

## Chapter 2

# Identifying and Estimating Costs and Benefits

**CONCERNED ABOUT LOSING MEMBERS** to Apex, Tom and Lynda want to take steps that will increase Hercules' profit, both immediately and over the long term. They begin by asking current members for suggestions. Some members want to make the gym more "fun" by having contests and prizes. Others would like Hercules to offer more programs and services such as yoga and karate. A few believe that the gym's facilities require major renovation, especially the spa and steam rooms.

You realize that these ideas vary greatly in terms of the resources and effort required to implement them. Organizing a contest might only take a few weeks, and it would have an immediate effect on Hercules' profit. In contrast, a renovation might take months but is likely to influence Hercules' profit for many years. In fact, Tom and Lynda may want to implement both of these suggestions, not just

### **APPLYING THE DECISION FRAMEWORK**

<b>What Is the Problem?</b>	Tom and Lynda want to increase Hercules' profitability, both by attracting new members and by preventing existing members from leaving Hercules for Apex.
<b>What Are the Options?</b>	Members have suggested many ideas, including running contests, offering new classes, and renovating the spa and steam rooms.
<b>What Are the Costs and Benefits?</b>	Tom and Lynda will need to identify, measure, and compare the costs and benefits of each option.
<b>Make the Decision!</b>	Tom and Lynda will select the option(s) that best meet(s) their goal of increasing profitability in both the short term and the long term.

one or the other. To formulate a coordinated response, they need to identify, measure, and compare the costs and benefits of each option in both the short term and the long term.



Alamy

*Tom and Lynda could offer classes in Yoga and/or Karate to respond to the threat posed by Apex.*

## LEARNING OBJECTIVES

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

- 1 Understand how to identify the costs and benefits of decision options.
- 2 Consider how time affects the realization of costs and benefits.
- 3 Explain the principles for estimating costs and benefits.
- 4 Describe the hierarchical nature of costs and its implications for cost measurement.

As you learned in Chapter 1, the primary role of management accounting is to measure the costs and benefits of decision options. This step consists of two tasks—*identifying* the costs and benefits to measure, and then *estimating* the amount of each identified cost and benefit. In this chapter, we focus on the principles that help managers accomplish these two tasks. We begin with the principles, *controllability* and *relevance*, that determine which costs and benefits to measure. Using these principles, we offer a way for grouping business decisions by their horizon—the time span within which an organization reaps the benefits and incurs the costs of a decision. Next, we describe the two key principles for estimating costs and benefits: *variability* and *traceability*. Finally, we extend the principle of variability to develop a hierarchy of costs, which helps to increase the accuracy of estimated costs.



## CHAPTER CONNECTIONS

*In Chapter 3, we discuss the kinds of accounting systems that you will encounter in the workplace. Such systems provide the data for measuring costs and benefits.*

## Knowing What to Measure

### LEARNING OBJECTIVE 1

Understand how to identify the costs and benefits of decision options.

From Chapter 1, we know that the value of a decision option equals the benefits reaped less the costs incurred. The principles of controllability and relevance help us identify these costs and benefits.

### CONTROLLABILITY

By picking an option, a decision maker *chooses* to receive some benefits and incur some costs relative to doing nothing. Conversely, by not picking an option, a decision maker *chooses* to forego the associated benefits but save on the additional costs. Thus, the benefits and costs that arise from the decision maker's choice of a particular option are controllable—the decision maker *controls* the costs that will be incurred and the benefits that will be received.

Because commercial organizations seek to maximize profit, they measure the value of a decision option as the change in profit relative to current profit. Thus, the **controllable benefits** and **controllable costs** for these organizations are the *incremental* revenues and expenditures relative to current revenues and expenditures or status quo.

Consider Tom and Lynda's decision regarding whether to offer yoga. Suppose that offering yoga increases Hercules' instructor salaries from \$8,400 to \$10,000 per month. This incremental amount of \$1,600 for instructor salaries is a controllable cost. Similarly, suppose that offering yoga increases Hercules' membership revenues from \$70,000 to \$75,000 per month. This incremental amount of \$5,000 for membership revenues is a controllable benefit. If these were the only incremental revenues and costs associated with this option, then the value of offering yoga is  $\$5,000 - \$1,600 = \$3,400$  per month.

For this decision, Tom and Lynda do not care about the amounts of many other costs and revenues, such as lease payments and rental revenues. They ignore these *noncontrollable* costs and benefits because the decision to offer yoga does not change them. Focusing on controllable costs and benefits or, equivalently, the costs and benefits incremental to the status quo, allows Tom and Lynda to evaluate each decision option and choose the best one.

