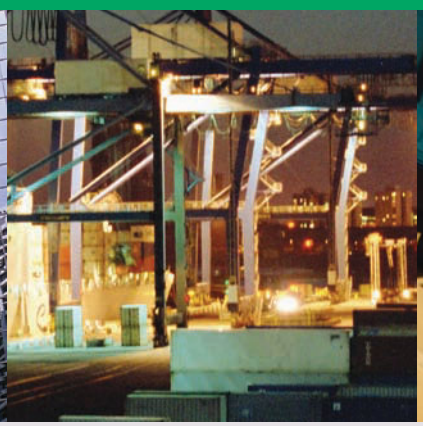





chapter 12

Tactical Decision Making

learning objectives

After studying this chapter, you should be able to:

1. Describe the tactical decision-making model.
2. Explain how the activity resource usage model is used in assessing relevance.
3. Apply tactical decision-making concepts in a variety of business situations.
4. Choose the optimal product mix when faced with one constrained resource.
5. Explain the impact of cost on pricing decisions.
6. Appendix: Use linear programming to find the optimal solution to a problem of multiple constrained resources.

Scenario

Tidwell Products, Inc.,[1] manufactures potentiometers, devices that adjust electrical resistance. Potentiometers are used in switches and knobs, for example, to control the volume on a radio or to raise or lower the lights using a dimmer switch. Currently, all parts necessary for the assembly of the products are produced internally. The firm, in operation for five years, 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 Tidwell Products, asked his vice president of marketing, John Tidwell, and his vice president of finance, Linda Thayn, to brainstorm ways to solve their capacity problem. Two proposals had been suggested and rejected. The first was to build the company's own plant. Leo believed it was too risky to invest the capital necessary to build a plant at this stage of the company's development. The second proposal involved a combination of leasing a larger facility and subleasing the current plant. This was rejected due to the difficulty of finding a tenant to sublease. After that, John was assigned the task of exploring the possibility of leasing a second facility comparable to the current one. Linda was assigned the task of identifying other possible solutions. Two weeks later, both reported back.

After some careful research, John concluded that the idea of leasing an additional plant was not a very good one. Tidwell's current level of production did not justify another plant. In fact, John predicted it would take at least five years before the company needed be concerned about expanding into another facility comparable to their current one. He believed that sales would grow modestly over the next five years, and that all that growth could be absorbed by the current production capacity. The large increases in demand that had been experienced the past five years were not likely to be repeated.

Linda had identified two feasible alternatives. One was to rent an additional building to be used for warehousing. By transferring warehousing needs to the new building, Tidwell could free up internal space for offices and for expanding the production of plastic moldings. She located a building within two miles of the plant that could be used. It has the capacity to handle both current needs and the modest growth that John predicted. The second alternative centered on outsourcing the production of some of their components. She pointed out that the market has been flooded with two components, shafts and bushings, that Tidwell currently makes. Prices have decreased significantly. They might be better off buying shafts and bushings instead of making them. Ceasing internal production of shafts and bushings would free up the space they needed.

Leo liked both of those alternatives. He asked Linda, as financial chief, to prepare a report that detailed the costs affecting the decision. He anticipated making a decision quickly.

Questions to Think About

1. Describe the decision to be made by Tidwell. Is it a strategic or tactical decision?
2. What costs do you think Leo is referring to in the last paragraph of the scenario? Give examples.
3. Assume Tidwell Products accepts Linda's first alternative. Are there any noncost factors that should be considered? What about her second alternative?

1 This scenario is based on the experiences of a real company. The names have been changed to preserve confidentiality.

One of the major roles of the management information system is supplying cost and revenue data that serve as the basis for user actions. Although a variety of user actions are possible, one of the more important actions that can be taken by users is tactical decision making. How cost and revenue data can be used to make tactical decisions is the focus of this chapter.

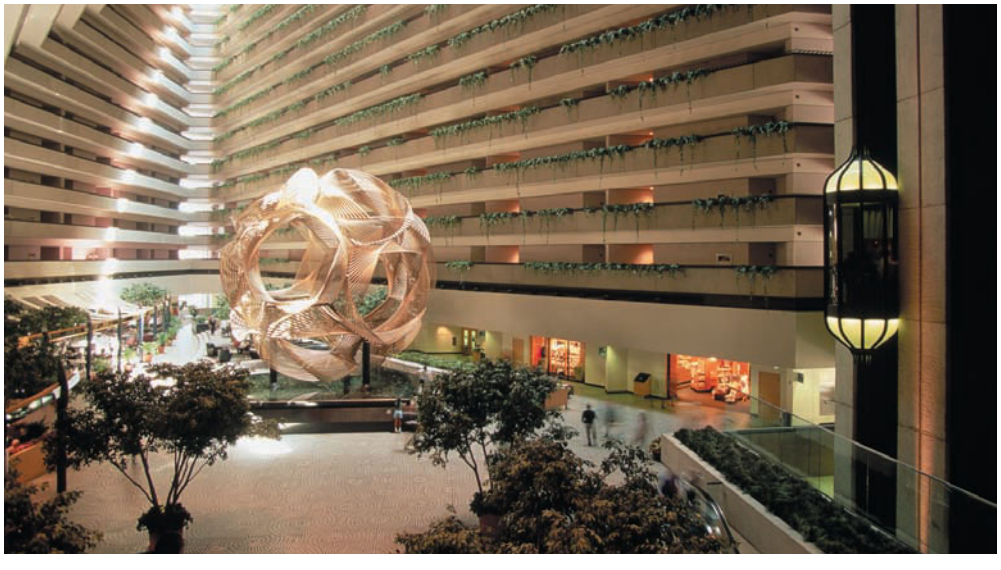
Tactical Decision Making

Objective 1

Describe the tactical decision-making model.

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. 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 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.

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 one-time order to increase profits) or small-scale (making instead of buying a component). Thus, *sound* tactical decision making means that the decisions made not only achieve 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. A good example of a company that has made tactical decisions that are in accordance with its strategic goals is **Hyatt Hotels Corporation**.[2] In the early 1990s, steep costs jeopardized a number of Hyatt's management contracts. It was necessary to reduce the cost structure fast. However, Hyatt attacked only the costs that guests did not particularly care about (for example, turndown service, in which the bedcovers are turned down at night and a mint is left on the pillow). Services that were important to business travelers, whom Hyatt courted, were expanded (for example, in-room fax machines).



Hotels must be careful to make tactical decisions that are in keeping with their image and strategic goals.

2 Richard A. Melcher, "Why Hyatt Is Toning Down the Glitz," *Business Week* (27 February 1995): pp. 92, 94.

Model for Making Tactical Decisions

How does a company go about making good tactical decisions? We can describe a general approach to making tactical decisions. The six[3] steps describing the recommended decision-making process are as follows:

1. Recognize and define the problem.
2. Identify alternatives as possible solutions to the problem; eliminate alternatives that are clearly not feasible.
3. Identify the costs and benefits associated with each feasible alternative. Classify costs and benefits as relevant or irrelevant, and eliminate irrelevant ones from consideration.
4. Total the relevant costs and benefits for each alternative.
5. Assess qualitative factors.
6. Select the alternative with the greatest overall benefit.

These six steps define a simple decision model. A **decision model** is a set of procedures that, if followed, will lead to a decision. Exhibit 12-1 depicts the sequence of steps to be followed.

Step 1	Define the problem.	Increase capacity for warehousing and production.
Step 2	Identify the alternatives.	1. Build new facility. 2. Lease larger facility; sublease current facility. 3. Lease additional facility. 4. Lease warehouse space. 5. Buy shafts and bushings; free up needed space.
Step 3	Identify costs and benefits associated with each feasible alternative.	Alternative 4: Variable production costs $345,000 Warehouse lease 135,000 Alternative 5: Purchase price 460,000
Step 4	Total relevant costs and benefits for each feasible alternative.	Alternative 4 480,000 Alternative 5 460,000 Differential cost $ 20,000
Step 5	Assess qualitative factors.	1. Quality of external supplier 2. Reliability of external supplier 3. Price stability 4. Labor relations and community image
Step 6	Make the decision.	Continue to produce shafts and bushings internally; lease warehouse.

Exhibit 12-1 Tactical Decision-Making Model for Tidwell Products' Space Problem

3 The decision-making model described here has six steps. There is nothing special about this particular listing. You may find it more useful to break down the steps into eight or 10 segments. Alternatively, you may find it useful to aggregate them into a shorter list. For example, you could use a three-step model: (1) identify the decision; (2) identify alternatives and their associated relevant costs; and (3) make the decision. The key point is to find a comfortable way for you to remember the important steps in the decision-making model.

Step 1: Define the Problem The first step is to recognize and define a specific problem. For example, the members of Tidwell's management team all recognized the need for additional space for warehousing, offices, and the production of plastic moldings. The amount of space needed, the reasons for the need, and how the additional space would be used are all important dimensions of the problem. However, the central question is *how* to acquire the additional space.

Step 2: Identify the Alternatives Step 2 is to list and consider possible solutions. Tidwell Products identified the following possible solutions:

1. Build its own facility with sufficient capacity to handle current and immediately foreseeable needs.
2. Lease a larger facility and sublease its current facility.
3. Lease an additional, similar facility.
4. Lease an additional building that would be used for warehousing only, thereby freeing up space for expanded production.
5. Buy shafts and bushings externally and use the space made available (previously used for producing these parts) to solve the space problem.

As part of this step, Tidwell must eliminate alternatives that are not feasible. The first alternative was eliminated because it carried too much risk for the company. The second alternative was rejected because subleasing was not a viable option. The third alternative was eliminated because it went too far in solving the space problem and, presumably, was too expensive. The fourth and fifth alternatives were feasible; they were within the cost and risk constraints and solved the space needs of the company. Notice that Leo linked the tactical decision (find more space) to the company's overall growth strategy by rejecting alternatives that involved too much risk at this stage of the company's development.

Step 3: Identify the Costs and Benefits Associated with Each Feasible Alternative In Step 3, the costs and benefits associated with each feasible alternative are identified. At this point, clearly irrelevant costs can be eliminated from consideration.[4] The management accountant is responsible for gathering necessary data.

Assume that Tidwell Products determines that the costs of making the shafts and bushings include the following:

Direct materials	$130,000
Direct labor	150,000
Variable overhead	65,000
Total variable production costs	$345,000

In addition, a warehouse must be leased to solve the space problem if Tidwell continues to manufacture the shafts and bushings internally. An appropriate warehouse has been located for $135,000 per year. The second alternative is to purchase the shafts and bushings externally and use the freed-up production space. An outside supplier has offered to supply sufficient products for $460,000 per year.

It should be mentioned that when the cash flow patterns become complicated for competing alternatives, it becomes difficult to produce a stream of equal cash flows for each alternative. In such a case, more sophisticated procedures can and should be used for the analysis. These procedures are discussed in the next chapter, which deals with the long-run investment decisions referred to as *capital expenditure decisions.*

4 It is fine to include irrelevant costs and benefits in the analysis as long as they are included for all alternatives. The reason we usually do not is that focusing only on the relevant costs and benefits reduces the amount of data to be collected.

Step 4: Total the Relevant Costs and Benefits for Each Feasible Alternative We now see that Alternative 4—continue producing internally and lease more space—costs $480,000, while Alternative 5—purchase outside and use internal space—costs $460,000. The comparison follows:

Alternative 4		Alternative 5	
Variable costs of production	$345,000	Purchase price	$460,000
Warehouse lease	135,000		
Total	$480,000		

The differential cost is $20,000 in favor of Alternative 5.

Step 5: Assess the Qualitative Factors While the costs and revenues associated with the alternatives are important, they do not tell the whole story. Qualitative factors can significantly affect the manager's decision. Qualitative factors are simply those factors that are hard to put a number on. For example, in the make-or-buy decision facing Tidwell Products, Leo Tidwell likely would be concerned with such qualitative considerations as the quality of the shafts and bushings purchased externally, the reliability of supply sources, the expected stability of prices over the next several years, labor relations, community image, and so on. To illustrate the possible impact of qualitative factors on the make-or-buy decision, consider the first two factors: quality and reliability of supply.

If the quality of shafts and bushings is significantly less when purchased externally from what is available internally, the quantitative advantage from purchasing may be more fictitious than real. Settling for lower-quality materials may reduce the

Managers Decide

A Comfortable ER Contributes to Hospital's Health

Many of us base our impression of hospital emergency rooms on the long-running television drama *ER.* Its emergency room is crowded and functional; the décor runs to green and white (with occasional splashes of red). Where do the patient's family and friends wait? Who knows—they are typically relegated to some cramped, uncomfortable waiting area. Some hospitals, however, have taken steps to improve the ambience of the ER waiting area.

St. Vincent's Hospital in New York City worked with a furniture design company to install warm colors and lighting in its ER waiting area. The objective was to create a "warm glow." Charlotte, North Carolina's Presbyterian Hospital just opened a pediatric ER with beach murals on the ceilings and video games for kids. The waiting room attached to the ER at Emory Crawford Long Hospital resembles an upscale hotel lobby, with contemporary décor and comfortable armchairs.

Why the new emphasis on improved ER waiting areas? Hospitals have found that many patients' first contact with their hospital is through the emergency room. If that contact was brusque and unpleasant, patients and their families look elsewhere for a hospital to perform elective surgery or more extensive medical procedures. Since the vast majority of ER patients have health insurance, a poor experience in the ER can negatively affect the bottom line for the hospital's more profitable departments. ■

Source: Peter Landers, "Hospital Chic: The ER's Makeover," *Wall Street Journal* (July 8, 2003): pp. D1, D3.

quality of the potentiometers, thus harming sales. Because of this, Tidwell Products may choose to continue to produce the parts internally.

Similarly, if supply sources are not reliable, production schedules could be interrupted, and customer orders could arrive late. These factors can increase labor costs and overhead and hurt sales. Again, depending on the perceived trade-offs, Tidwell Products may decide that producing the parts internally is better than purchasing them, even if relevant cost analysis gives the initial advantage to purchasing.

How should qualitative factors be handled in the decision-making process? First, they must be identified. Secondly, the decision maker should try to quantify them. Often, qualitative factors are simply more difficult to quantify—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 Tidwell's 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.

Step 6: Make the Decision Once all relevant costs and benefits for each alternative have been assessed and the qualitative factors weighed, a decision can be made. What did Leo decide for Tidwell Products? Given the relatively small difference in costs of the two alternatives and the weight Tidwell Products assigns to ensuring quality and full employment, the decision was made to make the shafts and bushings internally and lease the warehouse.

