 RESOURCE SUPPLY AND USAGE, SPECIAL ORDER, RELEVANCY

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**LO2, LO3,  
LO4**

Chasteen, Inc., has four salaried clerks to process purchase orders. Each clerk is paid a salary of \$27,400 and is capable of processing as many as 8,000 purchase orders per year. Each clerk uses a PC and laser printer in processing orders. Time available on each PC system is sufficient to process 8,000 orders per year. The depreciation on each PC system is \$1,800 per year. In addition to the salaries, Chasteen spends \$20,800 for forms, postage, and other supplies (assuming 32,000 purchase orders are processed). During the year, 29,320 orders were processed.

**Required:**

1. Classify the resources associated with purchasing as flexible or committed.
2. Compute the total activity availability, and break this into activity usage and unused activity.

3. Calculate the total cost of resources supplied (activity cost), and break this into the cost of activity used and the cost of unused activity.
4. (a) Suppose that a large special order will cause an additional 1,000 purchase orders. What purchasing costs are relevant? By how much will purchasing costs increase if the order is accepted? (b) Suppose that the special order causes 4,500 additional purchase orders. How will your answer to part (a) change?

## 18-3 DETERMINING RELEVANT COSTS

**LO2** Six months ago, Kelly O'Connor purchased a fire-engine red, used LeBaron convertible for \$10,000. Kelly was looking forward to the feel of the sun on her shoulders and the wind whipping through her hair as she zipped along the highways of life. Unfortunately, the wind turned her hair into straw, and she didn't do much zipping along since the car spent so much of its time in the shop. So far, she has spent \$1,200 on repairs, and she's afraid there is no end in sight. In fact, Kelly anticipates the following costs of restoration:

Rebuilt engine	\$ 700
New paint job	800
Tires	360
New interior	500
Miscellaneous maintenance	<u>340</u>
Total	<u>\$2,700</u>

On a visit to a used car dealer, Kelly found a 4-year-old Toyota RAV4 in excellent condition for \$10,000—Kelly thinks she might really be more the sport-utility type anyway. Kelly checked the blue book values and found that she can sell the LeBaron for only \$3,600. If she buys the RAV4, she will pay cash but would need to sell the LeBaron.

### Required:

1. In trying to decide whether to restore the LeBaron or buy the RAV4, Kelly is distressed because she has already spent \$11,200 on the LeBaron. The investment seems too much to give up. How would you react to her concern?
2. List all costs that are relevant to Kelly's decision. What advice would you give her?

## 18-4 SPECIAL-ORDER DECISION, FUNCTIONAL-BASED ANALYSIS, QUALITATIVE ASPECTS

**LO4** Boujoaudes, Inc., manufactures croquet sets. A national sporting goods chain recently submitted a special order for 4,000 croquet sets. Boujoaudes was not operating at capacity and could use the extra business. Unfortunately, the order's offering price of \$21 per croquet set was below the cost to produce the sets. The controller was opposed to taking a loss on the deal. However, the personnel manager argued in favor of accepting the order even though a loss would be incurred; it would avoid the problem of layoffs and would help maintain the community image of the company. The full cost to produce a croquet set is as follows:

Direct materials	\$ 7.90
Direct labor	5.40
Variable overhead	4.75
Fixed overhead	<u>3.10</u>
Total	<u>\$21.15</u>

No variable selling or administrative expenses would be associated with the order. Non-unit-level activity costs are a small percentage of total costs and are therefore not considered.

**Required:**

1. Assume that the company would accept the order only if it increased total profits. Should the company accept or reject the order? Provide supporting computations.
2. Consider the personnel manager's concerns. Discuss the merits of accepting the order even if it decreases total profits.

## 18-5 MAKE-OR-BUY, FUNCTIONAL-BASED ANALYSIS

LO2, LO4



Watanabe Company is currently manufacturing Part NIM-06, producing 15,000 units annually. The part is used in the production of several products made by Watanabe. The cost per unit for NIM-06 is as follows:

Direct materials	\$70.00
Direct labor	20.00
Variable overhead	3.00
Fixed overhead	<u>1.50</u>
Total	<u>\$94.50</u>

Of the total fixed overhead assigned to NIM-06, \$12,000 is direct fixed overhead (the annual lease cost of machinery used to manufacture Part NIM-06), and the remainder is common fixed overhead. An outside supplier has offered to sell the part to Watanabe for \$94. There is no alternative use for the facilities currently used to produce the part. No significant non-unit-based overhead costs are incurred.

**Required:**

1. Should Watanabe Company make or buy Part NIM-06?
2. What is the maximum amount per unit that Watanabe would be willing to pay to an outside supplier?

## 18-6 MAKE-OR-BUY, FUNCTIONAL-BASED AND ABC ANALYSIS

LO3, LO4



Golf-2-Go, Inc., a manufacturer of motorized carts for golfers, has just received an offer from a supplier to provide 2,000 units of a component used in its main product. The component is a wheel assembly that is currently produced internally. The supplier has offered to sell the wheel assembly for \$115 per unit. Golf-2-Go is currently using a functional, unit-based costing system that assigns overhead to jobs on the basis of direct labor hours. The estimated functional-based full cost of producing the wheel assembly is as follows:

Direct materials	\$70
Direct labor	30
Variable overhead	10
Fixed overhead	50

Prior to making a decision, the company's CEO commissioned a special study to see whether there would be any decrease in the fixed overhead costs. The results of the study revealed the following:

2 setups—\$1,800 each (The setups would be avoided, and total spending could be reduced by \$1,800 per setup.)

One half-time inspector is needed. The company already uses part-time inspectors hired through a temporary employment agency. The yearly cost of the part-time inspectors for the wheel assembly operation is \$12,300 and could be totally avoided if the part were purchased.