In some situations, it is easier for us to consider only *some* of the controllable costs and benefits when making our choice. The principle of relevance, which we discuss next, explains how we could still make the right choice by focusing on select controllable benefits and costs.

### RELEVANCE

Suppose you need a new desktop computer. How would you decide which model to buy? You would probably select several brands to consider and then compare the costs and benefits (features) of each. In making this comparison, it is logical to

ignore those costs and benefits that are common to the options, such as the cost of an external hard drive, even if these costs must be incurred (i.e., they are controllable). You need only focus on controllable costs and benefits that differ. In effect, you are using the principle of relevance. This principle narrows your attention to **relevant costs** and **relevant benefits**, which are the controllable costs and benefits that *differ* across decision options.

The principle of relevance helps decision makers compare options by focusing on those costs and benefits that *matter*, and ignoring items that are *common* and *irrelevant*. Such a focus simplifies the decision-making process. For example, consider Exhibit 2.1, which compares the costs and benefits of two desktop computers, both of which meet your computing needs.

You will have to pay \$1,979 if you choose Brand D and \$2,054 if you choose Brand H. These amounts are the controllable costs of the options. Intuitively, you ignore the benefit derived from using the computer as not relevant to your choice. Why? The reason is that you will get the same benefit from both brands. Thus, you prefer Brand D because its total controllable costs of \$1,979 are \$75 less than those of Brand H.

Indeed, as Exhibit 2.2 shows, we can apply the principle of relevance to simplify the problem further by focusing only on the costs that differ across the two models. We find that the \$75 difference in the relevant costs is the same as the difference in controllable costs. Do you see how Exhibit 2.2 might help you to make your decision more efficiently?



*Buyers focus on key differences when choosing a computer.* (Hafizov Ivan/iStockphoto)

**Exhibit 2.1** *Choosing a Computer by Comparing Controllable Costs*

	Brand D	Brand H
Base configuration (3.08 GHz Intel processor, 1 GB memory, 120GB 5400RPM hard drive, 15" flat panel display, Windows Vista Basic)	\$925	\$875
Upgrade to 19" flat panel display	125	125
Memory upgrade	225	225
100GB External hard drive	169	169
Upgrade to Windows Vista Professional	175	175
Office 2007 Suite	185	185
3-year service agreement	175	300
<b>Total controllable costs</b>	<b>\$1,979</b>	<b>\$2,054</b>

**Exhibit 2.2** *Choosing a Computer by Comparing Relevant Costs*

	Brand D	Brand H
Base configuration	\$925	\$875
3-year service agreement	175	300
<b>Total relevant costs</b>	<b>\$1,100</b>	<b>\$1,175</b>

## COMPARING CONTROLLABILITY AND RELEVANCE

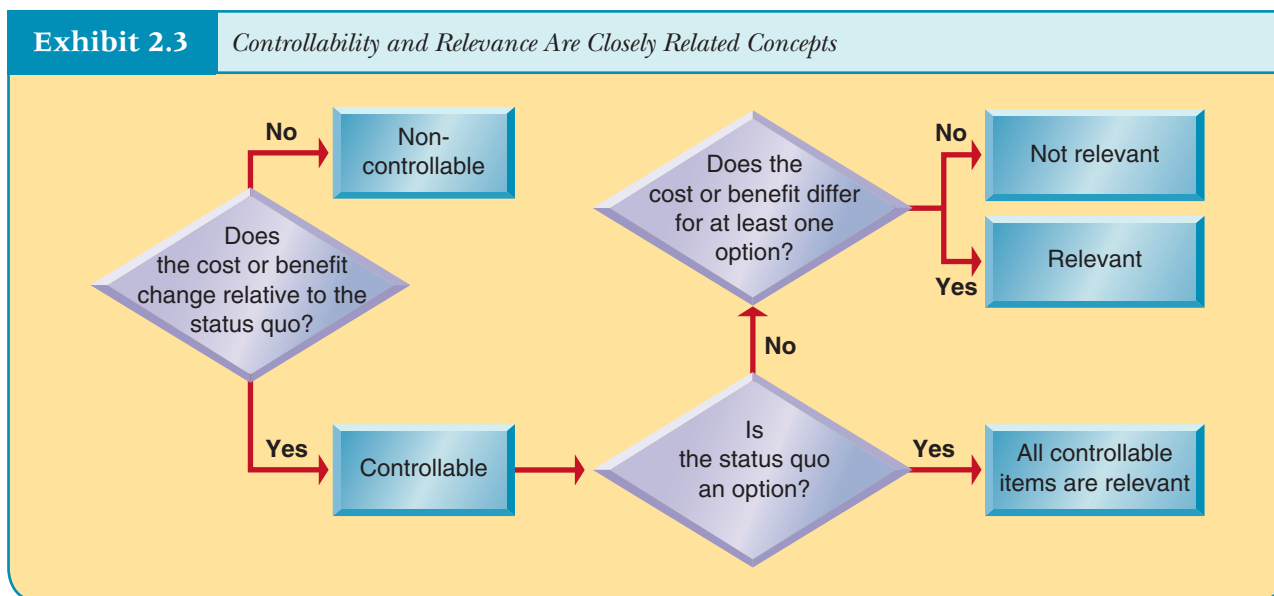
Will applying the concept of relevance always reduce the number of costs and benefits to consider? Not necessarily. As shown in Exhibit 2.3, the answer depends on whether the status quo is an available option. If the status quo is a feasible option, then *all* controllable costs and benefits are relevant because, by definition, they differ from the status quo. Using the concept of relevance therefore does not reduce the number of costs and benefits to consider. However, if the status quo is not a feasible option, then some controllable costs and benefits might not be relevant, letting us ignore them in our analysis.