Relevant Costs Defined

The tactical decision-making approach just described emphasized the importance of identifying and using relevant costs. But how do we identify and define the costs that affect the decision? **Relevant costs** are future costs that differ across alternatives. 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 must also 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 Tidwell's make-or-buy alternatives. We saw that the cost of direct labor used to produce shafts and bushings is $150,000 per year (based on normal volume). Should this cost be a factor in the decision? Is the direct labor cost a future cost that differs across the two alternatives? It is certainly a future cost. To produce the shafts and bushings for another year requires the services of direct laborers, who must be paid. But does it differ across the two alternatives? If shafts and bushings are purchased from an external supplier, no internal production is needed. The services of the direct laborers can be eliminated, reducing the direct labor cost for shafts and bushings under this alternative to zero. Thus, the cost of direct labor differs across alternatives ($150,000 for the make alternative and $0 for the buy alternative). It is, therefore, a relevant cost.

Implicit in this analysis is the use of a past cost to estimate a future cost. The most recent cost of direct labor for normal activity was $150,000. This past cost was used as the estimate of next year's cost. Although past costs are never relevant, they are often used to predict what future costs will be.

Illustration of an Irrelevant Past Cost Tidwell Products uses machinery to manufacture shafts and bushings. This machinery was purchased five years ago and is being depreciated at an annual rate of $125,000. Is this $125,000 a relevant cost? In other words, is depreciation a future cost that differs across the two alternatives?

Depreciation represents an allocation of a cost already incurred. It is a **sunk cost**, a cost that cannot be affected by any future action. 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.

In choosing between the two alternatives, the original cost of the machinery used to produce shafts and bushings and its associated depreciation are not factors. However, it should be noted that salvage value of the machinery (what Tidwell could receive for selling the machinery now) would be relevant and would be included as a benefit of purchasing from outside suppliers. To simplify our example, we are assuming that the salvage value of the machinery is zero.

Illustration of an Irrelevant Future Cost Assume that the cost to lease the entire factory, $340,000, is allocated to different production departments including the department that produces shafts and bushings, which receives $12,000 of the cost. Is this $12,000 cost relevant to the make-or-buy decision facing Tidwell?

The lease payment is a future cost since it must be paid during each of the next five years. But does the cost differ across the make-and-buy alternatives? Whatever option Tidwell chooses, the factory lease payment must be made—it is the same across both alternatives. The amount of the payment allocated to the remaining departments may change if production of shafts and bushings is stopped, but the level of the total payment is unaffected by the decision. It is, therefore, an irrelevant cost.

The example illustrates the importance of identifying allocations of common fixed costs. Allocations of common fixed costs can be safely classified as irrelevant since any choice usually does not affect the level of cost. The only effect may be a reallocation of those common fixed costs to fewer cost objects or segments.

We can now look at all three cost examples for the production of shafts and bushings to see which are relevant in deciding whether or not to continue production. Of the three, only direct labor cost is relevant, since it is the only one that occurs if production continues but stops if production stops.

	Cost to Make	− Cost Not to Make	= Differential Cost
Direct labor	$150,000	—	$150,000
Depreciation	125,000	$125,000	—
Allocated lease	12,000	12,000	—
	$287,000	$137,000	$150,000

The same concepts apply to benefits. One alternative may produce an amount of future benefits different from another alternative (for example, differences in future revenues). If future benefits differ across alternatives, then they are relevant and should be included in the analysis.

Ethics in Tactical Decision Making

In tactical decision making, ethical concerns revolve around the way in which decisions are implemented and the possible sacrifice of long-run objectives for short-run gain. Relevant costs are used in making tactical decisions—decisions that have an immediate view or limited objective in mind. However, decision makers should always maintain an ethical framework. Reaching objectives is important, but how you get there is perhaps 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 today and let the future take care of itself.

For example, laying off employees to increase profits in the short run could loosely qualify as a tactical decision. However, if the only benefit is an increase in short-run profits and there is no evidence that the decision supports the longer-term strategic objectives of the firm, then the decision can be questioned. In fact, the

workload may not decrease at all, but the number of people available to carry out the work has decreased. Pressure then may be exerted by managers on the remaining employees to work unreasonable amounts of overtime. Is this right?

All companies should have a clear mission and goals. For example, if marketing enthusiastically touts the product's high quality and reliability, while engineering and production are busily reducing the quality of the materials and reliability of the design, problems are sure to surface. Customers will see this inconsistency as an ethical lapse.

Debates about what is right and what is wrong can be endless. As was 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 hotlines so that employees can call and register complaints or ask about the propriety of certain actions. However, some ethical problems can be avoided simply by using common sense and not focusing solely on the short term at the expense of the long term. Consider two examples of cost cutting at **Ford Motor Company**. Recently, Ford decided to delete the rubber molding on the side of the Sable, saving about $100 per car. Years earlier, Ford saved approximately $7 per car by installing thin-walled gas tanks on the Pinto. Which decision do you think has ethical ramifications?

Relevance, Cost Behavior, and the Activity Resource Usage Model

Objective 2

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

Tidwell Products' space problem was a very simple example of tactical decision making. Most tactical decisions require more complicated analysis—in particular, they require more extensive consideration of cost behavior. Earlier work on relevant costing emphasized the importance of variable versus fixed costs. Usually, variable costs were relevant, and fixed costs were not. For example, the variable costs of production were relevant to the Tidwell Products' make-or-buy decision. The depreciation expense and factory lease were not relevant. However, activity-based costing allows us to go further as we consider variable costs with respect to both unit- and non-unit-based cost drivers.

The key point is that changes in supply and demand for activity resources must be considered when assessing relevance. If changes in demand and supply for resources across alternatives bring about changes in resource spending, then the changes in resource spending are the relevant costs that should be used in assessing the relative desirability of the two alternatives.

Recall from Chapter 3 that the activity resource usage model reminds us to consider both flexible and committed resources. These categories can help us to identify relevant costs and, thus, facilitate relevant cost analysis.

Flexible Resources

Resources that can be easily purchased in the amount needed and at the time of use are called **flexible resources**. For example, electricity used to run stoves that boil fruit in the production of jelly is a resource acquired as used and needed. 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. This type of resource spending is typically referred to as a variable cost. The key point is that the amount of resource demanded by the firm equals the amount of resource supplied.

Now, suppose that the jelly producer is asked by a customer to produce a special order of jelly for promotional purposes. The jelly producer must consider the follow-

ing two alternatives: (1) accept a special, one-time order or (2) reject the special order. If accepting the order increases the demand for kilowatt-hours (electricity's cost driver), then the cost of electricity will differ across alternatives. Thus, electricity is relevant to the decision.

Committed Resources

Committed resources are purchased before they are used. Therefore, there may or may not be unused capacity that will affect tactical decision making. We will consider two types of committed resources: those that can be altered in the short run and those that provide capacity for multiple periods.

Committed Resources for the Short Run Some committed resources are acquired in advance of usage through implicit contracting; they are usually acquired in lumpy amounts. (Graphically, we usually think of this cost as being step-variable or step-fixed.) This category often represents resource spending associated with 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 quantity 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 that 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 the order is accepted or not).

However, if a change in demand across activities produces a change in resource supply, then the activity cost will change and, thus, be relevant to the decision. A change in resource 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 (increasing resource spending) or (2) the demand for the resource drops permanently and supply exceeds demand enough so that activity capacity can be reduced (decreasing 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. 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, 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.

Committed Resources for Multiple Periods Often, resources are acquired in advance for multiple periods, before the resource demands are known. Leasing or buying a building is an example. 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, is 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 discussed in Chapter 18.

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. A good example of the rising importance of resources requiring multiperiod commitments is the technology required for design. **Black & Decker Corporation**'s design budget in North America reached $1 million in 1995 (up from $300,000 in 1990). Companies are trying to turn this expense back into the category of a resource acquired in advance (short-term) by outsourcing much of the design work.[5] Exhibit 12-2 summarizes the activity resource usage model's role in assessing relevancy.

Illustrative Examples of Relevant Cost Applications

Objective 3

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

Relevant costing is of value in solving many different types of problems. Traditionally, these applications include decisions to make or buy a component, to keep or drop a segment or product line, to accept a special order at less than the usual price, and to process a joint product further or sell it at the split-off point. Though by no means an exhaustive list, many of the same decision-making principles apply to a variety of problems.

Make-or-Buy Decisions

Managers are often faced with the decision of whether to make or buy components used in manufacturing. Indeed, management periodically should evaluate past decisions concerning production. Conditions upon which prior decisions were based

5 Bruce Nussbaum, "Is In-House Design on the Way Out?" *Business Week* (25 September 1995): p. 130.

Resource Category	Demand and Supply Relationships	Relevance
Flexible Resources	Supply = Demand	
	a. Demand Changes	a. Relevant
	b. Demand Constant	b. Not Relevant
Committed Resources (Short Term)	Supply − Demand = Unused Capacity	
	a. Demand Increase < Unused Capacity	a. Not Relevant
	b. Demand Increase > Unused Capacity	b. Relevant
	c. Demand Decrease (Permanent)	
	1. Activity Capacity Reduced	1. Relevant
	2. Activity Capacity Unchanged	2. Not Relevant
Committed Resources (Multiperiod Capacity)	Supply − Demand = Unused Capacity	
	a. Demand Increase < Unused Capacity	a. Not Relevant
	b. Demand Decrease (Permanent)	b. Not Relevant
	c. Demand Increase > Unused Capacity	c. Capital Decision

Exhibit 12-2 Activity Resource Usage Model and Assessing Relevance

may have changed, and as a result, a different approach may be required. Periodic evaluations, of course, are not the only source of these **make-or-buy decisions**. Frequently, as with Tidwell Products, the decision is motivated by an indirectly related, underlying problem.

To illustrate more fully the cost analysis of a make-or-buy problem, assume that Swasey Manufacturing currently produces an electronic component used in one of its printers. In one year, Swasey will switch production to another type of printer, and the electronic component will not be used. However, for the coming year, Swasey must produce 10,000 of these parts to support the production requirements for the old printer.

Swasey has been approached by a potential supplier of the component. The supplier will build the electronic component to Swasey's specifications for $4.75 per unit. The offer sounds very attractive since the full manufacturing cost per unit is $8.20. Should Swasey Manufacturing make or buy the component?

The problem and the feasible alternatives are both readily identifiable. Since the horizon for the decision is only one period, there is no need to be concerned about periodically recurring costs. Relevant costing is particularly useful for short-run analysis. We simply need to identify the relevant costs, total them, and make a choice (assuming no overriding qualitative concerns).

First, let's look at the costs associated with the production of these 10,000 parts. The full absorption cost is computed as follows:

	Total Cost	Unit Cost
Rental of equipment	$12,000	$1.20
Equipment depreciation	2,000	0.20
Direct materials	10,000	1.00
Direct labor	20,000	2.00
Variable overhead	8,000	0.80
General fixed overhead	30,000	3.00
Total	$82,000	$8.20

Most of the equipment is rented. However, one specialized piece of machinery had to be custom-made and was purchased. Rental equipment can be returned at

any time without penalty; the company is charged only for the time the equipment is held. The specialized machinery will not be fully depreciated at the end of the year; however, the company plans to scrap it since it cannot be sold. The company recently purchased sufficient materials for 5,000 components. No alternative use for the materials exists. Variable overhead is applied to the electronic component at $0.40 per direct labor dollar. General fixed overhead for the plant totals $1 million. General fixed overhead is assigned to products based on the space occupied by each product. The manufacturing facilities for the component under consideration occupy 6,000 of the plant's 200,000 square feet. Thus, general fixed overhead of $30,000 is allocated to the electronic component (0.03 × $1,000,000).

Of these cost items, depreciation can be eliminated; it is a sunk cost. Since the direct materials already purchased have no alternative use, half of the cost of total direct materials is also a sunk cost. General overhead is not relevant either. The $30,000 is an allocation of a common fixed cost that will continue even if the component is purchased externally.

All other costs are relevant. The cost of renting the equipment is relevant since it will not be needed if the part is bought externally. Similarly, direct labor, the remaining 5,000 units of direct materials, and variable overhead are all relevant; they would not be incurred if the component is bought externally.

Now, let's focus on the purchase of the component. Of course, the purchase cost is relevant. If the component is made, this cost would not be incurred. Are there any other costs associated with an outside purchase? A check with the receiving dock elicited the information that the receiving and inspecting crew was at capacity. An additional purchase of this magnitude would require hiring an additional half-time employee for the year at a cost of $8,500. The Purchasing Department had sufficient excess capacity to handle the purchase of the component; thus, no additional cost would be incurred there.

A listing of the total relevant costs for each alternative follows:

	Alternatives		Differential
	Make	Buy	Cost to Make
Rental of equipment	$12,000	—	$ 12,000
Direct materials	5,000	—	5,000
Direct labor	20,000	—	20,000
Variable overhead	8,000	—	8,000
Purchase cost	—	$47,500	(47,500)
Receiving Department labor	—	8,500	(8,500)
Total relevant cost	$45,000	$56,000	$(11,000)

The analysis shows that making the product is $11,000 cheaper than buying it. The offer of the supplier should be rejected.

The same analysis can be done on a unit-cost basis. Once the relevant costs are identified, relevant unit costs can be compared. For this example, these costs are $4.50 ($45,000/10,000) for the make alternative and $5.60 ($56,000/10,000) for the buy alternative.

Keep-or-Drop Decisions

Often, a manager needs to determine whether or not a segment, such as a product line, should be kept or dropped. Segmented reports prepared on a variable-costing basis provide valuable information for these **keep-or-drop decisions**. Both the segment's contribution margin and its segment margin are useful in evaluating the performance of segments. However, while segmented reports provide useful informa-

tion for keep-or-drop decisions, relevant costing describes how the information should be used to arrive at a decision.

To illustrate, consider Norton Materials, Inc., which produces concrete blocks, bricks, and roofing tile. The controller has prepared the following estimated income statement for 2008 (in thousands of dollars):

	Blocks	Bricks	Tile	Total
Sales revenue	$500	$800	$150	$1,450
Less: Variable expenses	250	480	140	870
Contribution margin	$250	$320	$ 10	$ 580
Less direct fixed expenses:				
Advertising	$ 10	$ 10	$ 10	$ 30
Salaries	37	40	35	112
Depreciation	53	40	10	103
Total	$100	$ 90	$ 55	$ 245
Segment margin	$150	$230	$(45)	$ 335
Less: Common fixed expenses				125
Operating income				$ 210

The projected performance of the roofing tile line shows a negative segment margin. This would represent the third consecutive year of poor performance for that line. The president of Norton Materials, Tom Blackburn—concerned about this poor performance—is trying to decide whether to drop or keep the roofing tile line.