Engineering work: 615 hours, \$20/hr. (Although the work decreases by 615 hours, the engineer assigned to the wheel assembly line also spends time on other products, and there would be no reduction in his salary.)

200 fewer material moves at \$40 per move

**Required:**

1. Ignore the special study, and determine whether the wheel assembly should be produced internally or purchased from the supplier.
2. Now, using the special study data, repeat the analysis.
3. Discuss the qualitative factors that would affect the decision, including strategic implications.
4. After reviewing the special study, the controller made the following remark: "This study ignores the additional activity demands that purchasing would cause. For example, although the demand for inspecting the part on the production floor decreases, will we not have a need to inspect the incoming parts in the receiving area? Will we actually save any inspection costs?" Is the controller right? Would this problem be avoided if Golf-2-Go had an activity-based costing system in place?

## 18-7 RESOURCE USAGE MODEL, SPECIAL ORDER

**LO3, LO4**

Nesbitt, Inc., manufactures display cases for retail stores. Good-4-U Foods, Inc., is a grocery chain that decided to expand into video rental and needs display cases. Good-4-U Foods offered to purchase 14,000 display cases for \$35 each. Normally, this type of case sells for \$45, but Nesbitt is operating at 80 percent of capacity and wants to make the special order work. Nesbitt's controller looked into the cost of the display cases using the following information from the activity-based accounting system:

<i>Activity Driver</i>	<i>Unused Capacity</i>	<i>Quantity<sup>a</sup> Demanded</i>	<i>Activity Rate<sup>b</sup></i>		
			<i>Fixed</i>	<i>Variable</i>	
Direct materials	Display cases	0	14,000	—	\$20
Direct labor	Direct labor hours	0	10,500	—	15
Setups	Setup hours	60	80	\$175	5
Inspection	Inspection hours	800	400	10	1
Machining	Machine hours	6,000	7,000	20	3

<sup>a</sup>This represents only the amount of resources demanded by the special order being considered.

<sup>b</sup>This is expected activity cost divided by activity capacity.

Expansion of activity capacity for setups, inspection, and machining must be done in steps. For setups, each step provides an additional 25 hours of setup activity and is priced at the fixed activity rate. For inspection, activity capacity is expanded by 2,000 hours per year, and the cost is \$20,000 per year (the salary for an additional inspector). Machine capacity can be leased for a year at a rate of \$20 per machine hour. Machine capacity must be acquired, however, in steps of 2,500 machine hours.

**Required:**

1. Compute the change in income for Nesbitt, Inc., if the order is accepted.
2. Suppose that the machining activity has 7,500 hours of unused capacity. How is the analysis affected?
3. Suppose that the setup activity has 80 hours of unused capacity and that the machining activity has 6,500 hours of unused capacity. How is the analysis affected?

## 18-8 KEEP-OR-DROP: FUNCTIONAL-BASED VERSUS ACTIVITY-BASED ANALYSIS

**LO3, LO4**

Lincoln, Inc., produces two types of peanut butter: Smooth and Crunchy. Of the two, Smooth is the more popular. Data concerning the two products follow:

	<i>Smooth</i>	<i>Crunchy</i>	<i>Unused Capacity<sup>a</sup></i>	<i>Units of Purchase<sup>b</sup></i>
Expected sales (in cases)	50,000	10,000	—	—
Selling price per case	\$100	\$80	—	—
Direct labor hours	40,000	10,000	—	As needed
Machine hours	10,000	2,500	—	2,500
Receiving orders	500	250	250	500
Packing orders	1,000	500	500	250
Material cost per case	\$50	\$48	—	—
Direct labor cost per case	\$10	\$8	—	—
Advertising costs	\$200,000	\$60,000	—	—

<sup>a</sup>Practical capacity less expected usage (all unused capacity is permanent).

<sup>b</sup>In some cases, activity capacity must be purchased in steps (whole units). These steps are provided as necessary. The cost per step is the fixed activity rate multiplied by the step units. The fixed activity rate is the expected fixed activity costs divided by practical activity capacity.

Annual overhead costs are as follows. These costs are classified as fixed or variable with respect to the appropriate activity driver.

<i>Activity</i>	<i>Fixed<sup>a</sup></i>	<i>Variable<sup>b</sup></i>
Direct labor benefits	\$ 0	\$200,000
Machine	200,000	250,000
Receiving	200,000	22,500
Packing	100,000	45,000
Total costs	<u>\$500,000</u>	<u>\$517,500</u>

<sup>a</sup>Costs associated with practical activity capacity. The machine fixed costs are all depreciation.

<sup>b</sup>These costs are for the actual levels of the cost driver.

### Required:

1. Prepare functional- and activity-based segmented income statements. In the functional-based system, a unit-level overhead rate is used, based on direct labor hours.
2. Using a functional-based approach, determine whether the Crunchy peanut butter product line should be kept or dropped.
3. Repeat the keep-or-drop analysis using an ABC approach.

## 18-9 SELL OR PROCESS FURTHER, BASIC ANALYSIS

**LO2, LO4** Diehlman, Inc., is a pork processor. Its plants, located in the Midwest, produce several products from a common process: sirloin roasts, chops, spare ribs, and the residual. The roasts, chops, and spare ribs are packaged, branded, and sold to supermarkets. The residual consists of organ meats and leftover pieces that are sold to sausage and hotdog processors. The joint costs for a typical week are as follows:

Direct materials	\$73,000
Direct labor	26,000
Overhead	39,000

The revenues from each product are as follows: sirloin roasts, \$50,000; chops, \$70,000; spare ribs, \$33,000; and residual, \$15,000.