An example will help clarify this distinction. Suppose Tom and Lynda are deciding among offering yoga, karate, or not offering either class. Furthermore, suppose that the instructor charges \$1,600 per month for either class. The status quo is not to offer either class, as Hercules does not currently offer yoga or karate. In this case, the item “instructor salaries” is a controllable cost because the decision could change Hercules’ salary expenses compared to the status quo. It also is a relevant cost because Hercules would only incur the additional salary expense of \$1,600 for some, but not all, options. Hercules incurs the additional salary expense if it offers either karate or yoga but avoids the cost if it offers neither.

In some situations, the status quo is not a viable option. Suppose that Tom and Lynda are committed to offering yoga or karate, meaning that the status quo is not an option. In this case, the \$1,600 instructor salary is still a controllable cost because Hercules’ salaries change by offering the new class. However, the \$1,600 is not relevant for the choice of which class to offer because it is the same for Hercules’ two options.

As our discussion highlights, we can use either controllability or relevance to make effective decisions. We can use the principle of controllability to identify the incremental costs and benefits relative to the status quo, calculate the value of each option, and choose the one with the highest value. Often, however, we may want to identify the best choice quickly and efficiently; in such cases, relevance is the operative principle. We identify relevant costs and benefits by asking if they differ across the feasible options. Summing relevant costs and benefits associated with each option gives us the *relative* values of the options, enabling us to make the right choice.

Check It! Exercise #1 allows you to sharpen your understanding of relevance and controllability.





## Check It! Exercise #1

After a satisfying lunch, Jason has decided to watch a movie. His choices are to watch a movie at a rundown theater close to his home or the same movie at a brand-new theater 15 miles away. Both theaters have the same ticket price. They also have the same prices for popcorn. Which of the following costs and benefits are controllable for this decision? Which of the following costs and benefits are relevant for watching the movie at the brand-new theater? Indicate your answer by marking a *Yes* or *No* in the appropriate column.

Item	Controllable?	Relevant?
(1) Amount spent for lunch today	_____	_____
(2) Tuition payment due next month	_____	_____
(3) Ticket price for movie	_____	_____
(4) Travel cost to the theater	_____	_____
(5) Utility from theater experience	_____	_____
(6) Amount spent for popcorn at theater	_____	_____

Solution at end of chapter.



## Connecting to Practice

### CONSUMER ELECTRONICS RECYCLING

In Europe, the Waste Electrical and Electronic Equipment (WEEE) Directive requires manufacturers to ensure that electronic products disposed of by consumers are recycled. In 2004, **Hewlett-Packard (HP)** and German electronics retailer **Media-Markt** offered customers the opportunity to return any used or unwanted IT products and receive a discount toward the purchase of any new HP product. More than 2,300 people dropped off equipment for recycling during the week-long program. In addition to these types of “trade-in” programs, HP also provides consumers the opportunity to donate working computer hardware to persons with disabilities, economically disadvantaged persons, and students.

**COMMENTARY:** Some decisions may unavoidably lead to *negative value* because the costs exceed the benefits for all decision options. Such decisions arise when the status quo is not a feasible option, perhaps because of legal or regulatory reasons. In the context of **HP**, numerous options exist for handling a product at the end of its useful life. Almost all of these options have a negative value (in terms of current profit) from the firm’s perspective. Accordingly, **Hewlett-Packard** seeks to minimize its costs of recycling computer and printer hardware, while at the same time maintaining its reputation as a “good global citizen.”