His first reaction is to take steps to increase the sales revenue of roofing tiles. He is considering an aggressive sales promotion coupled with an increase in the selling price. The marketing manager thinks that this approach would be fruitless, however; the market is saturated and the level of competition too keen to hold out any hope for increasing the firm's market share. An increase in the selling price would almost certainly result in a decrease in sales revenue.

Increasing the product line's profitability through cost cutting is not feasible either. Costs were cut the past two years to reduce the loss to its present anticipated level. Any further reductions would lower the quality of the product and adversely affect sales.

With no hope for improving the profit performance of the line beyond its projected level, Tom has decided to drop it. He reasons that the firm will lose a total of $10,000 in contribution margin but save $45,000 by dismissing the line's supervisor and eliminating its advertising budget. (The depreciation cost of $10,000 is not relevant since it represents an allocation of a sunk cost.) Thus, dropping the product line has a $35,000 advantage over keeping it. Before finalizing the decision, Tom decided to notify the marketing manager and the production supervisor. The following memo was sent to both individuals:

Memo

TO: Karen Gutierrez, Marketing, and Larry Olsen, Production
FROM: Tom Blackburn, President
SUBJECT: Tentative Decision Concerning the Production of Roofing Tiles
DATE: March 14, 2008

Since there is no realistic expectation of improving the profitability of the roofing tile line, I have reluctantly decided to discontinue its production. I realize that this decision will have a negative impact on the community since our workforce will need to be reduced. I am also sympathetic to the disruption this may cause in the personal lives of many employees.

However, we must be prepared to take actions that are in the best interests of the firm. By eliminating the roofing tile line, we can improve the firm's cash position by $35,000 per year. To support this decision, I am including the following analysis (focusing only on the tile segment), in thousands of dollars:

	Keep	Drop	Differential Amount to Keep
Sales	$150	$—	$150
Less: Variable expenses	140	—	140
Contribution margin	$ 10	$—	$ 10
Less: Advertising	(10)	—	(10)
Cost of supervision	(35)	—	(35)
Total relevant benefit (loss)	$(35)	$ 0	$(35)

I have included only future costs and benefits that differ across the two alternatives. Depreciation on the tile equipment is not relevant since it is simply an allocation of a sunk cost. Also, the level of common fixed costs is unchanged regardless of whether we keep or drop the tile line.

At this point, I view the decision as tentative and welcome any response. Perhaps I am overlooking something that would affect the decision. Please respond as soon as possible.

Keep-or-Drop with Complementary Effects In response to the memo, the marketing manager wrote that dropping the roofing tile line would lower sales of blocks by 10 percent and of bricks by 8 percent. She explained that many customers buy roofing tile at the same time they purchase blocks or bricks. Some will go elsewhere if they cannot buy both products at the same location.

Shortly after receiving this response, Tom Blackburn decided to repeat the analysis, factoring in the effect that dropping the tile line would have on the sales of the other two lines. He decided to use total firm sales and total costs for each alternative. As before, depreciation and common fixed costs were excluded from the analysis on the basis of irrelevancy.

Dropping the product line reduces total sales by $264,000: $50,000 (0.10 × $500,000) for blocks, $64,000 (0.08 × $800,000) for bricks, and $150,000 for roofing tiles. Similarly, total variable expenses are reduced by $203,400: $25,000 (0.10 × $250,000) for blocks, $38,400 (0.08 × $480,000) for bricks, and $140,000 for tiles. Thus, total contribution margin is reduced by $60,600 ($264,000 − $203,400). Since dropping the tile line saves only $45,000 in supervision costs and advertising, the net effect is a disadvantage of $15,600 ($45,000 − $60,600). The following is a summary of the analysis using the new information (in thousands):

	Keep	Drop	Differential Amount to Keep
Sales	$1,450	$1,186.0	$264.0
Less: Variable expenses	870	666.6	203.4
Contribution margin	$ 580	$ 519.4	$ 60.6
Less: Advertising	(30)	(20.0)	(10.0)
Cost of supervision	(112)	(77.0)	(35.0)
Total	$ 438	$ 422.4	$ 15.6

Tom was pleased to find the outcome favoring production of the roofing tile. The unpleasant task of dismissing some of his workforce was no longer necessary. However, just as he was preparing to write a second memo announcing his new decision, he received Larry Olsen's written response to his first memo.

Keep-or-Drop with Alternative Use of Facilities The production supervisor's response was somewhat different. He agreed that roofing tile should be eliminated but suggested that it be replaced with the production of floor tile. He gave assurances that existing machinery could be converted to produce this new product with little or no cost. He had also contacted the marketing manager about the marketability of floor tile and included this assessment in his response.

The marketing manager saw the market for floor tile as stronger and less competitive than that for roofing tile. However, the other two lines would still lose sales at the same rate; producing floor tile would not change that result. The following estimated financial statement for floor tile was also submitted (in thousands of dollars):

Sales	$100
Less: Variable expenses	40
Contribution margin	$ 60
Less: Direct fixed expenses	55
Segment margin	$ 5

Tom Blackburn was now faced with a third alternative: replacing the roofing tile with floor tile. Should the roofing tile line be kept, or should it be dropped and replaced with the floor tile?

From his prior analysis, Tom knows that dropping the roofing tile decreases the firm's contribution margin by $60,600. Producing the floor tile will generate $60,000 more in contribution margin according to the estimate. Dropping the roofing tile line and replacing it with floor tile, then, will cause a $600 net decrease in total contribution margin ($60,600 – $60,000). The same outcome can be developed by directly comparing the relevant benefits and costs of the two alternatives (dollars expressed in thousands).

	Keep	Drop and Replace	Differential Amount to Keep
Sales	$1,450	$1,286.0[a]	$164.0
Less: Variable expenses	870	706.6[b]	163.4
Contribution margin	$ 580	$ 579.4	$ 0.6

[a]$1,450 − $150 − $50 − $64 + $100
[b]$870 − $140 − $25 − $38.4 + $40

The Norton Materials example again illustrates the tactical decision-making process. First, a problem was identified and defined (the poor performance of the roofing tile product line). Next, possible solutions were listed, and those that were not feasible were eliminated. For example, increasing sales or further decreasing costs were both rejected as feasible solutions. Three feasible solutions were examined: (1) keeping the product line, (2) dropping it, and (3) dropping the product line and replacing it with another product. An analysis of the costs and benefits of the feasible alternatives led to the selection of the preferred alternative (keeping the product line).

The example provides some insights beyond the simple application of the decision model. The initial analysis, which focused on two feasible alternatives, led to a tentative decision to drop the product line. Additional information provided by the marketing manager led to a reversal of the first decision. Before that decision could be implemented, the manager was made aware of a third feasible alternative which required additional analysis.

Often, managers do not have all the information necessary to make the best decision. They also may not be able to identify all feasible solutions. Managers benefit from gathering all the information available before finalizing a decision. They should attempt to identify as many feasible solutions as possible. As the example clearly illustrates, limited information can result in poor decisions. If the set of

feasible solutions is too narrow, the best solution may never be selected simply because the manager has not thought of it. Managers can benefit from obtaining input from others who are familiar with the problem. By so doing, both the set of information and the set of feasible solutions can be expanded. The result is improved decision making.

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 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. These orders often can be attractive, especially when the firm is operating below its maximum productive capacity.

Suppose, for example, that an ice cream company is operating at 80 percent of its productive capacity. The company has a capacity of 20 million half-gallon units. The company produces only premium ice cream. The total costs associated with producing and selling 16 million units are as follows (in thousands of dollars):

	Total Cost	Unit Cost
Variable costs:		
Dairy ingredients	$ 11,200	$ 0.70
Sugar	1,600	0.10
Flavoring	2,400	0.15
Direct labor	4,000	0.25
Packaging	3,200	0.20
Commissions	320	0.02
Distribution	480	0.03
Other	800	0.05
Total variable costs	$24,000	$ 1.50
Fixed costs:		
Salaries	$ 960	$0.060
Depreciation	320	0.020
Utilities	80	0.005
Taxes	32	0.002
Other	160	0.010
Total fixed costs	$ 1,552	$0.097
Total costs	$25,552	$1.597
Wholesale selling price	$32,000	$2.00

An ice cream distributor from a geographic region not normally served by the company has offered to buy two million units at $1.55 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. As the manager of the ice cream company, would you accept or reject this order?

The offer of $1.55 is well below the normal selling price of $2.00; in fact, it is even below the total unit cost. Even so, accepting the order may be profitable. 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; fixed costs will continue regardless of whether the order is accepted or rejected.

If the order is accepted, a benefit of $1.55 per unit will be realized that otherwise wouldn't be. However, all of the variable costs except for distribution ($0.03)

and commissions ($0.02) also will be incurred, producing a cost of $1.45 per unit. The net benefit is $0.10 ($1.55 − $1.45) per unit. The relevant cost analysis can be summarized as follows:

	Accept	Reject	Differential Benefit to Accept
Revenues	$ 3,100,000	$—	$ 3,100,000
Dairy ingredients	(1,400,000)	—	(1,400,000)
Sugar	(200,000)	—	(200,000)
Flavoring	(300,000)	—	(300,000)
Direct labor	(500,000)	—	(500,000)
Packaging	(400,000)	—	(400,000)
Other	(100,000)	—	(100,000)
Profit	$ 200,000	$ 0	$ 200,000

We see that for this company, accepting the special order will increase profits by $200,000 ($0.10 × 2,000,000).

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. Sometimes, it is more profitable to process a joint product further, beyond the split-off point, prior to selling it. Determining whether to **sell or process further** is an important decision that a manager must make.

To illustrate, consider Appletime Corporation. Appletime is a large corporate farm that specializes in growing apples. Each plot produces approximately one ton of apples. The trees in each plot must be sprayed, fertilized, watered, and pruned.

These apples are a joint product to the purchaser. Large, unblemished apples are sold to grocery stores. Small, misshapen apples are canned as pie filling or applesauce.

When the apples are ripened, workers are hired to pick them. The apples are then transported to a warehouse, where they are washed and sorted. The approximate cost of all these activities (including processing) is $300 per ton per year.

Apples are sorted into three grades (A, B, and C) determined by size and blemishes. Large apples without blemishes (bruises, cuts, wormholes, and so on) are sorted into one bin and classified as Grade A. Small apples without blemishes are sorted into a second bin and classified as Grade B. All remaining apples are placed in a third bin and classified as Grade C. Every ton of apples produces 800 pounds of Grade A, 600 pounds of Grade B, and 600 pounds of Grade C.

Grade A apples are sold to large supermarkets for $0.40 per pound. Grade B apples are packaged in 5-pound bags and sold to supermarkets for $1.30 per bag. (The cost of each bag is $0.05.) Grade C apples are processed further and made into applesauce. The sauce is sold in 16-ounce cans for $0.75 each. The cost of processing is $0.10 per pound of apples. The final output is 500 sixteen-ounce cans. Exhibit 12-3 summarizes the process.

A large supermarket chain recently requested that Appletime supply 16-ounce cans of apple pie filling for which the chain was willing to pay $0.90 per can. Appletime determined that the Grade B apples would be suitable for this purpose and estimated that it would cost $0.20 per pound to process the apples into pie filling. The output would be 500 sixteen-ounce cans.

In deciding whether to sell Grade B apples at split-off or to process them further and sell them as pie filling, the common costs of spraying, pruning, and so on are not relevant. The company must pay the $300 per ton for these activities regardless of whether it sells at split-off or processes further. However, the revenues earned at split-off are likely to differ from the revenues that would be received if the Grade B apples are sold as pie filling. Therefore, revenues are a relevant consideration. Similarly, the processing costs occur only if further processing takes place. Hence, processing costs are relevant.

Since there are 600 pounds of Grade B apples at split-off, Appletime sells 120 five-pound bags at a net per-unit price of $1.25 ($1.30 – $0.05). Thus, the total net revenues at split-off are $150 ($1.25 × 120). If the apples are processed into pie

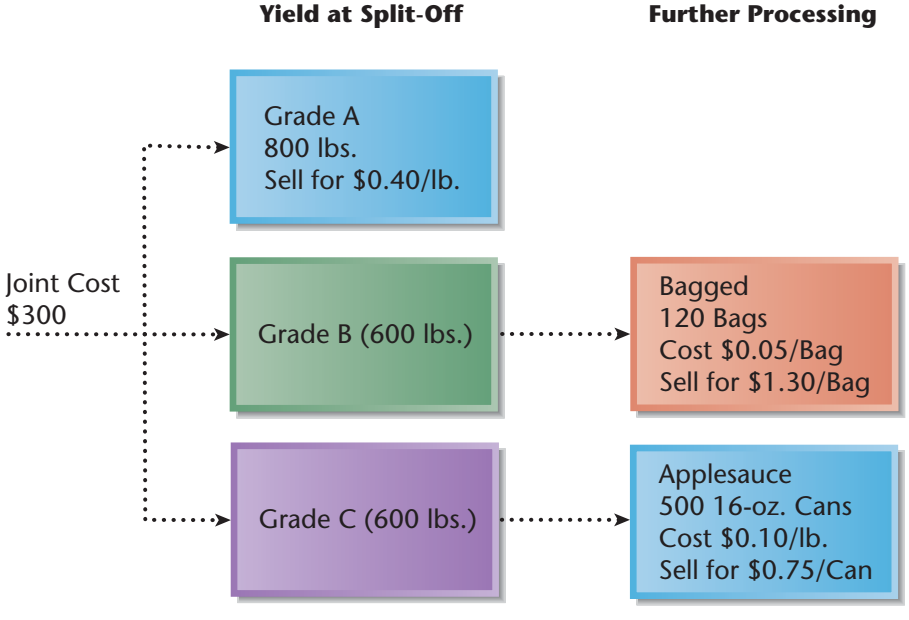


Exhibit 12-3 Appletime's Joint Process

filling, then the total revenues are \$450 (\$0.90 × 500). Therefore, the incremental revenues from processing further are \$300 (\$450 − \$150). The incremental costs of processing are \$120 (\$0.20 × 600 pounds). Since revenues increase by \$300 and costs by only \$120, the net benefit of processing further is \$180. Thus, Appletime should process the Grade B apples into pie filling. The analysis is summarized as follows:

	Process Further	Sell	Differential Amount to Process Further
Revenues	\$450	\$150	\$300
Processing cost	120	—	120
Total	\$330	\$150	\$180

Product Mix Decisions

Objective 4

Choose the optimal product mix when faced with one constrained resource.