Diehlman's management has learned that certain organ meats are a prized delicacy in Asia. They are considering separating those from the residual and selling them abroad for \$50,000. This would bring the value of the residual down to \$8,500. In addition,

the organ meats would need to be packaged and then air freighted to Asia. Further processing cost per week is estimated to be \$30,000 (the cost of renting additional packaging equipment, purchasing materials, and hiring additional direct labor). Transportation cost would be \$7,500 per week. Finally, resource spending would need to be expanded for other activities as well (purchasing, receiving, and internal shipping). The increase in resource spending for these activities is estimated to be \$2,175 per week.

**Required:**

1. What is the gross profit earned by the original mix of products for one week?
2. Should the company separate the organ meats for shipment overseas or continue to sell them at split-off? What is the effect of the decision on weekly gross profit?

## 18-10 FOREIGN TRADE ZONES

**LO2** Elmondo, Inc., is considering opening a new warehouse to serve the Southwest region. Jefferson Moore, controller for Elmondo, has been reading about the advantages of foreign trade zones. He wonders if locating in one would be of benefit to his company, which imports about 90 percent of its merchandise (e.g., chess sets from the Philippines, jewelry from Thailand, pottery from Mexico, etc.). Jefferson estimates that the new warehouse will store imported merchandise costing about \$3,450,000 per year. Inventory shrinkage at the warehouse (due to breakage and mishandling) is about 4 percent of the total. The average tariff rate on these imports is 20 percent.

**Required:**

1. If Elmondo locates the warehouse in a foreign trade zone, how much will be saved in tariffs? Why?
2. Suppose that, on average, the merchandise stays in an Elmondo warehouse for seven months before shipment to retailers. Carrying cost for Elmondo is 12 percent per year. If Elmondo locates the warehouse in a foreign trade zone, how much will be saved in carrying costs? What will the total tariff-related savings be?

## PROBLEMS

### 18-11 KEEP-OR-DROP FOR SERVICE FIRM, COMPLEMENTARY EFFECTS, FUNCTIONAL-BASED ANALYSIS

**LO2, LO4** Serene Assurance Company provides both automobile and life insurance. The projected income statements for the two products are as follows:

	<i>Automobile Insurance</i>	<i>Life Insurance</i>
Sales	\$4,200,000	\$12,000,000
Less: Variable expenses	<u>3,830,000</u>	<u>9,600,000</u>
Contribution margin	\$ 370,000	\$ 2,400,000
Less: Direct fixed expenses	<u>400,000</u>	<u>500,000</u>
Segment margin	\$ (30,000)	\$ 1,900,000
Less: Common fixed expenses (allocated)	<u>100,000</u>	<u>200,000</u>
Operating income (loss)	<u>\$ (130,000)</u>	<u>\$ 1,700,000</u>

The president of the company is considering dropping the automobile insurance. However, some policyholders prefer having their auto and life insurance with the same

company, so if automobile insurance is dropped, sales of life insurance will drop by 15 percent. No significant non-unit-level activity costs are incurred.

**Required:**

1. If Serene Assurance Company drops automobile insurance, by how much will income increase or decrease? Provide supporting computations.
2. Assume that increasing the advertising budget by \$50,000 will increase sales of automobile insurance by 10 percent and life insurance by 3 percent. Prepare a segmented income statement that reflects the effect of increased advertising. Should advertising be increased?

## 18-12 SPECIAL ORDER, FUNCTIONAL-BASED ANALYSIS

LO2, LO4

CMA

Lancaster Company manufactures two types of hair conditioners, Creamy and Shiny, out of a joint process. The joint (common) costs incurred are \$840,000 for a standard production run that generates 360,000 gallons of Creamy and 240,000 gallons of Shiny. Additional processing costs beyond the split-off point are \$2.80 per gallon for Creamy and \$1.80 per gallon for Shiny. Creamy sells for \$4.80 per gallon, while Shiny sells for \$7.80 per gallon.

Comida Buena, a supermarket chain, has asked Lancaster to supply it with 480,000 gallons of Shiny at a price of \$7.30 per gallon. Comida Buena plans to have the conditioner bottled in 16-ounce bottles with its own Comida Buena label.

If Lancaster accepts the order, it will save \$0.10 per gallon in packaging of Shiny. There is sufficient excess capacity for the order. However, the market for Creamy is saturated, and any additional sales of Creamy would take place at a price of \$3.20 per gallon. Assume that no significant non-unit-level activity costs are incurred.

**Required:**

1. What is the profit normally earned on one production run of Creamy and Shiny?
2. Should Lancaster accept the special order? Explain. (*CMA adapted*)

## 18-13 RESOURCE USAGE, SPECIAL ORDER

LO3, LO4

Perry Medical Center (PMC) has five medical technicians who are responsible for conducting sonogram testing. Each technician is paid a salary of \$36,000 and is capable of processing 1,000 tests per year. The sonogram equipment is one year old and was purchased for \$150,000. It is expected to last five years. The equipment's capacity is 25,000 tests over its life. Depreciation is computed on a straight-line basis, with no salvage value expected. The reading of the sonogram is verified by an outside physician whose fee is \$10 per test. The technician's report with the outside physician's note of verification is sent to the referring physician. In addition to the salaries and equipment, PMC spends \$10,000 for forms, paper, power, and other supplies needed to operate the equipment (assuming 5,000 tests are processed). When PMC purchased the equipment, it fully expected to perform 5,000 tests per year. In fact, during its first year of operation, 5,000 tests were run. However, a larger hospital has established a clinic in Perry and will siphon off some of PMC's business. During the coming years, PMC is expected to run only 4,200 sonogram tests yearly. PMC has been charging \$65 for the test—enough to cover the direct costs of the test plus an assignment of general overhead (e.g., depreciation on the hospital building, lighting and heating, and janitorial services).