### SUNK COSTS

When identifying costs and benefits, we only focus on *future* revenues and *future* costs. Why? Because the benefits and costs of an option will be realized in the future, and only if we choose the option. The cost of the exercise equipment that Tom and

Lynda installed at Hercules six months ago is a past expenditure, a **sunk cost**, which their decisions today will not affect. Sunk costs do not influence value because we cannot change the past. We define value relative to where we are today, not where we could have been or would like to be. As such, sunk costs are neither controllable nor relevant. Indeed, pharmaceutical companies such as **Baxter Healthcare** and **Novartis** often abandon failed drugs even after investing millions of dollars in research and development. These firms know not to “throw good money after bad” and when to cut their losses.

Sunk costs are never relevant because they pertain to the past. How far into the future must we look to identify controllable costs and benefits? As we discuss next, the nature of the decision influences how far we have to look and, in turn, the number of costs and benefits to consider.

## Time and Controllability

### LEARNING OBJECTIVE 2

Consider how time affects the realization of costs and benefits.

A decision’s horizon significantly influences the controllable costs and benefits we need to consider. Suppose you, a business major, need to choose a History class to fulfill your breadth requirement. For this decision, you might consider only a few items such as the fit with your schedule and the popularity of the class. Limiting the items considered is reasonable because you will incur almost all of the costs and receive the benefits within a few months. In contrast, suppose you are thinking about whether to change your major. You will naturally consider many more factors such as how the choice will affect the set of courses taken the next semester and the change in career prospects. Intuitively, you realize that the latter decision affects costs and benefits over a longer period. Accordingly, you consider more costs and benefits relative to the number when picking a class to fulfill breadth requirements. This same intuition carries over to business decisions, leading managers to distinguish between short- and long-term decisions.

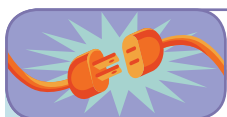
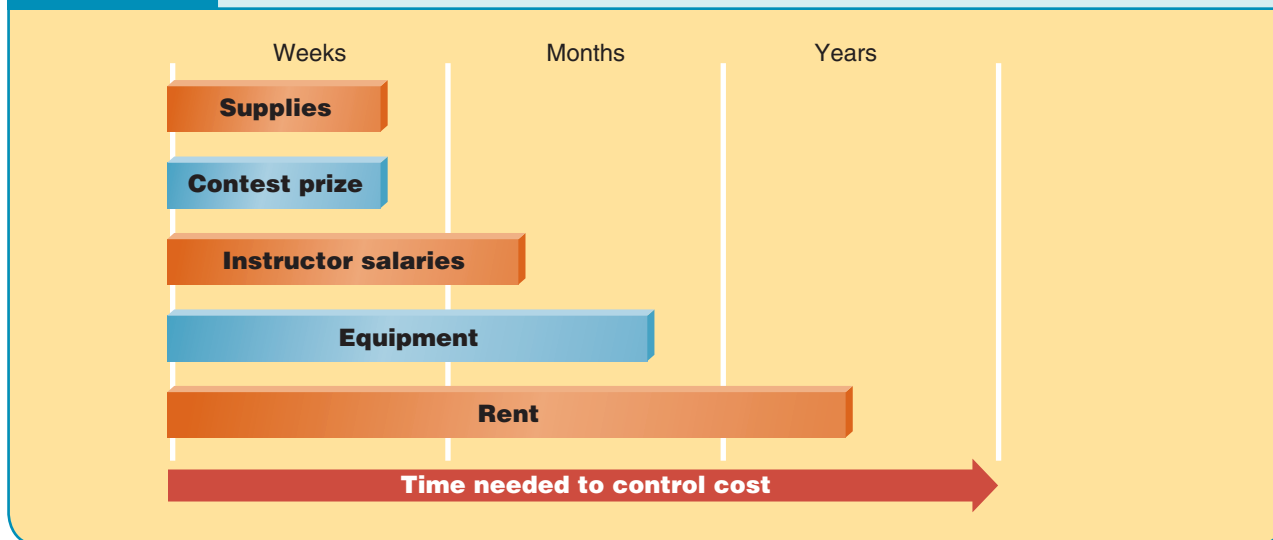
## CATEGORIZING DECISIONS BASED ON TIME

As illustrated in Exhibit 2.4, a decision maker’s control over costs and benefits increases as the time horizon increases. This expansion occurs because previously made commitments and obligations expire with time. For example, Hercules has considerable discretion over expenditures on routine items like towels and cleaning supplies because Tom and Lynda buy these items as needed. Salaries for instructors represent commitments over a longer period because Hercules signs six-month contracts with its instructors. If a decision calls for the immediate replacement of the Pilates instructor, the instructor’s salary is noncontrollable; Hercules needs to honor the six-month contractual commitment even if Tom and Lynda replace the instructor. The cost is controllable, however, for the longer-term decision of whether to offer Pilates next year. In this case, the six-month contract will have expired.