In the preceding example, of every 2,000 pounds of apples harvested, 800 were Grade A, 600 were Grade B, and 600 were Grade C. Although the relative amounts of each type of apple can be influenced to some extent by the procedures followed in spraying, watering, fertilizing, and so on, the mix of apples is largely beyond Appletime's control. However, many organizations have total discretion in choosing their product mix. Moreover, decisions about product mix can have a significant impact on an organization's profitability.

Each mix represents an alternative that carries with it an associated profit level. A manager should choose the alternative that maximizes total profits. Since fixed costs do not vary with activity level, the total fixed costs of a firm would be the same for all possible mixes and, therefore, are not relevant to the decision. Thus, a manager needs to choose the alternative that maximizes total contribution margin.

Assume, for example, that Jorgenson Company produces two types of gears: X and Y, with unit contribution margins of \$25 and \$10, respectively. If the firm possesses unlimited resources and the demand for each product is unlimited, then the product mix decision is simple—produce an infinite number of each product. Unfortunately, every firm faces limited resources and limited demand for each product. These limitations are called **constraints**. A manager must choose the optimal mix given the constraints found within the firm.

Assuming that Jorgenson can sell all that is produced, some may argue that only Gear X should be produced and sold—it has the larger contribution margin. However, this solution is not necessarily the best. The selection of the optimal mix can be significantly affected by the relationships of the constrained resources to the individual products. These relationships affect the quantity of each product that can be produced and, consequently, the total contribution margin that can be earned. This point is most vividly illustrated when one is faced with a single resource constraint.

One Constrained Resource

Assume that each gear must be notched by a special machine. The firm owns eight machines that together provide 40,000 hours of machine time per year. Gear X requires two hours of machine time, and Gear Y requires 0.5 hour of machine time. Assuming no other constraints, what is the optimal mix of gears? Since each unit of Gear X requires two hours of machine time, a total of 20,000 units can be produced per year (40,000/2). At \$25 per unit, Jorgenson can earn a total contribution margin of \$500,000. On the other hand, Gear Y requires only 0.5 hour of machine time per unit; therefore, 80,000 (40,000/0.5) gears can be produced. At \$10 per unit, the total contribution margin is \$800,000. Producing only Gear Y yields a higher profit level

than producing only Gear X—even though the unit contribution margin for X is 2.5 times larger than that for Y.

The contribution margin per unit of each product is not the critical concern. The contribution margin per unit of scarce resource is the deciding factor. The product yielding the highest contribution margin per machine hour should be selected. Gear X earns $12.50 per machine hour ($25/2), but Gear Y earns $20 per machine hour ($10/0.5). Thus, the optimal mix is 80,000 units of Gear Y and none of Gear X.

Multiple Constrained Resources

The presence of only one constrained resource is unrealistic. All organizations face multiple constraints: limitations of materials, limitations of labor inputs, limited demand for each product, and so on. The solution of the product mix problem in the presence of multiple constraints is considerably more complicated and requires the use of a specialized mathematical technique known as *linear programming,* which is defined and illustrated in the appendix at the end of this chapter.

Pricing

Objective 5

Explain the impact of cost on pricing decisions.

One of the more difficult decisions faced by a company is pricing. This section examines the impact of cost on price and the role of the accountant in gathering the needed information.

Cost-Based Pricing

Demand is one side of the pricing equation; supply is the other side. Since revenue must cover cost for the firm to make a profit, many companies start with cost to determine price. That is, they calculate product cost and add the desired profit. The mechanics of this approach are straightforward. Usually, there is some cost base and a markup. The **markup** is a percentage applied to the base cost; it includes desired profit and any costs not included in the base cost. Companies that bid for jobs routinely base bid price on cost.

Consider Elvin Company, owned and operated by Clare Elvin, which assembles and installs computers to customer specifications. Costs of the components and other direct materials are easy to trace. Direct labor cost is similarly easy to trace to each job. Assemblers receive, on average, $15 per hour. Last year, Elvin's total direct labor cost was $140,000. Overhead, consisting of utilities, small tools, building space, and so on, amounted to $84,000. Elvin Company's income statement for last year is as follows:

Revenues		$856,500
Cost of goods sold:		
Direct materials	$489,750	
Direct labor	140,000	
Overhead	84,000	713,750
Gross profit		$142,750
Selling and administrative expenses		25,000
Operating income		$ 117,750

Suppose that Clare wants to earn about the same amount of profit on each job as was earned last year. She could calculate a markup on cost of goods sold by summing selling and administrative expenses and operating income and then dividing by cost of goods sold:

$$\begin{aligned}\text{Markup on COGS} &= (\text{Selling and administrative expenses} \\ &\quad + \text{Operating income})/\text{COGS} \\ &= (\$25{,}000 + \$117{,}750)/\$713{,}750 \\ &= 0.20\end{aligned}$$

The markup on cost of goods sold is 20 percent. Notice that the 20 percent markup covers both profit and selling and administrative expenses. The markup is not pure profit.

The markup can be calculated using a variety of bases. Clearly, for Elvin Company, the cost of purchased materials is the largest component. Last year, the markup on direct materials amounted to 46.4 percent of all other costs and profit:

$$\begin{aligned}\text{Markup on direct materials} &= (\text{Direct labor} + \text{Overhead} + \text{Selling and} \\ &\quad \text{administrative expenses} + \text{Operating income})/ \\ &\quad \text{Direct materials} \\ &= (\$140{,}000 + \$84{,}000 + \$25{,}000 + \\ &\quad \$117{,}750)/\$489{,}750 \\ &= 0.749\end{aligned}$$

A markup percentage of 74.9 percent of direct materials cost would also yield the same amount of profit, assuming the level of operations and other expenses remained stable. The choice of base and markup percentage generally rests on convenience. If Clare finds that the labor varies in rough proportion to the cost of direct materials (for example, more expensive components take more time to set up) and that the cost of materials is easier to track than the cost of goods sold, then direct materials might be the better base.

To see how the markup can be used in bidding, suppose that Clare has the opportunity to bid on a job for a local insurance company. The job requires Elvin Company to assemble 100 computers according to certain specifications. She estimates the following costs:

Direct materials (computer components, software, cables)	$ 100,000
Direct labor (100 × 6 hours × $15)	9,000
Overhead (60 percent of direct labor cost)	5,400
Estimated cost of goods sold	$ 114,400
Plus 20 percent markup on COGS	22,880
Bid price	$137,280

Thus, Elvin Company's initial bid price is $137,280. Note that this is the first pass at a bid. Clare can adjust the bid based on her knowledge of competition for the job and other factors. The markup is a guideline, not an absolute rule.

If Elvin Company bids every job at cost plus 20 percent, is it guaranteed a profit? No, not at all. If very few jobs are won, the entire markup will go toward selling and administrative expenses, the costs not explicitly included in the bidding calculations.

Markup pricing is often used by retail stores, and their typical markup is 100 percent of cost. Thus, if a sweater is purchased by Graham Department Store for $24, the retail price marked is $48 [$24 + (1.00 × $24)]. Of course, the 100 percent markup is not pure profit—it goes toward the salaries of the clerks, payment for space and equipment (cash registers, furniture, and fixtures), utilities, advertising, and so on. A major advantage of markup pricing is that standard markups are easy to apply. Consider the difficulty of setting a price for every piece of merchandise in a hardware or department store. It is much simpler to apply a uniform markup to cost and then adjust prices as needed if demand is less than anticipated.

Target Costing and Pricing

We just examined the way in which companies use cost to determine price. Now, let's work backward and see how price can determine cost. **Target costing** is a method of determining the cost of a product or service based on the price (target price) that customers are willing to pay. This is also referred to as *price-driven costing*.

Most American companies, and nearly all European firms, set the price of a new product as the sum of the costs and the desired profit. The rationale is that the company must earn sufficient revenues to cover all costs and yield a profit. Peter Drucker writes, "This is true but irrelevant: Customers do not see it as their job to ensure manufacturers a profit. The only sound way to price is to start out with what the market is willing to pay."[6]

Target costing is a method of working backward from price to find cost. The marketing department determines what characteristics and price for a product are most acceptable to consumers; then, it is the job of the company's engineers to design and develop the product such that cost and profit can be covered by that price. Japanese firms have been doing this for years; American companies are beginning to use target costing. For example, Montclair Paper Mill applied target costing to solve the problem of continuing losses on every ton of paper sold. Management believed the problem was in the pricing of the product, not its manufacture. They instituted a program to reduce per ton paper costs by 60%, by reducing the cost of fiber input, increasing the yield per machine, and reducing conversion costs. The resultant cost decrease to the target cost resulted in a dramatic turnaround.[7]

Let's return to the Elvin Company example. Suppose Clare finds that the insurance company will not consider any bid over $100,000. Her cost-based bid was $137,280. Is she out of the running? No, not if she can tailor her bid to the customer's desired price. Recall that the original bid called for $100,000 of direct materials and $9,000 of direct labor. Clearly, adjusting the materials will yield the greatest savings. Working with the customer specifications, Clare must determine whether or not a less expensive set of components will achieve the insurance company objectives. Suppose that the insurance company has specified sufficient hard-disk space on each drive to accommodate particular software and that the minimum required is 800 megabytes. Clare's original bid specified 3 GB hard drives. If she reduces the hard-disk space to 1.5 GBs and uses a marginally slower drive, she could save $25,000. Substituting a slightly more expensive monitor (a $20 increase), which does not require the installation of screen-saver software, would result in saving $30 per computer on software and 15 minutes of direct labor time (at $15 per hour) to install it. The net reduction is $13.75 [($30 + $3.75) – $20] for each of the 100 computers. So far, Clare has developed the following costs:

Direct materials ($100,000 − $25,000)	$75,000
Direct labor (100 × 5.75 hours × $15)	8,625
Total prime cost	$83,625

Recall that Elvin Company applies overhead at the rate of 60 percent of direct labor cost. However, Clare must think carefully about this job. Perhaps somewhat less overhead will be incurred because purchasing is reduced (no need to purchase screen-saver software) and testing is reduced (the smaller hard drives require fewer hours of testing). Perhaps overhead for this job will amount to $4,313 (50 percent of direct labor). That would make the cost of the job $87,938 ($4,313 + $83,625).

Still, not all costs have been covered. There is the administrative cost and desired profit. If the standard markup of 20 percent is applied, the bid would be $105,526. This is still too high. Now, Clare must determine if further cuts are possi-

6 Peter Drucker, "The Five Deadly Business Sins," *Wall Street Journal* (21 October 1993): p. A22.

7 Taken from J. K. Shank and J. Fisher (1999), "Target Costing as a Strategic Tool," *Sloan Management Review,* Cambridge, Vol. 41, p. 73–82.

ble or if she wants to decrease desired profit and administrative expenses. As you can see, target costing is an iterative process. Clare will go through the cycle until she either achieves the target cost or determines that she cannot do so. Note, however, that given the customer's price ceiling, Clare now has a chance of winning the bid.

A further issue might cause concern. Is there anything ethically wrong with changing the components from the initial bid to the target-costed bid? No, the new components meet customer specifications and are clearly described in the bid. In fact, Clare's initial bid was overspecified. If the customer wants a Chevrolet, the bidder need not provide a Rolls-Royce, especially at Chevrolet prices. However, if in Clare's professional opinion the insurance company should upgrade its specifications, she could point that out. For example, if she knows that the insurance company's word-processing program is due for an upgrade that will take more hard-disk space, she could inform the company of that and encourage an increase in specified disk space.

Target costing involves much more up-front work than cost-based pricing. However, let's not forget the additional work that must be done if the cost-based price turns out to be higher than what customers will accept. Then the arduous task of bringing costs into line to support a lower price, or the opportunity cost of missing the market altogether, begins. For example, the U.S. consumer electronics market is virtually nonexistent because cost-based pricing led to increasingly higher prices. Japanese (and later Korean) firms practicing target costing offered lower prices and won the market.

Target costing can be used most effectively in the design and development stage of the product life cycle. At that point, the features of the product, as well as its costs, are still fairly easy to adjust.

Legal Aspects of Pricing

Customers and costs are important economic determinants of price. The U.S. government also has an important impact on pricing. The basic principle behind much pricing regulation is that competition is good and should be encouraged. Therefore, collusion by companies to set prices and the deliberate attempt to drive competitors out of business are prohibited. In general, cost is an important justification for price.

Predatory Pricing The practice of setting prices below cost for the purpose of injuring competitors and eliminating competition is called **predatory pricing**. It is important to note that pricing below cost is not necessarily predatory pricing. Companies frequently price an item below cost—loss leaders or weekly specials in a grocery store, for example. State laws on predatory pricing create a patchwork of legal definitions. Twenty-two states have laws against predatory pricing, each state differing somewhat in definition and rules. Oklahoma, for example, requires retailers to sell products at a price at least 6.75 percent above cost, unless the store is having a sale or matching a competitor's price. A 1937 Arkansas law forbids companies from selling or advertising "any article or product . . . at less than the cost thereof to the vendor . . . for the purpose of injuring competitors and destroying competition."

An example of the application of state predatory pricing laws is the lawsuit filed by three Conway, Arkansas, drugstores against **Wal-Mart**.[8] The druggists contended that Wal-Mart engaged in predatory pricing by selling more than 100 products below cost. One difficulty is showing exactly what cost is. Wal-Mart has low overhead and phenomenal buying power. Suppliers are regularly required to shave prices to win Wal-Mart's business. Smaller concerns cannot win such price breaks. Thus, the fact that Wal-Mart prices products below competitors' costs does not necessarily mean that those products are priced below Wal-Mart's cost. (Although in this case, the CEO of Wal-Mart did concede that Wal-Mart on occasion prices products below its own cost.)

8 Wal-Mart lost the suit in October 1993 and won the case on appeal.

A key legal point is that the below-cost price must be for the purpose of driving out competitors. Usually, this is a difficult point to prove. In general, states follow federal law in predatory pricing cases, and the federal law makes it difficult to prove predatory pricing since price competition is so highly valued.

Predatory pricing on the international market is called **dumping** and occurs when companies sell below cost in other countries. For years, U.S. automobile manufacturers have accused Japanese companies of dumping. Companies found guilty of dumping products in the United States are subject to trade restrictions and stiff tariffs—which act to increase the price of the good. The defense against a charge of dumping is demonstrating that the price is indeed above or equal to cost.