At the beginning of the second year, an HMO from a neighboring community approached PMC and offered to send its clients to PMC for sonogram testing provided that the charge per test would be \$35. The HMO estimates that it can provide about

500 patients per year. The HMO has indicated that the arrangement is temporary—for one year only. The HMO expects to have its own testing capabilities within one year.

### Required:

1. Classify the resources associated with the sonogram activity into one of the following: (1) committed resources or (2) flexible resources.
2. Calculate the activity rate for the sonogram testing activity. Break the activity rate into fixed and variable components. Now, classify each activity resource as relevant or irrelevant with respect to the following alternatives: (1) accept the HMO offer and (2) reject the HMO offer. Explain your reasoning.
3. Assume that PMC will accept the HMO offer if it reduces the hospital's operating costs. Should the HMO offer be accepted?
4. Harry Birdwell, PMC's hospital controller, argued against accepting the HMO's offer. Instead, he argued that the hospital should be increasing the charge per test rather than accepting business that doesn't even cover full costs. He also was concerned about local physician reaction if word got out that the HMO was receiving tests for \$35. Discuss the merits of Harry's position. Include in your discussion an assessment of the price increase that would be needed if the objective is to maintain total revenues from sonogram testing experienced in the first year of operation.
5. Elaine Day, PMC's administrator, has been informed that one of the sonogram technicians is leaving for an opportunity at a larger hospital. She has met with the other technicians, and they have agreed to increase their hours to pick up the slack so that PMC won't need to hire another technician. By working a couple hours extra every week, each remaining technician can perform 1,050 tests per year. They agreed to do this for an increase in salary of \$2,000 per year. How does this outcome affect the analysis of the HMO offer?
6. Assuming that PMC wants to bring in the same revenues earned in the sonogram activity's first year less the reduction in resource spending attributable to using only four technicians, how much must PMC charge for a sonogram test?

## 18-14 ACTIVITY-BASED RESOURCE USAGE MODEL, MAKE-OR-BUY

### LO3, LO4

Brandy Dees recently bought Nievo Enterprises, a company that manufactures ice skates. Brandy decided to assume management responsibilities for the company and appointed herself president shortly after the purchase was completed. When she bought the company, Brandy's investigation revealed that with the exception of the blades, all parts of the skates are produced internally. The investigation also revealed that Nievo once produced the blades internally and still owned the equipment. The equipment was in good condition and was stored in a local warehouse. Nievo's former owner had decided three years earlier to purchase the blades from external suppliers.

Brandy Dees is seriously considering making the blades instead of buying them from external suppliers. The blades are purchased in sets of two and cost \$8 per set. Currently, 100,000 sets of blades are purchased annually.

Skates are produced in batches, according to shoe size. Production equipment must be reconfigured for each batch. The blades could be produced using an available area within the plant. Prime costs will average \$5.00 per set. There is enough equipment to set up three lines of production, each capable of producing 80,000 sets of blades. A supervisor would need to be hired for each line. Each supervisor would be paid a salary of \$40,000. Additionally, it would cost \$1.50 per machine hour for power, oil, and other operating expenses. Since three types of blades would be produced, additional demands would be made on the setup activity. Other overhead activities affected in-

clude purchasing, inspection, and materials handling. The company's ABC system provides the following information about the current status of the overhead activities that would be affected. (The lumpy quantity indicates how much capacity must be purchased should any expansion of activity supply be needed—the units of purchase. The purchase cost per unit is the fixed activity rate. The variable rate is the cost per unit of resources acquired as needed for each activity.)

<i>Activity</i>	<i>Cost Driver</i>	<i>Current Activity Capacity</i>	<i>Activity Usage</i>	<i>Lumpy Quantity</i>	<i>Fixed Activity Rate</i>	<i>Variable Activity Rate</i>
Setups	Number of setups	1,000	800	100	\$200	\$500
Purchasing	Number of orders	50,000	47,000	5,000	10	0.50
Inspecting	Inspection hours	20,000	18,000	2,000	15	none
Materials handling	Number of moves	9,000	8,700	500	30	1.50

The demands that *production* of blades places on the overhead activities are as follows:

<i>Activity</i>	<i>Resource Demands</i>
Machining	50,000 machine hours
Setups	250 setups
Purchasing	4,000 purchase orders (associated with materials)
Inspection	1,500 inspection hours
Materials handling	650 moves

If the blades are made, the purchase of the blades from outside suppliers will cease. Therefore, purchase orders will decrease by 6,500 (the number associated with their purchase). Similarly, the moves for the handling of incoming blades will decrease by 400. Any unused activity capacity is viewed as permanent.

#### Required:

1. Should Nievo make or buy the blades?
2. Explain how the ABC resource usage model helped in the analysis. Also, comment on how a conventional approach would have differed.

## 18-15 SEGMENTED INCOME STATEMENTS, KEEP-OR-DROP DECISION, SPECIAL-ORDER DECISION, JIT AND ACTIVITY-BASED COSTING, STRATEGIC CONSIDERATIONS

**LO3, LO4** Emery Company, a manufacturer of motors for washing machines, has installed a JIT purchasing and manufacturing system. After several years of operation, Emery has succeeded in reducing inventories to insignificant levels. During the coming year, Emery expects to produce 200,000 motors: 150,000 of the Regular Model and 50,000 of the Heavy Duty Model. The motors are produced in manufacturing cells. The expected output represents 80 percent of the capacity for the Regular Model cell and 100 percent of capacity for the Heavy Duty Model cell. (This capacity includes time for cell workers to perform maintenance and materials handling.) The selling price for the Regular Model is \$60; for the Heavy Duty Model, \$70.