Similarly, Hercules’ lease will expire in five years. This cost is controllable for long-term decisions such as where to locate the gym, but it is not controllable for shorter-term decisions such as which classes to offer.

Whether we are addressing decisions made by Hercules or by **IBM**, it is important to keep the time horizon in mind. The horizon affects whether a cost or benefit is controllable for that decision.

At this point, you might ask what distinguishes short-term decisions from long-term decisions? The answer is, “The ability to change the levels of *capacity resources*

**Exhibit 2.4** *More Costs and Benefits Become Controllable over Time***Connecting to Practice****CONTROLLABLE COSTS  
AND AIRLINE PRICING**

Commercial airlines such as **United** and **Northwest** frequently post flight schedules months in advance of the actual flights. Such commitments trigger a set of costs, including those related to the planes needed to fly the routes and operating the facilities at serviced airports. These costs are noncontrollable once the airline finalizes its schedule.

In contrast, fares for flights change frequently, sometimes in a matter of minutes, meaning that revenues are a controllable benefit even in the short term. Airlines use computer programs to set and continuously adjust prices. They divide available seats into fare “buckets,” with each bucket carrying a different fare and restrictions. Computer programs constantly adjust the number of seats available in each bucket, taking into account tickets sold, historical demand patterns, and the number of connecting passengers likely to use the route as one leg of a longer trip. It is therefore common to find that the person in the next seat has paid twice (or, worse, half) what you paid for the same flight!

**COMMENTARY:** Once an airline’s commitment to a flight schedule expires, it could decide not to fly certain routes or service certain destinations. The cost of operating the facilities at the no-longer serviced airports is controllable for a decision that spans a longer horizon.

related to plants, equipment, and salaried staff.” In the short term, these resources are fixed and noncontrollable; that is, organizations cannot substantially alter their abilities to deliver products or services in the short term. For example, **United Airlines** has a certain number of planes, pilots, and landing slots; it cannot decide



to fly twice the number of routes next month because it simply does not have enough resources, nor can it acquire them in such a short time period.

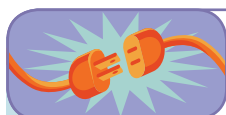
In the long term, organizations *can* change capacity. Thus, capacity costs are controllable for long-term decisions—that is, organizations can alter their abilities to deliver products or services in the long term. For example, **United** can decide to expand the number of routes it flies over the next several years if it purchases additional planes, hires additional pilots, and acquires the necessary landing slots. Thus, the controllable costs and benefits for such long-term decisions include many items that are not controllable for short-term decisions.

Equivalently, we could classify decisions as relating to the short or long term depending on the time over which we experience the costs and benefits. We realize the costs and benefits of short-term decisions relatively quickly; indeed, many short-term decisions are recurring. For example, we make decisions about what to eat and what to wear every day. If we make a poor choice one day, we have the opportunity to make another choice the next day. In contrast, we make long-term decisions less frequently—it's not often that we choose a major or buy a car. We



### CHAPTER CONNECTIONS

*The modules in this book correspond to decisions in differing time horizons. Chapters 4–8 focus on the role of managerial accounting in short-term decisions. Sample topics include cost–volume–profit analysis, differential cost analysis, budgeting, and variance analysis. Chapters 9–13 focus on the role of managerial accounting in long-term decisions. Sample topics include activity based costing, capital budgeting, the balanced scorecard, and value chain analysis.*



## Connecting to Practice

### VIRTUAL ORCHESTRA

An **Apple** computer is the newest member of the orchestra in many productions. Professional musicians are fighting a losing battle with producers who are replacing musicians with a “virtual orchestra,” particularly for tours. Even though it costs upwards of \$50,000 per play to install, the computer-synthesizer can cut the number of musicians needed by 50% or more. The cost savings mount up when you begin to consider the cost of transporting, housing, and feeding two dozen musicians for weeks at a time. While producers claim no appreciable difference in quality, music unions point to glitches in some shows as evidence that there is no replacing a live musician.