Price Discrimination Perhaps the most potent weapon against price discrimination in the United States is the 1936 Robinson-Patman Act.[9] **Price discrimination** refers to the charging of different prices to different customers for essentially the same product. Note that services and intangibles are not covered by this act. The Robinson-Patman Act states that it is unlawful "to discriminate in price between purchasers of commodities of like grade and quality . . . where the effect of such discrimination may be substantially to lessen competition, to tend to create a monopoly in any line of commerce, or to injure, destroy, or prevent competition with any person who either grants or knowingly receives the benefit of such discrimination, or with customers of either of them." A key feature is that only manufacturers or suppliers are covered by the act. Importantly, the Robinson-Patman Act does allow price discrimination under certain specified conditions: (1) if the competitive situation demands it and (2) if costs can justify the lower price. Clearly, this second condition is important for the accountant, as a lower price offered to one customer must be justified by identifiable cost savings. Additionally, the amount of the discount must be at least equaled by the amount of cost saved.

What about quantity discounts—are they permissible under Robinson-Patman? Consider quantity discounts offered by **Morton Salt** (now **Morton International, Inc.**) during the 1940s. Less-than-carload shipments were priced at $1.60 per case delivered. Carload shipments were priced at $1.50 per case, and extra discounts of $0.10 and an additional $0.05 were given for purchases of 5,000 cases and 50,000 cases, respectively, if purchased within a 12-month period. The Supreme Court, in a 1948 decision, found that Morton Salt had violated the Robinson-Patman Act because so few buyers qualified for the quantity discount; at the time, only five large chain stores had purchases high enough to qualify for the lowest price of $1.35 per case. While Morton Salt argued that the discounts were available to all purchasers, the Court noted that for all practical purposes, small wholesalers and retail grocers could not qualify for the discounts. A key point here is that so few purchasers were eligible for the discount that competition was lessened. So while the act states that quantity discounts can be given, they must not appreciably lessen competition.

Freight is considered part of the price for purposes of the Robinson-Patman Act. If a company requires the customer to pay freight charges, then there is no problem. However, price discrimination may occur if the price charged includes delivery. Suppose the firm charges a uniform delivery price. Then, customers located next to the firm pay the same price as customers located 1,000 miles away. Because the cost of delivering to nearby customers is much less than delivering to far-off customers, the nearby customers are paying "phantom freight."

The burden of proof for firms accused of violating the Robinson-Patman Act is on the firms. The cost justification argument must be buttressed by substantial cost data. Proving a cost justification is an absolute defense; however, the expense of preparing evidence and the FTC's restrictive interpretations of the defense have made

9 This section relies on two sources: William A. Rutter, *Antitrust,* 3rd ed. (Gardena, CA: Gilbert Law Summaries, 1972): pp. 57–64; and William A. Baldwin, *Market Power, Competition, and Antitrust Policy* (Homewood, IL: Richard D. Irwin, Inc., 1987): pp. 430–435.

it a seldom-used choice in the past. Now, the availability of large databases, the development of activity-based costing, and powerful computing make it a more palatable alternative. Still, problems remain. Cost allocations make such determinations particularly thorny. In justifying quantity discounts to larger companies, a company might keep track of sales calls, differences in time and labor required to make small and large deliveries, and so on.

In computing a cost differential, the company must create classes of customers based on the average costs of selling to those customers and then charge all customers in each group a cost-justifiable price.

Fairness and Pricing

Community standards of fairness have an important effect on prices. For example, should toy stores raise the price of sleds the morning after a heavy snowfall? They could, but generally they do not. Their customers believe that a price increase at such a time would be taking unfair advantage. Whether we characterize the store's reluctance to raise prices in this situation as fairness or as an act in the long-term best interests of the company, the result is the same.

© Getty Images/PhotoDisc

An early snowfall may mean that sleds are in short supply. Even so, most stores opt to ensure long-term customer goodwill by not raising the price above the normal level.

Price gouging is said to occur when firms with market power price products "too high." How high is too high? Surely, cost is a consideration. Any time price just covers cost, gouging does not occur. This is why so many firms go to considerable trouble to explain their cost structure and point out costs consumers may not realize exist. Pharmaceutical companies, for example, emphasize the research and development costs associated with new drugs. When a high price is clearly not supported by cost, buyers take offense. For example, after Hurricane Katrina in 2005, some landlords sharply raised rents on undamaged properties, even evicting some low-income tenants. Gulf Coast residents faced with those increases were outraged that some property owners would take advantage of the disaster to profiteer.[10]

It is easy to see that cost as a justification for price underlies community standards of fairness. Ethics are founded on a sense of fairness. So, unethical behavior in pricing is related to taking unfair advantage of customers. Cost-related price increases are the best defense against customer rebellion.

Appendix: Linear Programming

Linear programming is a method that searches among possible solutions until it finds the optimal solution. The theory of linear programming permits many solutions to be ignored. In fact, all but a finite number of solutions are eliminated by the theory with the search then limited to the resulting finite set.

To illustrate how linear programming can be used to solve a problem of multiple constrained resources, we will use the earlier example of the product mix for Jorgenson Company. Assume that there are demand constraints for both Gear X and Gear Y. For Gear X, no more than 15,000 units can be sold; for Gear Y, no more than 40,000 units can be sold. As before, the objective is to maximize Jorgenson's total contribution margin subject to the constraints the company faces.

Objective 6

Use linear programming to find the optimal solution to a problem of multiple constrained resources.

10 CBS News story at http://tinyurl.com/jj2zx ; *Baton Rouge Advocate,* http://tinyurl.com/h3uhn

The objective can be expressed mathematically. Let X and Y be the number of units produced and sold of Gear X and Gear Y, respectively. Since the unit contribution margins are \$25 and \$10 for X and Y, respectively, the total contribution margin (Z) can be expressed as:

$$Z = \$25X + \$10Y \tag{10.1}$$

Equation 10.1 is called the objective function. The **objective function** is the function to be optimized. In this case, the objective is to maximize the total contribution margin.

Jorgenson also has three constraints. One is the limited machine hours available for production, and the other two reflect the demand limitations for each product. Consider the machine-hour constraint first. Two machine hours are used for each unit of Gear X, and 0.5 machine hour is used for each unit of Gear Y. Thus, the total machine hours used can be expressed as $2X + 0.5Y$. The maximum of 40,000 machine hours available can be expressed mathematically as follows:

$$2X + 0.5Y \leq 40{,}000 \tag{10.2}$$

The two demand constraint limitations can also be expressed mathematically:

$$X \leq 15{,}000 \tag{10.3}$$
$$Y \leq 40{,}000 \tag{10.4}$$

Jorgenson's problem is to select the number of units of X and Y that maximize total contribution margin subject to the constraints in Equations 10.2, 10.3, and 10.4. This problem can be expressed in the following way, which is the standard formulation for a linear programming problem (often referred to as a *linear programming model*):

$$\text{Max. } Z = \$25X + \$10Y$$

subject to

$$\begin{aligned} 2X + 0.5Y &\leq 40{,}000 \\ X &\leq 15{,}000 \\ Y &\leq 40{,}000 \\ X &\geq \$\ 0 \\ Y &\geq 0 \end{aligned}$$

The last two constraints are called *nonnegativity constraints* and simply reflect the reality that negative quantities of a product cannot be produced. All constraints, taken together, are referred to as the **constraint set**.

A **feasible solution** is a solution that satisfies the constraints in the linear programming model. The collection of all feasible solutions is called the **feasible set of solutions**. For example, producing and selling 10,000 units of Gear X and 20,000 units of Gear Y would be a feasible solution and a member of the feasible set. This product mix uses 30,000 machine hours [(2 × 10,000) + (0.5 × 20,000)], which is under the limit for machine hours. Additionally, the company can sell the indicated amounts since they do not exceed the demand constraints for each product. If this mix is selected, the company would earn a contribution margin totaling \$450,000 [(\$25 × 10,000) + (\$10 × 20,000)].

However, the mix of 10,000 units of X and 20,000 units of Y is not the best mix. One better solution would be to produce and sell 12,000 units of X and 30,000 units of Y. This mix uses 39,000 machine hours [(2 × 12,000) + (0.5 × 30,000)] and produces a total contribution margin of \$600,000 [(\$25 × 12,000) + (\$10 × 30,000)]. This feasible solution is better than the first because it produces \$150,000 more in profits. However, even better feasible solutions exist. The objective is to identify the best. The best feasible solution—the one that maximizes the total contribution margin—is called the **optimal solution**.

When there are only two products, the optimal solution can be identified by graphing. Since solving the problem by graphing provides considerable insight into the way linear programming problems are solved, the Jorgenson problem will be solved in this way.

Four steps are followed in solving the problem graphically.

1. Graph each constraint.
2. Identify the feasible set of solutions.
3. Identify all corner-point values in the feasible set.
4. Select the corner point that yields the largest value for the objective function.

The graph of each constraint for the Jorgenson problem is shown in Exhibit 12-4. The nonnegativity constraints put the graph in the first quadrant. The other constraints are graphed by assuming that equality holds. Since each constraint is a linear equation, the graph is obtained by identifying two points on the line, plotting those points, and connecting them.

A feasible area for each constraint (except for the nonnegativity constraints) is determined by everything that lies below (or to the left) of the resulting line. The *feasible set* or *region* is the intersection of each constraint's feasible area. The feasible set is shown by the figure *ABCDE;* it includes the boundary of the figure.

There are five corner points: *A*, *B*, *C*, *D*, and *E*. Their values, obtained directly from the graph, are (0,0) for *A*, (15,0) for *B*, (15,20) for *C*, (10,40) for *D*, and (0,40) for *E*. The impact of these values on the objective function is as follows (expressed in thousands):

Corner Point	X-value	Y-value	Z = $25X + $10Y
A	0	0	$ 0
B	15	0	375
C	15	20	575
D	10	40	650*
E	0	40	400

*Optimal solution

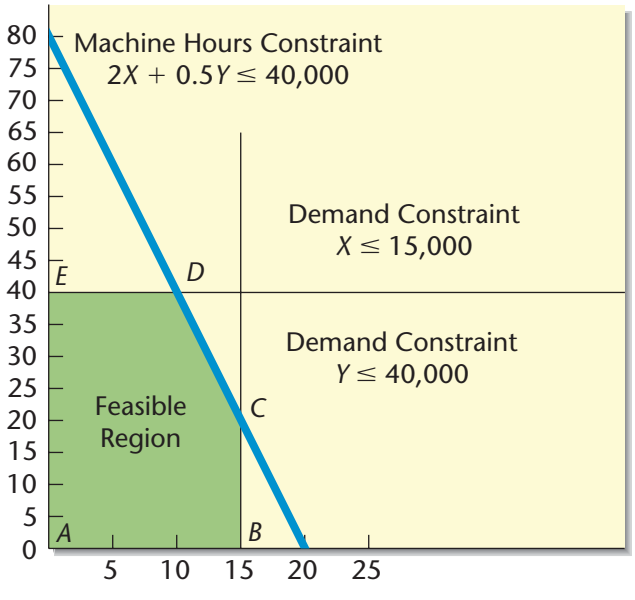


Exhibit 12-4 Graphical Solution (coordinates represent thousands)

The optimal solution calls for producing and selling 10,000 units of Gear X and 40,000 units of Gear Y. No other feasible solution will produce a larger contribution margin. It has been shown in the literature on linear programming that the optimal solution will always be one of the corner points. Thus, once the graph is drawn and the corner points identified, finding the solution is simply a matter of computing the value of each corner point and selecting the one with the greatest value.

Graphical solutions are not practical with more than two or three products. Fortunately, an algorithm called the **simplex method** can be used to solve larger linear programming problems. This algorithm has been coded and is available for use on computers to solve these larger problems.

The linear programming model is an important tool for making product mix decisions, though it requires very little independent managerial decision making. The mix decision is made by the linear programming model itself. Assuming that the linear programming model is a reasonable representation of reality, the main role for management is to ensure that accurate data are used as input to the model. This includes the ability to recognize the irrelevancy of fixed costs and the ability to assess the accounting and technological inputs accurately (for example, the unit selling prices, the unit costs, and the amount of resource consumed by each product as it is produced).

Summary of Learning Objectives

1. Describe the tactical decision-making model.
The decision-making model described in this chapter consists of six steps: recognizing and defining the problem, identifying alternatives, determining the costs and benefits of each alternative, comparing relevant costs and benefits for each alternative, assessing qualitative factors, and making the decision. In using cost analysis to choose among alternatives, managers should take steps to ensure that all important feasible alternatives are being considered.

2. Explain how the activity resource usage model is used in assessing relevancy.
The activity resource usage model breaks costs into two groups: flexible resources and committed resources. Flexible resources are acquired as used and needed; supply equals demand. If demand changes, the cost is relevant. Committed resources are acquired in advance; therefore, they may have unused capacity. The cost may or may not be relevant. If committed resources have sufficient unused capacity, their cost is not relevant. If there is not sufficient excess capacity, the additional cost is relevant.

3. Apply tactical decision-making concepts in a variety of business situations.
Several examples illustrating the application of the relevant costing model were given within the chapter. Applications were illustrated for make-or-buy decisions, keep-or-drop decisions, special-order decisions, and sell-or-process-further decisions. Product mix decisions were also discussed. The list of applications is by no means exhaustive but was given to illustrate the scope and power of relevant costing analysis.

4. Choose the optimal product mix when faced with one constrained resource.
In dealing with a resource constraint, it is important to phrase the product contribution margin in terms of contribution margin per unit of constrained resource.

5. Explain the impact of cost on pricing decisions.
Costs are important inputs into the pricing decision. Cost-based pricing uses a markup based on a subset of costs. Target costing works backward from a price acceptable to consumers to find the cost necessary to manufacture the product. The Robinson-Patman Act permits cost data to be used as an absolute defense in price discrimination cases.

6. Appendix: Use linear programming to find the optimal solution to a problem of multiple constrained resources.
Linear programming is a method that locates the optimal solution in a set of feasible solutions. The graphical method may be used with two products. When more than two products are involved, the simplex method is used.