The relevant data for next year's expected production are as follows:

	<i>Regular Cell</i>	<i>Heavy Duty Cell</i>
Direct materials	\$3,500,000	\$1,000,000
Labor*	\$900,000	\$315,000
Power	\$250,000	\$100,000
Depreciation	\$800,000	\$300,000
Number of runs	100	100
Number of cell workers	20	5
Square footage	20,000	10,000

\*Responsible for production, maintenance, and materials handling.

The following overhead costs are common to each cell:

Plant depreciation	\$900,000
Production scheduling	300,000
Cafeteria	100,000
Personnel	150,000

These costs are assigned to the cells using cost drivers selected from the cell activity data given above.

In addition to the overhead costs, the company expects the following nonmanufacturing costs:

Commissions (2% of sales)	\$250,000
Advertising:	
Regular Model	400,000
Heavy Duty Model	200,000
Administration (all fixed)	500,000

Keith Golding, president of Emery Company, is concerned about the profit performance of each model. He wants to know the effect on the company's profitability if the Heavy Duty Model is dropped. At the same time this request was made, the company was approached by a customer in a market not normally served by the company. This customer offered to buy 30,000 units of the Regular Model at \$30 per unit. The order was requested on a direct contact basis, and no commissions will be paid. Keith was inclined to reject the offer, since it was half the model's normal selling price. However, before making the decision, he wanted to know the effect of accepting the offer on the company's profits.

To help decide on the two issues, the following additional data have been made available:

<i>Activity</i>	<i>Cost Driver</i>	<i>Supply</i>	<i>Usage</i>	<i>Lumpy Quantity*</i>	<i>Fixed Rate</i>
Scheduling	Runs	250	200	25	\$1,200
Cafeteria	Cell workers	45	25	15	1,800
Personnel	Cell workers	40	25	20	3,750

\*Lumpy quantity is the amount of resource that would be acquired (saved) if the *capacity* of the activity is expanded (reduced); the fixed rate is the per-unit price of the resource (which, however, can only be purchased in the lumpy amounts indicated).

Of the three activities, the cafeteria activity is the only one with a variable activity rate. This rate is \$760 per cell worker.

### Required:

1. Prepare an ABC segmented income statement for Emery Company using products as segments. Can the unused activity be exploited to increase overall profits? Explain.

2. By how much will profits be affected if the Heavy Duty Model is dropped?
3. Prepare an analysis that shows what the effect on company profitability will be if the special order is accepted. Was the president correct in his feelings concerning the special order?
4. Now, assume that the models are regularly sold to companies that produce medium- to high-quality washing machines. The special-order customer will use the motors in a low-end washing machine and plans to advertise the fact that the low-end washing machine can be purchased at a lower price with the same quality as a so-called higher-quality brand. Given this information and the results of Requirement 2, should the order be accepted? Explain.

## 18-16 MAKE-OR-BUY, FUNCTIONAL-BASED ANALYSIS, QUALITATIVE CONSIDERATIONS

**LO2, LO4** Gray Dentistry Services is part of an HMO that operates in a large metropolitan area. Currently, Gray has its own dental laboratory to produce porcelain and gold crowns. The unit costs to produce the crowns are as follows:

	<i>Porcelain</i>	<i>Gold</i>
Direct materials	\$ 60	\$ 90
Direct labor	20	20
Variable overhead	5	5
Fixed overhead	<u>22</u>	<u>22</u>
Total	<u>\$107</u>	<u>\$137</u>

Fixed overhead is detailed as follows:

Salary (supervisor)	\$30,000
Depreciation	5,000
Rent (lab facility)	20,000

Overhead is applied on the basis of direct labor hours. The rates above were computed using 5,500 direct labor hours. No significant non-unit-level overhead costs are incurred.

A local dental laboratory has offered to supply Gray all the crowns it needs. Its price is \$100 for porcelain crowns and \$132 for gold crowns; however, the offer is conditional on supplying both types of crowns—it will not supply just one type for the price indicated. If the offer is accepted, the equipment used by Gray's laboratory would be scrapped (it is old and has no market value), and the lab facility would be closed. Gray uses 1,500 porcelain crowns and 1,000 gold crowns per year.

### Required:

1. Should Gray continue to make its own crowns, or should they be purchased from the external supplier? What is the dollar effect of purchasing?
2. What qualitative factors should Gray consider in making this decision?
3. Suppose that the lab facility is owned rather than rented and that the \$20,000 is depreciation rather than rent. What effect does this have on the analysis in Requirement 1?
4. Refer to the original data. Assume that the volume of crowns is 3,000 porcelain and 2,000 gold. Should Gray make or buy the crowns? Explain the outcome.

## 18-17 SELL OR PROCESS FURTHER

**LO4** Chemco Corporation buys three chemicals that are processed to produce two popular ingredients for liquid cough syrups. The three chemicals are in liquid form. The purchased chemicals are blended for two to three hours and then heated for 15 minutes.



The results of the process are two separate ingredients, Suppressant AB2 and Suppressant AB3. For every 2,200 gallons of chemicals used, 1,000 gallons of each suppressant are produced. The suppressants are sold to companies that process them into their final form. The selling prices are \$25 per gallon for AB2 and \$12 per gallon for AB3. The costs to produce 1,000 gallons of each chemical are as follows:

Chemicals	\$11,000
Direct labor	9,000
Catalyst	3,600
Overhead	7,000

The suppressants are bottled in 5-gallon plastic containers and shipped. The cost of each container is \$1.65. The costs of shipping are \$0.20 per container.