**COMMENTARY:** The decision to go with the virtual orchestra versus live musicians influences subsequent costs and commitments, such as the salaries of the musicians and the cost of moving the orchestra from one location to another. In addition, this decision may affect the quality of the musical performance.

make such decisions expecting to realize the costs and benefits over an extended period and, as such, not expecting to revisit the decision for some time. Moreover, changing our minds about our choice for a long-term decision can be difficult and costly.

Unfortunately, no unique rule enables us to classify *all* decisions per their horizon without any ambiguity. Many decisions are difficult to classify as they contain elements of both the short and the long term. That said, understanding a decision's horizon is important because time influences whether a cost or benefit is controllable. In other words, time helps us identify the costs and benefits we need to include in the decision—that is, the costs and benefits that are “on the table” and that we need to estimate.

## How to Estimate Costs and Benefits

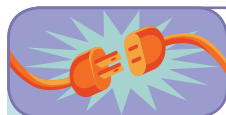
Thus far, we have focused on how to identify costs and benefits associated with decision options and which of these costs and benefits have priority in making decisions. However, knowing *what* to measure is only the first step. We now turn to the next step of *how* to estimate costs and benefits.

The core idea underlying estimation is that *costs and benefits are the result of performing activities*. When Nike engages in the activity of advertising on television, it incurs the advertising costs but also receives the benefits in terms of increased revenues. Likewise, Hercules will realize the costs and benefits of offering the yoga class by performing specific activities such as hiring a yoga instructor and scheduling classes. We therefore estimate costs and benefits by first estimating the change in activity for an option and then calculating the financial impact of this change in activity levels.

The principles of variability and traceability underlie the estimation of costs and benefits. Variability deals with *how* activities influence costs and benefits, whereas

### LEARNING OBJECTIVE 3

Explain the principles for estimating costs and benefits.



## Connecting to Practice

### ESTIMATING SOFTWARE COSTS AT INFOSYS

**Infosys** is a multibillion-dollar Indian company specializing in information technology and business consulting. Infosys routinely completes “turnkey” software systems for its global client base. When bidding for a new contract, the company needs to estimate the cost of project completion to ensure that it earns a reasonable profit. Common activities used to estimate software costs include lines of code, functions (e.g., complexity of inputs and outputs), and objects (e.g., number of screens displayed).

**COMMENTARY:** **Infosys** incurs numerous costs to complete any consulting project, including costs related to hardware, travel and training, networking and communications, compensation to engineers and professional staff, and central office administration. It is impractical for **Infosys** to estimate every cost associated with a consulting project. Instead, the company likely relies on a few activities to estimate the cost of project completion.

traceability is the degree to which we can directly relate a cost or benefit to a specific option.

## VARIABILITY

Some costs change as the volume of activity changes, while other costs stay the same. **Variability** is the relation between a cost or a benefit and an activity. A **variable cost** is proportional to the volume of activity, (b) a **fixed cost** does not change as the volume of activity changes, and, (c) a **mixed cost** contains both fixed and variable components. Similar definitions apply to variable, fixed, and mixed benefits.

We can only classify a cost or benefit as variable, mixed, or fixed as it relates to a specific activity and/or a specific time horizon. For example, factory rent varies with the number of buildings leased, but it does not change with respect to weekly production levels. Likewise, we might consider Hercules' rent as fixed for short-term decisions but variable for long-term decisions.

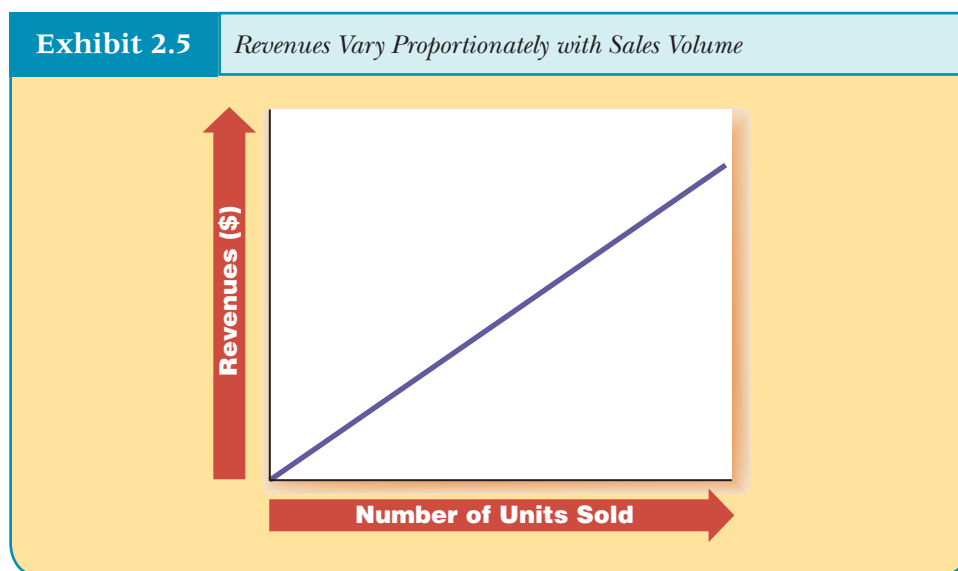
The specific activity we choose to estimate costs and benefits depends on the item that we want to measure, the decision context, and the organization. Hercules could measure activity in terms of the number of members, **Breyers** could measure activity in terms of cases of ice cream sold, and **Google** could measure activity in search requests. Let us examine the variability of benefits and costs with regard to a common measure of activity: sales volume.