Key Terms

Committed resources, 523
Constraint set, 540
Constraints, 533
Decision model, 517
Dumping, 538
Feasible set of solutions, 540
Feasible solution, 540
Flexible resources, 522
Joint products, 531
Keep-or-drop decisions, 526
Linear programming, 539
Make-or-buy decisions, 525
Markup, 534
Objective function, 540
Optimal solution, 540
Predatory pricing, 537
Price discrimination, 538
Price gouging, 539
Relevant costs, 520
Sell or process further, 531
Simplex method, 542
Special-order decisions, 530
Split-off point, 531
Strategic decision making, 516
Sunk cost, 520
Tactical decision making, 516
Target costing, 536

Review Problem

Special-Order Decision

Rianne Company produces a light fixture with the following unit cost:

Direct materials	$2
Direct labor	1
Variable overhead	3
Fixed overhead	2
Unit cost	$8

The production capacity is 300,000 units per year. Because of a depressed housing market, the company expects to produce only 180,000 fixtures for the coming year. The company also has fixed selling costs totaling $500,000 per year and variable selling costs of $1 per unit sold. The fixtures normally sell for $12 each.

At the beginning of the year, a customer from a geographic region outside the area normally served by the company offered to buy 100,000 fixtures for $7 each. The customer also offered to pay all transportation costs. Since there would be no sales commissions involved, this order would not have any variable selling costs.

Required

Should the company accept the order? Provide both qualitative and quantitative justification for your decision. Assume that no other orders are expected beyond the regular business and the special order.

Solution

The company is faced with a problem of idle capacity. Accepting the special order would bring production up to near capacity. Two options are available: accept or reject the order. If the order is accepted, then the company could avoid laying off employees and would enhance and maintain its community image. However, the order is considerably below the normal selling price of $12. Because the price is so low, the company needs to assess the potential impact of the sale on its regular customers and on the profitability of the firm. Considering the fact that the customer is located in a region not usually served by the company, the likelihood of an adverse impact on regular business is not high. Thus, the qualitative factors seem to favor acceptance.

The only remaining consideration is the profitability of the special order. To assess profitability, the firm should identify the relevant costs and benefits of each alternative. This analysis is as follows:

	Accept	Reject
Revenues	$ 700,000	$—
Direct materials	(200,000)	—
Direct labor	(100,000)	—
Variable overhead	(300,000)	—
Total benefits	$ 100,000	$ 0

Accepting the order would increase profits by $100,000. (The fixed overhead and selling costs are all irrelevant since they are the same across both alternatives.) *Conclusion:* The order should be accepted since both qualitative and quantitative factors favor it.

Questions for Writing and Discussion

1. What is the difference between tactical and strategic decisions?
2. Explain why depreciation on an existing asset is always irrelevant.
3. Give an example of a future cost that is not relevant.
4. Explain why relevant costs need to be expressed on a periodically recurring basis.
5. Relevant costs always determine which alternative should be chosen. Do you agree or disagree? Explain.
6. Give an example of a fixed cost that is relevant.
7. What is the difference, if any, between a relevant cost and a differential cost?
8. When, if ever, is depreciation a relevant cost?
9. What role do past costs play in relevant costing decisions?
10. Can direct materials ever be irrelevant in a make-or-buy decision? Explain.
11. Discuss the importance of complementary effects in a keep-or-drop decision.
12. What are some ways a manager can expand his or her knowledge of the feasible set of alternatives?
13. Should joint costs be considered in a sell-or-process-further decision? Explain.
14. Suppose that a product can be sold at split-off for $5,000 or processed further at a cost of $1,000 and then sold for $6,400. Should the product be processed further?
15. Why are fixed costs never relevant in a product mix decision?
16. Suppose that a firm produces two products. Should the firm always place the most emphasis on the product with the largest contribution margin per unit? Explain.
17. Why would a firm ever offer a price on a product that is below its full cost?
18. When can a firm legally offer different prices for the same product?
19. Discuss the purpose of linear programming.
20. What is an objective function? A constraint? A constraint set?
21. What is a feasible solution? A feasible set of solutions?
22. Explain the procedures for graphically solving a linear programming problem. What solution method is usually used when the problem includes more than two or three products?

Exercises

12-1

Model for Making Tactical Decisions
LO1

The model for making tactical decisions that was described in your text has six steps. These steps are listed, out of order, below. Put the steps in the correct order, starting with the step that should be taken first.

A. Select the alternative with the greatest overall benefit.
B. Identify the costs and benefits associated with each feasible alternative.
C. Assess qualitative factors.
D. Recognize and define the problem.

E. Identify alternatives as possible solutions to the problem.
F. Total the relevant costs and benefits for each alternative.

12-2

Flexible versus Committed Resources
LO2

Consider each of the following independent situations.

A. The Purchasing Department has five purchasing agents that work full time and are paid a salary of $35,000 per year. Each purchase order takes about 90 minutes, and requires approximately $5 of forms and supplies. Each order also requires, on average, about 45 minutes of telephone or Internet time to check with potential suppliers. The company pays a flat monthly rate for telephone and Internet services. The depreciation on office equipment for the Purchasing Department is $3,000 per month.
B. El Munchies, a taco stand near the college, hires counter staff at the rate of $7.50 per hour. Each staff member knows that the hours vary each week depending on the amount of business that El Munchies expects. Food is purchased from a restaurant supplier on an "as needed" basis; there is about 4 days of perishable goods inventory on hand, and a month's worth of nonperishable goods (e.g., napkins, paper cups) in inventory. Utilities are paid on a monthly basis for the previous month's usage. El Munchies has a three-year lease on the building and parking lot. Each month, the restaurant buys newspaper and radio advertising for the coming month.
C. Jared Benning runs a lawn mowing service during the summers to help pay for his college expenses. Jared bought a power mower (it runs on gasoline and must have its oil changed monthly due to the volume of lawns mowed) and a gas-powered weed eater for trimming along the edges. Jared buys a season's worth of lawn mower oil at the beginning of summer because he can get a discount if he buys in bulk. From time to time, Jared has a commitment elsewhere. When that happens, a friend of his mows the yards that day; he and the friend have agree on a per yard fee for this. Jared owns a used pickup truck and uses it to haul his equipment from job to job.

Required

Classify the resources in each of the above situations as flexible or committed. If the resource is committed, determine whether it is committed for the short term or committed for multiple periods.

12-3

Make-or-Buy Decision
LO3

Chesbrough, Inc., makes many of the components of its main product in-house. Recently, Berham Electronics offered to supply one component, K-25, at a price of $6.50 each. Chesbrough uses 20,000 units of component K-25 each year. The absorption cost per unit of this component is as follows:

Direct materials	$2.95
Direct labor	0.40
Variable overhead	1.80
Fixed overhead	4.00
Total	$9.15

The fixed overhead is an allocated expense; none of it would be eliminated if production of component K-25 stopped.

Required

1. What are the alternatives facing Chesbrough, Inc., with respect to production of component K-25?
2. List the relevant costs for each alternative. Suppose that Chesbrough, Inc., purchases K-25 from Berham Electronics. By how much will operating income increase or decrease?

12-4

Make-or-Buy Decision
LO3

Refer to **Exercise 12-3**. Now suppose that $1.85 of the fixed overhead for component K-25 is the cost of leasing special equipment used to make K-25. If production of K-25 stops, then the leased machinery can be returned immediately at no further cost.

Required

1. What are the relevant costs for each alternative?
2. If Chesbrough, Inc., purchases K-25 from Berham Electronics, by how much will operating income increase or decrease?

12-5

Keep-or-Drop Decision
LO3

Garringer Company makes two products, regulars and seasonals. Information on costs associated with each product line is as follows:

	Regulars	Seasonals
Sales revenue	$135,000	$15,000
Less: Variable expenses	50,000	8,600
Contribution margin	$ 85,000	$ 6,400
Less:		
Direct fixed expenses	3,000	1,200
Common fixed expenses	54,000	6,000
Operating income	$ 28,000	$ (800)

The direct fixed expenses are advertising and selling costs that are incurred by the particular product line. The common fixed expenses are allocated to the two product lines on the basis of sales revenue. Total common fixed expenses would not change if a product line were dropped.

Required

1. Develop a segmented income statement, by product and in total for Garringer Company. Be sure to show the segment margin for each product.
2. By how much would operating income increase or decrease if the seasonals were dropped?

12-6

Keep-or-Drop Decision
LO3

Yavapei Company produces three products: A, B, and C. A segmented income statement, with amounts given in thousands, follows:

	A	B	C	Total
Sales revenue	$1,800	$1,600	$210	$ 3,610
Less: Variable expenses	1,350	1,000	140	2,490
Contribution margin	$ 450	$ 600	$ 70	$1,120
Less: Direct fixed expenses	150	300	80	530
Segment margin	$ 300	$ 600	$(10)	$ 590
Less: Common fixed expenses				340
Operating income				$ 250

Direct fixed expenses include depreciation on equipment dedicated to the product lines of $20,000 for A, $120,000 for B, and $25,000 for C. None of the product line equipment can be sold, and would have to be disposed of if the product line were dropped.

Required

1. What impact on profit would result from dropping Product C?
2. Suppose that 10 percent of the customers for Product B choose to buy from Yavapei because it offers a full range of products, including Product C. If C were

no longer available from Yavapei, these customers would go elsewhere to purchase B. Now what is the impact on profit if Product C is dropped?

12-7

Special-Order Decision; Flexible and Committed Resources
LO2, LO3

Thomson Company has been approached by a new customer with an offer to purchase 34,000 units of Thomson's product at a price of $24 each. The new customer is geographically separated from Thomson's other customers, and there would be no effect on existing sales. Thomson normally produces 400,000 units but plans to produce and sell only 360,000 in the coming year. The normal sales price is $30 per unit. Unit cost information is as follows:

Direct materials	$ 8.00
Direct labor	10.00
Variable overhead	4.00
Fixed overhead	3.40
Total	$25.40

If Thomson accepts the order, no fixed manufacturing activities will be affected because there is sufficient excess capacity.

Required

1. Should Thomson accept the special order? By how much will profit increase or decrease if the order is accepted?
2. Suppose that Thomson's distribution center at the warehouse is operating at full capacity and would need to add capacity costing $6,000 for every 5,000 units to be packed and shipped. Should Thomson accept the special order? By how much will profit increase or decrease if the order is accepted?

12-8

Special-Order Decision
LO2, LO3

After several years producing and selling at capacity (50,000 units), Melton Company faced a year with projected sales and production of 38,000 units. A potential customer offered to purchase 7,000 units at a price of $18 each. The normal sales price is $30 each. Unit cost information is as follows:

Direct materials	$ 9.00
Direct labor	6.50
Variable overhead	2.00
Fixed overhead	3.75
Total	$21.25

Melton also pays a sales commission of $1.75. The commission would have to be paid on this order.

Required

1. Should Melton accept the special order? By how much will profit increase or decrease if the order is accepted?
2. Suppose that Melton does not have to pay the sales commission on the special order. Should Melton accept the special order? By how much will profit increase or decrease if the order is accepted?

12-9

Sell or Process Further; Basic Analysis
LO1, LO2, LO3

Danelle, Inc., produces four products (Alpha, Beta, Gamma, and Delta) from a common input. The joint costs for a typical quarter follow:

Direct materials	$128,000
Direct labor	56,000
Overhead	80,000

The revenues from each product are as follows: Alpha, $130,000; Beta, $93,000; Gamma, $30,000; and Delta, $40,000.

Management is considering processing Delta beyond the split-off point, which would increase the sales value of Delta to $73,700. However, to process Delta further means that the company must rent some special equipment costing $15,400 per quarter. Additional materials and labor also needed would cost $8,500 per quarter.

Required

1. What is the operating profit earned by the four products for one quarter?
2. Should the division process Product Delta further or sell it at split-off? What is the effect of the decision on quarterly operating profit?

12-10

Product Mix Decision; Single Constraint
LO4

Norton Company produces two products (Juno and Hera) that use the same material input. Juno uses two pounds of the material for every unit produced, and Hera uses five pounds. Currently, Norton has 16,000 pounds of the material in inventory. All of the material is imported. For the coming year, Norton plans to import an additional 8,000 pounds to produce 2,000 units of Juno and 4,000 units of Hera. The unit contribution margin is $30 for Juno and $60 for Hera.

Norton Company has received word that the source of the material has been shut down by embargo. Consequently, the company will not be able to import the 8,000 pounds it planned to use in the coming year's production. No other source of the material exists.

Required

1. Compute the total contribution margin that the company would earn if it could manufacture 2,000 units of Juno and 4,000 units of Hera.
2. Determine the optimal usage of the company's inventory of 16,000 pounds of the material. Compute the total contribution margin for the product mix that you recommend.

12-11

Product Mix Decision; Single Constraint
LO4

Sealing Company manufactures three types of floppy disk storage units. Each of the three types requires the use of a special machine that has a total operating capacity of 15,000 hours per year. Information on the three types of storage units is as follows:

	Basic	Standard	Deluxe
Selling price	$9.00	$30.00	$35.00
Variable cost	$6.00	$20.00	$10.00
Machine hours required	0.10	0.50	0.75

Sealing Company's marketing director has assessed demand for the three types of storage units and believes that the firm can sell as many units as it can produce.

Required

1. How many of each type of unit should be produced and sold to maximize the company's contribution margin? What is the total contribution margin for your selection?
2. Now, suppose that Sealing Company believes that it can sell no more than 12,000 of the deluxe model but up to 50,000 each of the basic and standard models at the selling prices estimated. What product mix would you recommend, and what would the total contribution margin be?

12-12

Cost-Based Pricing Decision
LO5

Colin Silverman, owner of Silverman Cabinets, Inc., is preparing a bid on a job that requires $800 of direct materials, $1,600 of direct labor, and $3,200 of overhead. Colin normally applies a standard markup based on cost of goods sold to arrive at an initial bid price. He then adjusts the price as necessary in light of other factors (for example, competitive pressure). Last year's income statement is as follows:

Sales	$206,349
Cost of goods sold	144,300
Gross margin	$ 62,049
Selling and administrative expenses	46,300
Operating income	$ 15,749

Required

1. Calculate the markup Colin will use.
2. What is Colin's initial bid price?

12-13

Cost-Based Pricing Decision
LO5

Last year, Bagger Company had sales revenue of $1,250,000, direct materials of $240,000, direct labor of $310,700, and overhead of $449,300. Bagger calculates sales price using a markup on cost of goods sold.

Required

1. Calculate the markup Bagger will use.
2. If a job has manufacturing cost of $43,000, what is Bagger's price?

12-14

Product Mix Decision with One Constrained Resource
LO4

Orly Company produces two models of an industrial product that require the use of a laser-operated drilling machine. The laser-operated drilling machines owned by the firm provide a total of 12,000 hours per year. Model A-4 requires six hours of machine time, and Model M-3 requires three hours of machine time. Model A-4 has a contribution margin of $24 per unit, and Model M-3 has a contribution margin of $15.