Chemco Corporation could process Suppressant AB2 further by mixing it with inert powders and flavoring to form cough tablets. The tablets can be sold directly to retail drug stores as a generic brand. If this route is taken, the revenue received per case of tablets would be \$8.50, with 10 cases produced by every gallon of Suppressant AB2. The costs of processing into tablets total \$5.00 per gallon of AB2. Packaging costs \$4.86 per case. Shipping costs \$0.40 per case.

#### Required:

1. Should Chemco sell Suppressant AB2 at split-off, or should AB2 be processed and sold as tablets?
2. If Chemco normally sells 360,000 gallons of AB2 per year, what will be the difference in profits if AB2 is processed further?

## 18-18 PLANT SHUTDOWN OR CONTINUE OPERATIONS, QUALITATIVE CONSIDERATIONS, FUNCTIONAL-BASED ANALYSIS

LO2, LO4

CMA

GianAuto Corporation manufactures automobiles, vans, and trucks. Among the various GianAuto plants around the United States is the Denver cover plant, where vinyl covers and upholstery fabric are sewn. These are used to cover interior seating and other surfaces of GianAuto products.

Pam Vosilo is the plant manager for the Denver cover plant—the first GianAuto plant in the region. As other area plants were opened, Pam, in recognition of her management ability, was given the responsibility to manage them. Pam functions as a regional manager, although the budget for her and her staff is charged to the Denver plant.

Pam has just received a report indicating that GianAuto could purchase the entire annual output of the Denver cover plant from outside suppliers for \$30 million. Pam was astonished at the low outside price, because the budget for the Denver plant's operating costs was set at \$52 million. Pam believes that the Denver plant will have to close down operations in order to realize the \$22 million in annual cost savings.

The budget (in thousands) for the Denver plant's operating costs for the coming year follows:

Materials		\$12,000
Labor:		
Direct	\$13,000	
Supervision	3,000	
Indirect plant	<u>4,000</u>	20,000

(continued)

Overhead:

Depreciation—Equipment	\$ 5,000	
Depreciation—Building	3,000	
Pension expense	4,000	
Plant manager and staff	2,000	
Corporate allocation	<u>6,000</u>	<u>20,000</u>
Total budgeted costs		<u>\$52,000</u>

Additional facts regarding the plant's operations are as follows:

Due to the Denver plant's commitment to use high-quality fabrics in all of its products, the purchasing department was instructed to place blanket orders with major suppliers to ensure the receipt of sufficient materials for the coming year. If these orders are cancelled as a consequence of the plant closing, termination charges would amount to 15 percent of the cost of direct materials.

Approximately 700 plant employees will lose their jobs if the plant is closed. This includes all direct laborers and supervisors as well as the plumbers, electricians, and other skilled workers classified as indirect plant workers. Some would be able to find new jobs, but many others would have difficulty. All employees would have difficulty matching the Denver plant's base pay of \$9.40 per hour, the highest in the area. A clause in the Denver plant's contract with the union may help some employees; the company must provide employment assistance to its former employees for 12 months after a plant closing. The estimated cost to administer this service would be \$1 million for the year.

Some employees would probably elect early retirement because the company has an excellent pension plan. In fact, \$3 million of next year's pension expense would continue whether or not the plant is open.

Pam and her staff would not be affected by the closing of the Denver plant. They would still be responsible for administering three other area plants.

Equipment depreciation for the plant is considered to be a variable cost and the units-of-production method is used to depreciate equipment; the Denver plant is the only GianAuto plant to use this depreciation method. However, it uses the customary straight-line method to depreciate its building.

### Required:

1. Prepare a quantitative analysis to help in deciding whether or not to close the Denver plant. Explain how you would treat the nonrecurring relevant costs.
2. Consider the analysis in Requirement 1, and add to it the qualitative factors that you believe are important to the decision. What is your decision? Would you close the plant? Explain. (*CMA adapted*)

## 18-19 MAKE-OR-BUY, FUNCTIONAL-BASED ANALYSIS

LO1, LO2,  
LO4

Morrill Company produces two different types of gauges: a density gauge and a thickness gauge. The segmented income statement for a typical quarter follows.



	Density Gauge	Thickness Gauge	Total
Sales	\$150,000	\$80,000	\$230,000
Less: Variable expenses	<u>80,000</u>	<u>46,000</u>	<u>126,000</u>
Contribution margin	\$ 70,000	\$34,000	\$104,000
Less: Direct fixed expenses*	<u>20,000</u>	<u>38,000</u>	<u>58,000</u>
Segment margin	<u>\$ 50,000</u>	<u>\$ (4,000)</u>	\$ 46,000
Less: Common fixed expenses			<u>30,000</u>
Operating income			<u>\$ 16,000</u>

\*Includes depreciation.

The density gauge uses a subassembly that is purchased from an external supplier for \$25 per unit. Each quarter, 2,000 subassemblies are purchased. All units produced are sold, and there are no ending inventories of subassemblies. Morrill is considering making the subassembly rather than buying it. Unit-level variable manufacturing costs are as follows:

Direct materials	\$2
Direct labor	3
Variable overhead	2

No significant non-unit-level costs are incurred.

Morrill is considering two alternatives to supply the productive capacity for the subassembly.

- Lease the needed space and equipment at a cost of \$27,000 per quarter for the space and \$10,000 per quarter for a supervisor. There are no other fixed expenses.
- Drop the thickness gauge. The equipment could be adapted with virtually no cost and the existing space utilized to produce the subassembly. The direct fixed expenses, including supervision, would be \$38,000, \$8,000 of which is depreciation on equipment. If the thickness gauge is dropped, sales of the density gauge will not be affected.