### Variability of Benefits

For most businesses, sales volume (i.e., number of units sold) determines revenues. That is, as Exhibit 2.5 shows, revenues are proportional to sales volume. For example, **DreamWorks**'s revenues increase with movie ticket sales, revenues at **Dell** vary with personal computer sales, and Hercules' monthly revenues reflect its current membership level.

### Variability of Costs

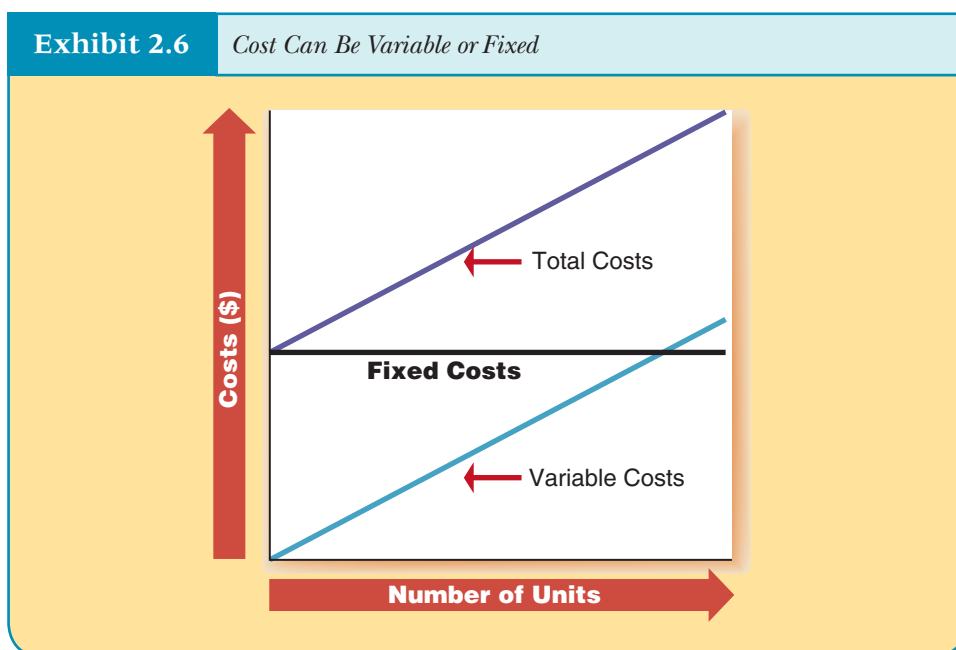
Costs can be variable, fixed, or mixed with respect to sales volume. Variable costs for a computer assembler such as **Gateway** include the hard drives installed in its computers, the cartons used to pack the computers, and the hourly labor required to assemble the computers. These costs are proportional to computer sales. (Economists



often refer to variable costs as *marginal costs* because the unit variable cost is the cost of producing an additional unit.)

**Gateway** also incurs fixed costs, such as factory rent, salaries for technical support staff, and the cost of testing equipment. These costs are fixed as they do not change in the short term, even if sales volume changes. Mixed costs include utilities and a plant manager’s compensation that has both a fixed salary component and a variable bonus component (which increases with the volume of sales beyond a certain base level). However, we can split any mixed cost into fixed and variable components. Therefore, we can represent a firm’s total costs as the sum of fixed and variable costs, as Exhibit 2.6 shows. We discuss fixed and variable costs in more detail in Chapter 4.

The principle of variability means that, when estimating costs and benefits, the first step is to estimate the change in activity. For example, Tom and Lynda would estimate the increase in membership if they offered yoga. They can then apply the



 **Check It! Exercise #2**

The following table provides total variable costs and total fixed costs for several activity levels. Verify that the unit variable cost is the same for all activity levels, while the fixed cost per unit decreases as the volume of activity increases.