Required

1. Calculate the optimal number of units of each model that should be produced, assuming that an unlimited number of each model can be sold.
2. Calculate the optimal number of units of each model that should be produced, assuming that no more than 2,500 units of each model can be sold.

12-15

Product Mix Decision with One Constrained Resource
LO4

O'Connor Company produces two models of machine housings that require the use of a special lathe. The six lathes owned by the firm provide a total of 12,000 hours per year. Model 14-D requires four hours of machine time, and Model 33-P requires two hours of machine time. Model 14-D has a contribution margin of $12 per unit, and Model 33-P has a contribution margin of $10.

Required

1. Calculate the optimal number of units of each model that should be produced, assuming that an unlimited number of each model can be sold.
2. Calculate the optimal number of units of each model that should be produced, assuming that no more than 5,000 units of each model can be sold.

12-16

Appendix: Linear Programming Decision
LO6

Refer to **Exercise 12-15**. Assume that no more than 2,000 units of Model 14-D can be sold and that no more than 5,000 units of Model 33-P can be sold.

Required

1. Formulate the linear programming problem faced by O'Connor Company. To do so, you must derive mathematical expressions for the objective function and for the lathe constraints.
2. Solve the linear programming problem using the graphical approach.
3. Compute the total contribution margin produced by the optimal mix developed in Requirement 2.

12-17

Appendix: Product Mix; Multiple Constraints
LO6

Zanbrow Company produces two products that use the same material input. Product A uses two pounds of the material for every unit produced, and Product B uses five pounds. Currently, Zanbrow has 6,000 pounds of the material in inventory and will not be able to obtain more for the coming year. The maximum demand (sales) for A is estimated at 1,000 units, and for B it is estimated at 2,000 units. The detail of each product's unit contribution margin follows:

	Product A	Product B
Selling price	$81	$139
Less variable expenses:		
Direct materials	(20)	(50)
Direct labor	(21)	(14)
Variable overhead	(10)	(15)
Contribution margin	$30	$60

Assume that Product A uses three direct labor hours for every unit produced and that Product B uses two hours. A total of 6,000 direct labor hours is available for the coming year.

Required

1. Formulate the linear programming problem faced by Zanbrow Company. To do so, you must derive mathematical expressions for the objective function and for the material and labor constraints.
2. Solve the linear programming problem using the graphical approach.
3. Compute the total contribution margin produced by the optimal mix developed in Requirement 2.

12-18

Keep-or-Buy Decision; Sunk Costs
LO1, LO3

Heath Wilburt purchased a previously owned, two-year-old Chevrolet Silverado short-bed pickup truck for $10,200. Since purchasing the car, he has spent the following amounts on parts and labor:

New stereo system	$1,200
Trick paint	400
New tires	800
Total	$2,400

Unfortunately, the new stereo doesn't completely drown out the sounds of a grinding transmission. Apparently, the Silverado needs a considerable amount of work to make it reliable transportation. Heath estimates that the needed repairs include the following:

Transmission overhaul	$2,400
Water pump	400
Master cylinder work	1,700
Total	$4,500

In a visit to a used car dealer, Heath has found a one-year-old Dodge Ram pickup truck in mint condition for $12,300. Heath has advertised and found that he can sell the Silverado for only $9,400, and that is assuming that the truck still runs with its engine problems. If he buys the Dodge Ram, he will pay cash, but he would need to sell the Silverado.

Required

1. In trying to decide whether to restore the Silverado or buy the Dodge Ram, Heath is distressed because he already has spent $12,600 on the Silverado. The investment seems too much to give up. How would you react to his concern?

2. Assuming that Heath would be equally happy with the Silverado or the Dodge Ram, should he buy the newer pickup, or should he restore the Silverado?

12-19

Make-or-Buy Decision
LO1, LO2, LO3

Sherwood Company is currently manufacturing part Z911, producing 40,000 units annually. The part is used in the production of several products made by Sherwood. The cost per unit for Z911 is as follows:

Direct materials	$ 9.00
Direct labor	3.00
Variable overhead	2.50
Fixed overhead	4.00
Total	$18.50

Of the total fixed overhead assigned to Z911, $88,000 is direct fixed overhead (the lease of production machinery and salary of a production line supervisor—neither of which will be needed if the line is dropped). The remaining fixed overhead is common fixed overhead. An outside supplier has offered to sell the part to Sherwood for $16. There is no alternative use for the facilities currently used to produce the part.

Required

1. Should Sherwood Company make or buy part Z911?
2. What is the most Sherwood would be willing to pay an outside supplier?
3. If Sherwood bought the part, by how much would income increase or decrease?

12-20

Make-or-Buy Decision
LO1, LO2, LO3

Refer to **Exercise 12-19**. Now suppose that all of the fixed overhead is common fixed overhead.

Required

1. Should Sherwood Company make or buy part Z911?
2. What is the most Sherwood would be willing to pay an outside supplier?
3. If Sherwood bought the part, by how much would income increase or decrease?

Problems

12-21

Model for Making Tactical Decisions
LO1

Austin Porter is a sophomore at a small Midwestern university—SMWU. He is considering whether or not to continue at this university or to transfer to one with a nationally recognized engineering program. Austin's decision-making process included the following:

A. He surfed the Internet to check out the sites of a number of colleges and universities with engineering programs.
B. Austin wrote to five of the universities to obtain information on their engineering colleges, tuition and room and board costs, likelihood of his being accepted, and so on.
C. Austin compared costs of the five other schools to the cost of his present school. He totaled the balance in his checking and savings accounts, estimated the earnings from his work-study job, and asked his parents whether or not they would be able to help him out.
D. Austin's high-school sweetheart had a long heart-to-heart talk with him about their future—specifically, that there might be no future if he left town.
E. Austin thought that while he enjoyed his present college, its engineering program did not have the national reputation that would enable him to get a good job on

either the East or West coast. Working for a large company on the coast was an important dream of his.

F. Austin's major advisor agreed that a school with a national reputation would make job hunting easier. However, he reminded Austin that small-college graduates had occasionally gotten the kind of jobs Austin wanted.
G. Austin had a number of good friends at the small college, and they were encouraging him to stay.
H. A friend of Austin's from high school returned for a long weekend. She went to a prestigious university and told Austin of the fun and opportunities available at her school. She encouraged Austin to check out the possibilities elsewhere.
I. A friendly professor outside of Austin's major area ran into him at the student union. She listened to his thinking and reminded him that a degree from a small college would easily get him into a good graduate program. Perhaps he ought to consider postponing the job hunt until a master's degree was in hand.
J. Two of the three prestigious universities accepted Austin and offered him financial aid. The third one rejected his application.
K. Austin made his decision.

Required

Classify the above events as one of the six steps of the model for making tactical decisions described in your text.

12-22

Make-or–Buy Decision; Qualitative Considerations
LO2, LO3

Powell Dentistry Services operates in a large metropolitan area. Currently, Powell has its own dental laboratory to produce porcelain and gold crowns. The unit costs to produce the crowns are as follows:

	Porcelain	Gold
Direct materials	$ 80	$165
Direct labor	27	27
Variable overhead	8	8
Fixed overhead	22	22
Total	$137	$222

Fixed overhead is detailed as follows:

Salary (supervisor)	$26,000
Depreciation	5,000
Rent (lab facility)	32,000

Overhead is applied on the basis of direct labor hours. These rates were computed using 5,500 direct labor hours.

A local dental laboratory has offered to supply Powell all the crowns it needs. Its price is $130 for porcelain crowns and $200 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 Powell's laboratory would be scrapped (it is old and has no market value), and the lab facility would be closed. Powell uses 3,000 porcelain crowns and 800 gold crowns per year.

Required

1. Should Powell 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 Powell consider in making this decision?
3. Suppose that the lab facility is owned rather than rented and that the $32,000 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 used is 4,000 porcelain and 600 gold. Should Powell make or buy the crowns? Explain the outcome.

12-23

Sell or Process Further
LO3

Primack Pharmaceutical Corporation buys three chemicals that are processed to produce two types of analgesics used as ingredients for popular over-the-counter drugs. The purchased chemicals are blended for two to three hours and then heated for 15 minutes. The results of the process are two separate analgesics, rhinime and stercol, which are sent to a drying room until their moisture content is reduced to 6 to 8 percent. For every 1,300 pounds of chemicals used, 600 pounds of rhinime and 600 pounds of stercol are produced. After drying, rhinime and stercol are sold to companies that process them into their final form. The selling prices are $15 per pound for rhinime and $37 per pound for stercol. The costs to produce 600 pounds of each analgesic are as follows:

Chemicals	$9,360
Direct labor	8,200
Overhead	19,900

The analgesics are packaged in 20-pound bags and shipped. The cost of each bag is $1.30. Shipping costs $0.15 per pound.

Primack could process rhinime further by grinding it into a fine powder and then molding the powder into tablets. The tablets can be sold directly to retail drug stores as a generic brand. If this route is taken, the revenue received per bottle of tablets would be $5.00, with 10 bottles produced from every pound of rhinime. The costs of grinding and tableting total $2.50 per pound of rhinime. Bottles cost $0.50 each. Bottles are shipped in boxes that hold 25 at a shipping cost of $1.70 per box.

Required

1. Should Primack sell rhinime at split-off, or should rhinime be processed and sold as tablets?
2. If Primack normally sells 265,000 pounds of rhinime per year, what will be the difference in profits if rhinime is processed further?

12-24

Keep-or-Drop Decision
LO3

AudioMart is a retailer of radios, stereos, and televisions. The store carries two portable sound systems that have radios, tape players, and speakers. System A, of slightly higher quality than System B, costs $20 more. With rare exceptions, the store also sells a headset when a system is sold. The headset can be used with either system. Variable-costing income statements for the three products follow:

	System A	System B	Headset
Sales	$45,000	$ 32,500	$8,000
Less: Variable expenses	20,000	25,500	3,200
Contribution margin	$25,000	$ 7,000	$4,800
Less: Fixed costs*	10,000	18,000	2,700
Operating income	$15,000	$(11,000)	$2,100

* This includes common fixed costs totaling $18,000, allocated to each product in proportion to its revenues.

The owner of the store is concerned about the profit performance of System B and is considering dropping it. If the product is dropped, sales of System A will increase by 30 percent, and sales of headsets will drop by 25 percent.

Required

1. Prepare segmented income statements for the three products using a better format.
2. Prepare segmented income statements for System A and the headsets assuming that System B is dropped. Should B be dropped?

3. Suppose that a third system, System C, with a similar quality to System B, could be acquired. Assume that with C the sales of A would remain unchanged; however, C would produce only 80 percent of the revenues of B, and sales of the headsets would drop by 10 percent. The contribution margin ratio of C is 50 percent, and its direct fixed costs would be identical to those of B. Should System B be dropped and replaced with System C?

12-25

Accept or Reject a Special Order
LO2, LO3

Steve Murningham, manager of an electronics division, was considering an offer by Pat Sellers, manager of a sister division. Pat's division was operating below capacity and had just been given an opportunity to produce 8,000 units of one of its products for a customer in a market not normally served. The opportunity involves a product that uses an electrical component produced by Steve's division. Each unit that Pat's department produces requires two of the components. However, the price the customer is willing to pay is well below the price usually charged; to make a reasonable profit on the order, Pat needs a price concession from Steve's division. Pat had offered to pay full manufacturing cost for the parts. So that Steve would know that everything was aboveboard, Pat had supplied the following unit-cost and price information concerning the special order, excluding the cost of the electrical component:

Selling price	$ 32
Less costs:	
Direct materials	(17)
Direct labor	(7)
Variable overhead	(2)
Fixed overhead	(3)
Operating profit	$ 3

The normal selling price of the electrical component is $2.30 per unit. Its full manufacturing cost is $1.85 ($1.05 variable and $0.80 fixed). Pat had argued that paying $2.30 per component would wipe out the operating profit and result in her division showing a loss. Steve was interested in the offer because his division was also operating below capacity (the order would not use all the excess capacity).

Required

1. Should Steve accept the order at a selling price of $1.85 per unit? By how much will his division's profits be changed if the order is accepted? By how much will the profits of Pat's division change if Steve agrees to supply the part at full cost?
2. Suppose that Steve offers to supply the component at $2. In offering the price, Steve says that it is a firm offer not subject to negotiation. Should Pat accept this price and produce the special order? If Pat accepts the price, what is the change in profits for Steve's division?
3. Assume that Steve's division is operating at full capacity and that Steve refuses to supply the part for less than the full price. Should Pat still accept the special order? Explain.

12-26

Keep or Drop a Division
LO2, LO3

Jan Shumard, president and general manager of Danbury Company, was concerned about the future of one of the company's largest divisions. The division's most recent quarterly income statement follows:

Sales	$3,751,500
Less: Cost of goods sold	2,722,400
Gross profit	$1,029,100
Less: Selling and administrative expenses	1,100,000
Operating (loss)	$ (70,900)

Jan is giving serious consideration to shutting down the division since this is the ninth consecutive quarter that it has shown a loss. To help him in his decision, the following additional information has been gathered:

- The division produces one product at a selling price of $100 to outside parties.
- The division sells 50 percent of its output to another division within the company for $83 per unit (full manufacturing cost plus 25 percent). The internal price is set by company policy. If the division is shut down, the user division would buy the part externally for $100 per unit.
- The fixed overhead assigned per unit is $20.
- There is no alternative use for the facilities if shut down. The facilities and equipment would be sold and the proceeds invested to produce an annuity of $100,000 per year.
- Of the fixed selling and administrative expenses, 30 percent represent allocated expenses from corporate headquarters.
- Variable selling expenses are $5 per unit sold for units sold externally. These expenses are avoided for internal sales. No variable administrative expenses are incurred.

Required

1. Prepare an income statement that more accurately reflects the division's profit performance.
2. Should the president shut down the division? What would be the effect on the company's profits if the division was closed?