### Required:

- Should Morrill Company make or buy the subassembly? If it makes the subassembly, which alternative should be chosen? Explain and provide supporting computations.
- Suppose that dropping the thickness gauge will decrease sales of the density gauge by 10 percent. What effect does this have on the decision?
- Assume that dropping the thickness gauge decreases sales of the density gauge by 10 percent and that 2,800 subassemblies are required per quarter. As before, assume that there are no ending inventories of subassemblies and that all units produced are sold. Assume also that the per-unit sales price and variable costs are the same as in Requirement 1. Include the leasing alternative in your consideration. Now, what is the correct decision?

## 18-20 EXPORTING, MAQUILADORAS, FOREIGN TRADE ZONES

**LO2** Paladin Company manufactures plain-paper fax machines in a small factory in Minnesota. Sales have increased by 50 percent in each of the past three years, as Paladin has expanded its market from the United States to Canada and Mexico. As a result, the Minnesota factory is at capacity. Beryl Adams, president of Paladin, has examined the situation and developed the following alternatives.

- Add a permanent second shift at the plant. However, the semi-skilled workers who assemble the fax machines are in short supply, and the wage rate of \$15 per hour would probably have to be increased across the board to \$18 per hour in order to attract sufficient workers from out of town. The total wage increase (including fringe benefits) would amount to \$125,000. The heavier use of plant facilities would lead to increased plant maintenance and small tool cost.
- Open a new plant and locate it in Mexico. Wages (including fringe benefits) would average \$3.50 per hour. Investment in plant and equipment would amount to \$300,000.
- Open a new plant and locate it in a foreign trade zone, possibly in Dallas. Wages would be somewhat lower than in Minnesota, but higher than in Mexico. The advantages of postponing tariff payments on imported parts could amount to \$50,000 per year.

**Required:**

Advise Beryl of the advantages and disadvantages of each alternative.

## 18-21 **MANAGERIAL DECISION CASE: CENTRALIZE VERSUS DECENTRALIZE**

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**LO2, LO4**

Central University, a Midwestern university with approximately 17,400 students, was in the middle of a budget crisis. For the third consecutive year, state appropriations for higher education remained essentially unchanged. (The university is currently in its 2006–2007 academic year.) Yet, utilities, Social Security benefits, insurance, and other operating expenses have increased. Moreover, the faculty were becoming restless, and some members had begun to leave for other, higher-paying opportunities.

The president and the academic vice president had announced their intention to eliminate some academic programs and to reduce others. The savings that result would be used to cover the increase in operating expenses and to allow raises for the remaining faculty. Needless to say, the possible dismissal of tenured faculty aroused a great deal of concern throughout the university.

With this background, the president and academic vice president called a meeting of all department heads and deans to discuss the budget for the coming year. As the budget was presented, the academic vice president noted that continuing education, a separate, centralized unit, had accumulated a deficit of \$504,000 over the past several years, which must be eliminated during the coming fiscal year. The vice president noted that allocating the deficit equally among the seven colleges would create a hardship on some of the colleges, wiping out all of their operating budgets except for salaries.

After some discussion of alternative ways to allocate the deficit, the head of the accounting department suggested an alternative solution: decentralize continuing education, allowing each college to assume responsibility for its own continuing education programs. In this way, the overhead of a centralized continuing education could be avoided.

The academic vice president responded that the suggestion would be considered, but it was received with little enthusiasm. The vice president observed that continuing education was now generating more revenues than costs—and that the trend was favorable.

A week later, at a meeting of the Deans' Council, the vice president reviewed the role of continuing education. He pointed out that only the dean of continuing education held tenure. If continuing education were decentralized, her salary (\$50,000) would continue. However, she would return to her academic department, and the university would save \$20,000 of instructional wages, since fewer adjunct faculty would be needed in her department. All other employees in the unit were classified as staff. Continuing education had responsibility for all noncredit offerings. Additionally, it had nominal responsibility for credit courses offered in the evening on campus and for credit courses offered off campus. However, all scheduling and staffing of these evening and off-campus courses were done by the heads of the academic departments. The head of each department had to approve the courses offered and the staffing. According to the vice president, advertising is one of the main contributions of the continuing education department to the evening and off-campus programs. He estimated that \$30,000 per year is being spent.

After reviewing this information, the vice president made available the following information pertaining to the department's performance for the past several years (the 2006–2007 data were projections). He once again defended keeping a centralized

department, emphasizing the favorable trend revealed by the accounting data. (All numbers are expressed in thousands.)

	2003–2004	2004–2005	2005–2006	2006–2007
Tuition revenues:				
Off-campus	\$ 300	\$ 400	\$ 400	\$ 410
Evening	—	525	907	1,000
Noncredit	135	305	338	375
Total	<u>\$ 435</u>	<u>\$1,230</u>	<u>\$1,645</u>	<u>\$1,785</u>
Operating costs:				
Administration	\$ 132	\$ 160	\$ 112	\$ 112
Off-campus:				
Direct <sup>b</sup>	230	270	270	260
Indirect	350	410	525	440
Evening	— <sup>a</sup>	220	420	525
Noncredit	135	305	338	375
Total	<u>\$ 847</u>	<u>\$1,365</u>	<u>\$1,665</u>	<u>\$1,712</u>
Income (loss)	<u><u>\$(412)</u></u>	<u><u>\$( 135)</u></u>	<u><u>\$ ( 20)</u></u>	<u><u>\$ 73</u></u>

<sup>a</sup>In 2003–2004, the department had no responsibility for evening courses. Beginning in 2004–2005, it was given the responsibility to pay for any costs of instruction incurred when adjunct faculty were hired to teach evening courses. Tuition revenues earned by evening courses also began to be assigned to the department at the same time.

<sup>b</sup>Instructional wages.

The dean of the College of Business was unimpressed by the favorable trend identified by the academic vice president. The dean maintained that decentralization still would be in the best interests of the university. He argued that although decentralization would not fully solve the deficit, it would provide a sizable contribution each year to the operating budgets for each of the seven colleges.

The academic vice president disagreed vehemently. He was convinced that continuing education was now earning its own way and would continue to produce additional resources for the university.

### Required:

You have been asked by the president of Central University to assess which alternative, centralization or decentralization, is in the best interest of the school. The president is willing to decentralize provided that significant savings can be produced and the mission of the continuing education department will still be carried out. Prepare a memo to the president that details your analysis and reasoning and recommends one of the two alternatives. Provide both qualitative and quantitative reasoning in the memo.

## 18-22 COLLABORATIVE LEARNING EXERCISE

**LO4** Rick Morgan sat at his desk mulling over an important decision. As plant manager for the Salina factory, he was under pressure to reduce costs and improve productivity. He had been approached several weeks before by Lauren Gosnell, the purchasing manager, who told him that a major supplier had offered to supply the plant with Component A56 at a delivered cost that was less than the factory's full cost to manufacture the component. Rick was well aware that good deals are sometimes not as good as they sound. So, he had asked Lauren and James Terrant, the plant controller, to prepare full cost analyses of the offer. The results lay on his desk.

Lauren's report was brief and to the point. The factory used 50,000 units of Part A56 each year. The full manufacturing cost was \$45 each; the proposed price from the

supplier was \$39 each. This would result in a \$300,000 per year cost savings. Lauren was wholeheartedly in favor of outsourcing this component.

James's report was also brief. He detailed the direct materials, direct labor, and overhead assigned to Part A56. His analysis supported Lauren's assertion that the full cost of the component was \$45 each. James also recommended outsourcing.

While both reports were in favor of outside purchase, Rick was troubled. He wondered if there were hidden costs of outsourcing. He also wondered about the internal costs—and what would happen to the employees who worked on the A56 line. Were there any costs associated with the layoffs that had not been considered? Rick picked up the phone and called his former business professor, Kate Buchanan, and asked her to meet him for lunch the next day.

**RICK:** Kate, you've had a chance to read these two reports. Tell me, does it seem that anything is missing? Is this as great a deal as it sounds?"

**KATE:** Well, on the surface, Rick, it certainly looks good. But you may be right—there are some missing factors. For one thing, the outsourcing of this component will lead to the idling of one of your production lines. What are you planning to do with the excess capacity? Are there some costs hidden in overhead that will continue even though you aren't making the part anymore?

**RICK:** What do you mean by hidden?

**KATE:** I mean that some costs are flexible, but others are committed. Basically, flexible costs disappear immediately when you stop making a part—like direct materials. If you don't make A56, then you don't need to buy the sheet metal and solder. However, other costs are committed. For example, you use welding equipment on that line, what will happen to it? Right now, depreciation on the equipment is included in the overhead assigned to A56. When you stop making the part, will you still have the welding equipment? If so, the depreciation will still be there, but will be spread over other items you manufacture. I think you are right to consider the impact of the layoff, too. We often think of direct labor as being a variable or flexible cost. But any worker laid off will file for unemployment insurance. Your rates on all your remaining workers will skyrocket and will stay high for the next three years. And that is assuming no further layoffs. Plus, there's more.

**RICK:** More? How so?

**KATE:** Remember activity-based costing from our accounting class? Your plant clearly uses a functional-based approach to assigning overhead. If it used activity-based costing, you might find out that purchasing and receiving costs will go up if the supplier's offer is accepted. Of course, there could also be a decrease in that the materials used now would no longer be purchased, received, and stored.

**RICK:** Wow, Kate, how am I going to get all the information I need? I'm afraid I can't just ask James. He's been here forever. I tried to get him to look into ABC a year or so ago. He won't—says it's a fad that isn't worth the trouble. And Lauren is really enthusiastic about this possibility. I won't be getting an objective assessment from her. Would you like to take this on as a project? I'll pay your consulting rate.

**KATE:** (shaking her head) I sympathize, Rick. Unfortunately, it looks as if you might have to start making some tough decisions—starting with the Accounting Department. If James can't do an appropriate analysis of this one opportunity, he won't be able to meet your needs for information in the future. I think you need more than a one-time analysis. You need ongoing managerial accounting help. I can recommend a couple of recent accounting grads. One in particular has over 10 years of experience in industry and an outstanding academic record in our graduate program. He's intelligent, flexible, and energetic.

**RICK:** You may be right. Could you e-mail me his name and phone number when you get back to the office? I'd like to consider this. Meanwhile, let's grab a second cup of coffee and you can bring me up to speed on this flexible versus committed costing idea.

**Required:**

Form groups of three to five students to discuss the following questions. Choose one representative from your group to present the group's answers to the class.

1. Suggest some costing features that a controller should consider in evaluating the outsourcing opportunity. How would you go about getting the appropriate information?
2. Why do you think Lauren is so enthusiastic about the outsourcing opportunity? Could there be any reason(s) other than cost savings? Did James violate any of the ethical standards described in Chapter 1?
3. Rick is clearly considering a change in the controller. Do you think he should fire James? Where should Rick's loyalties lie?

## 18-23 CYBER RESEARCH CASE

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**LO1, LO2** For years, companies have been announcing outsourcing decisions and plant closings. Check the recent business news (e.g., <http://www.wsj.com> or <http://www.businessweek.com>) for this type of announcement. Go to the company's Web site for information on the decision. Write a brief (1- to 2-page) description of the decision, and speculate on what types of costing information might have led to it.