12-27

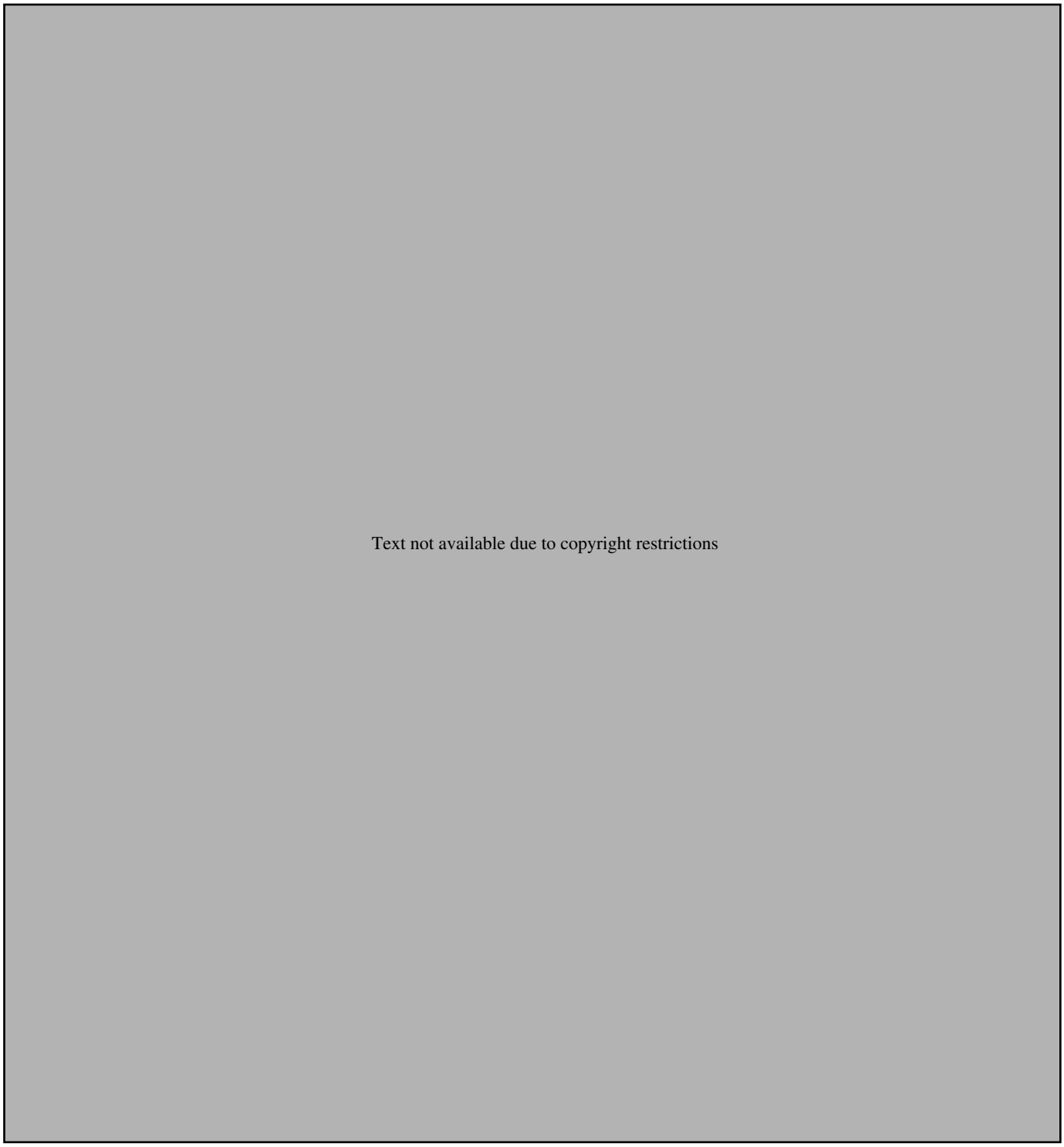
Appendix: Product Mix Decision; Single and Multiple Constraints; Basics of Linear Programming
LO4, LO6

Paper Products, Inc., produces table napkins and facial tissues. The manufacturing process is highly mechanized; both products are produced by the same machinery by using different settings. For the coming period, 200,000 machine hours are available. Management is trying to decide on the quantities of each product to produce. The following data are available (for napkins, one unit is one package of napkins; for facial tissues, one unit is one box of tissues):

	Napkins	Tissues
Machine hours per unit	1.00	0.50
Unit selling price	$2.50	$3.00
Unit variable cost	$1.50	$2.25

Required

1. Determine the units of each product that should be produced in order to maximize profits.
2. Because of market conditions, the company can sell no more than 150,000 packages of napkins and 300,000 boxes of facial tissues. Do the following:
   a. Formulate the problem as a linear programming problem.
   b. Determine the optimal mix using a graph.
   c. Compute the maximum profit given the optimal mix.



12-29

Make-or-Buy Decision
LO2, LO3

Henderson Company produces two products, A and B. The segmented income statement for a typical quarter follows:

	Product A	Product B	Total
Sales	$150,000	$80,000	$230,000
Less: Variable expenses	80,000	46,000	126,000
Contribution margin	$ 70,000	$34,000	$104,000
Less: Direct fixed expenses*	20,000	38,000	58,000
Segment margin	$ 50,000	$(4,000)	$ 46,000
Less: Common fixed expenses			30,000
Operating income			$ 16,000

* Includes depreciation.

Product A 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. Henderson is considering making the subassembly rather than buying it. Unit variable manufacturing costs are as follows:

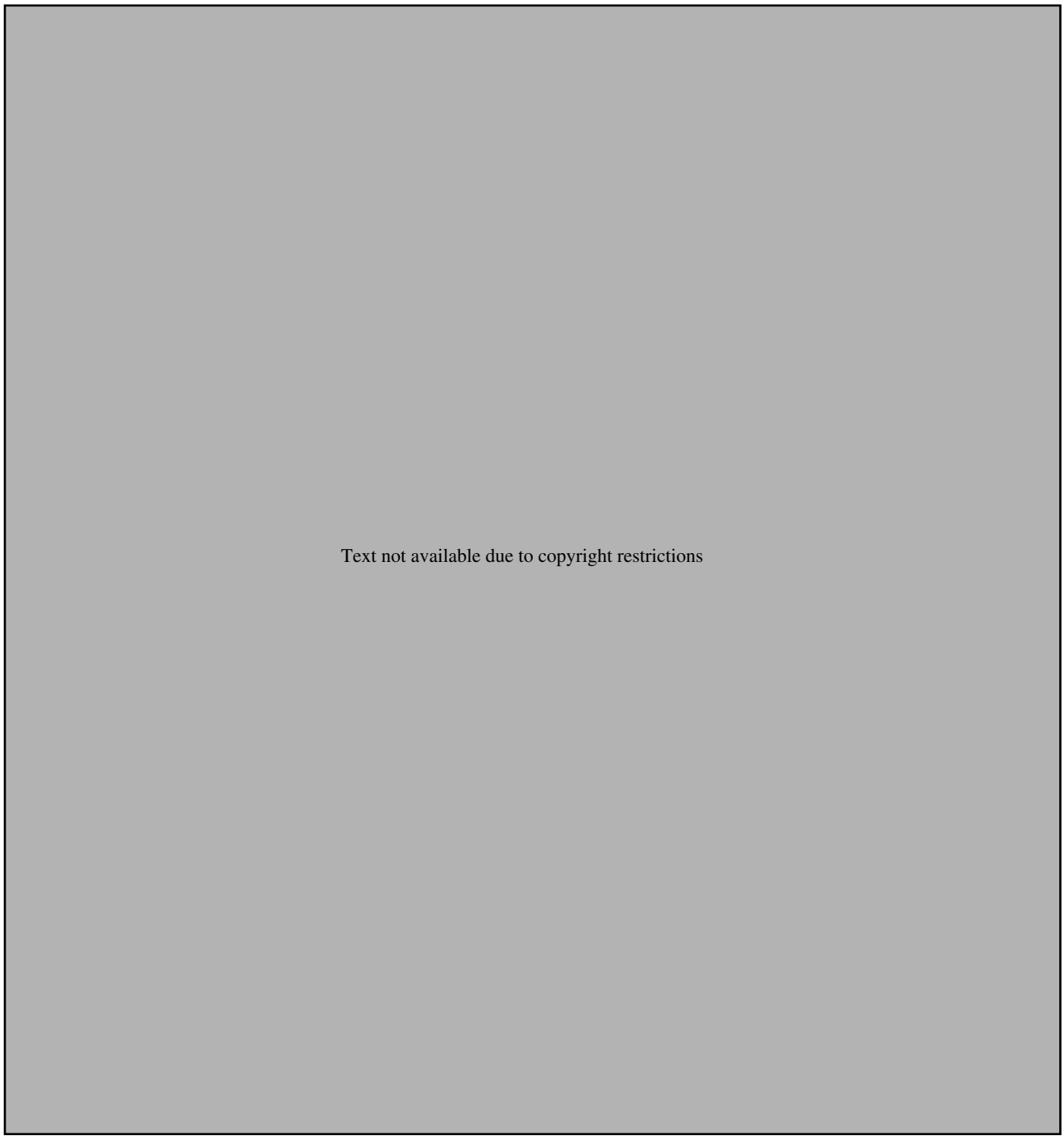
Direct materials	$2
Direct labor	3
Variable overhead	2

Two alternatives exist to supply the productive capacity:

1. 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. No other fixed expenses are incurred.
2. Drop Product B. 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 Product B is dropped, the sales of Product A will not be affected.

Required

1. Should Henderson Company make or buy the subassembly? If it makes the subassembly, which alternative should be chosen? Explain and provide supporting computations.
2. Suppose that dropping B will decrease sales of A by 6 percent. What effect does this have on the decision?
3. Assume that dropping B decreases sales of A by 6 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?



Managerial Decision Cases

12-31

Make-or-Buy Decision: Ethical Considerations
LO1, LO2, LO3

Pamela McDonald, CMA and controller for Murray Manufacturing, Inc., was having lunch with Roger Branch, manager of the company's Power Department. Over the past six months, Pamela and Roger had developed a romantic relationship and were making plans for marriage. To keep company gossip at a minimum, Pamela and Roger had kept the relationship very quiet, and no one in the company was aware of it.

The topic of the luncheon conversation centered on a decision concerning the company's Power Department that Larry Johnson, president of the company, was about to make.

Pamela: Roger, in our last executive meeting, we were told that a local utility company offered to supply power and quoted a price per kilowatt-hour that they said would hold for the next three years. They even offered to enter into a contractual agreement with us.

Roger: This is news to me. Is the bid price a threat to my area? Can they sell us power cheaper than we make it? And why wasn't I informed about this matter? I should have some input. This burns me. I think I should give Larry a call this afternoon and lodge a strong complaint.

Pamela: Calm down, Roger. The last thing I want you to do is call Larry. Larry made us all promise to keep this whole deal quiet until a decision had been made. He did not want you involved because he wanted to make an unbiased decision. You know that the company is struggling somewhat, and they are looking for ways to save money.

Roger: Yeah, but at my expense? And at the expense of my department's workers? At my age, I doubt that I could find a job that pays as well and has the same benefits. How much of a threat is this offer?

Pamela: Jack Lacy, my assistant controller, prepared an analysis while I was on vacation. It showed that internal production is cheaper than buying, but not by much. Larry asked me to review the findings and submit a final recommendation for next Wednesday's meeting. I've reviewed Jack's analysis, and it's faulty. He overlooked the interactions of your department with other service departments. When these are considered, the analysis is overwhelmingly in favor of purchasing the power. The savings are about $300,000 per year.

Roger: If Larry hears that, my department's gone. Pam, you can't let this happen. I'm three years away from having a vested retirement. And my workers—they have home mortgages, kids in college, families to support. No, it's not right. Pam, just tell him that your assistant's analysis is on target. He'll never know the difference.

Pamela: Roger, what you're suggesting doesn't sound right either. Would it be ethical for me to fail to disclose this information?

Roger: Ethical? Do you think it's right to lay off employees that have been loyal, faithful workers simply to fatten the pockets of the owners of this company? The Murrays already are so rich that they don't know what to do with their money. I think that it's even more unethical to penalize me and my workers. Why should we have to bear the consequences of some bad marketing decisions? Anyway, the effects of those decisions are about gone, and the company should be back to normal within a year or so.

Pamela: You may be right. Perhaps the well-being of you and your workers is more important than saving $300,000 for the Murrays.

Required

1. Should Pamela have told Roger about the impending decision concerning the Power Department? In revealing this information, did Pamela violate any of the ethical standards described in Chapter 1?
2. Should Pamela provide Larry with the correct data concerning the Power Department? Or should she protect its workers? What would you do if you were Pamela?

12-32

Centralize versus Decentralize
LO1, LO2, LO3

Central University, a Midwestern university with approximately 13,000 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 the academic year 2007–2008). 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 for 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 budget 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 program 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 temporary 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. What courses were offered and who staffed them had to be approved by the head of each department. According to the vice president, one of the main contributions of the Continuing Education Department to the evening and off-campus programs is advertising. 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 2007–2008 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.)

	2004–05	2005–06	2006–07	2007–08
Tuition revenues:				
Off-campus	$300	$ 400	$ 400	$ 410
Evening	—[a]	525	907	1,000
Noncredit	135	305	338	375
Total	$435	$1,230	$1,645	$1,785
Operating costs:				
Administration	$132	$ 160	$ 112	$ 112
Off-campus:				
Direct[b]	230	270	270	260
Indirect	350	410	525	440

(continued)

	2004–05	2005–06	2006–07	2007–08
Evening	(—)[a]	220	420	525
Noncredit	135	305	338	375
Total	$ 847	$1,365	$1,665	$1,712
Income (loss)	$(412)	$ (135)	$ (20)	$ 73

[a]In 2004–05, the department had no responsibility for evening courses. Beginning in 2005, it was given the responsibility to pay for any costs of instruction incurred when temporary or 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.
[b]Instructors' 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 Continuing Education 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.

Research Assignments

12-33

Research Assignment
LO1, LO2, LO5

"Dumping" is an accusation that is often made against foreign companies. Japanese automobile companies, for example, have been accused of this practice.

Required

Go to the library and find out the following:

1. What is dumping?
2. Why do international trade agreements usually prohibit dumping? Do you agree that its prohibition is good for the U.S. consumer? Explain.
3. Explain how the relevant costing principles learned in this chapter relate to dumping.
4. Provide several examples of companies accused of dumping. See if you can determine the outcome of an accusation made against one company. Why do you suppose that international companies pursue dumping even though it is prohibited? What are the ethical implications?

12-34

Cybercase
LO1, LO3

Several of the websites for major airlines contain news of current special fares and flights. A decision to run a brief "fare special" is an example of a tactical decision. Check one or more of these websites for recent examples of fare specials and write a brief paper discussing the types of cost and revenue information that would go into making this type of tactical decision.