Volume of Activity	Total Variable Costs	Total Fixed Costs	Unit Variable Cost	Fixed Cost Per Unit
100 units	\$1,200	\$1,000	_____	_____
125 units	\$1,500	\$1,000	_____	_____
200 units	\$2,400	\$1,000	_____	_____
250 units	\$3,000	\$1,000	_____	_____

Solution at end of chapter.



### CHAPTER CONNECTIONS

*The short-term decisions that we discuss in Chapters 4–8 rely on classifying costs as being either fixed or variable, because many costs are noncontrollable (i.e., are fixed) in the short term. In Chapters 9–13, we consider long-term decisions, where most costs that we classified as fixed in the short term become controllable.*

concept of variability to convert the change in membership to corresponding changes in revenues and costs. Traceability, the principle we discuss next, pertains to the confidence with which any decision maker, including Tom and Lynda, can estimate a cost or a benefit.

### TRACEABILITY

**Traceability** is the degree to which we can directly relate a cost or revenue to a decision option. A cost or revenue that we can uniquely relate (*trace*) to a decision option is a **direct cost** or a **direct benefit**. If only a portion of the cost or revenue pertains to a particular decision option, then it is an **indirect cost** or an **indirect benefit**. Organizations frequently refer to indirect costs as *common costs* and to indirect manufacturing costs as manufacturing **overhead**.

#### Direct and Indirect Benefits

Assume that **Frigidaire**, a leading manufacturer of kitchen appliances, is determining whether to continue making a particular model of refrigerator. In this case, the company can directly identify the revenues received from sales of the refrigerator. However, the product might also provide indirect benefits. For example, buyers of the **Frigidaire** refrigerator might be more likely to purchase other **Frigidaire** appliances in the future, thereby increasing overall revenues.

#### Direct and Indirect Costs

**Frigidaire** can uniquely identify the type, quantity, and costs of raw materials used to make the refrigerator. The cost of such raw materials is a direct cost associated with the decision to make the refrigerator. However, the company may use the same machinery to produce many different refrigerators and related products. The cost of such machinery is an indirect cost.

It is important not to confuse direct and common costs with variable and fixed costs. A direct cost can be fixed or variable. The cost of a machine used only for manufacturing this refrigerator is a fixed, direct cost. The cost of raw materials is a variable, direct cost. Likewise, indirect costs also can be fixed or variable. The regular salary (e.g., not including bonuses) paid to the plant manager who oversees the production of this and other refrigerators is a fixed, indirect cost. The cost of oils and lubricants to run the machines is indirect and variable. It is variable because the amount depends on the number of refrigerators made; it is indirect because it is not possible to identify the amount of coolants used for a particular refrigerator.

We can identify direct and indirect costs in all functional areas. Direct marketing expenses include sales commissions. The expense of maintaining sales offices, however, is an indirect cost. Similarly, the royalty payment for a patent used in product development is a direct cost, while the cost of maintaining research staffs is indirect.

**Exhibit 2.7**

*Sample Costs and Benefits Classified by Controllability, Variability, and Traceability*

Item	Controllable for Decision to Offer Yoga?	Variable in Number of Members?	Traceable to Decision to Offer Yoga?
Dues from new members	Yes	Yes	Yes
Instructor salary	Yes	No	Yes
Supplies	Yes	Yes	No
Rent for gym	No	No	No



*The instructor's salary is controllable and traceable to the decision to offer yoga.*  
(Masterfile)

When evaluating whether Hercules should offer the yoga class, we must consider both the variability and the traceability of the associated costs and benefits. Exhibit 2.7 lists and labels some of the costs and benefits that Tom and Lynda will consider when deciding whether to offer yoga.

It is easier to estimate direct costs and benefits than indirect costs and benefits. Why? By definition, direct costs and benefits relate entirely to a decision option. In contrast, only a part of the indirect cost or benefit relates to the decision option. Thus, we need to determine the portion of an indirect cost or benefit attributable to the option. This allocation of costs often requires assumptions and is therefore imprecise. In the next section, we extend the principle of variability to develop a **cost hierarchy**, which can help increase the accuracy of estimated costs.

## Hierarchical Cost Structure

Say you and your friends decide to travel to a concert. You might need one car for four of you, but two cars for five. As Exhibit 2.8 shows, this example illustrates a step cost. **Step costs** stay at the same level for a certain activity range (one to four people), but jump to a higher amount if the volume of activity increases beyond this range (adding a fifth person to the group). For Hercules, the cost of the yoga instructor is a step cost. Until a volume of 30 members, say, the cost is fixed. If enrollment in the yoga class exceeds 30 members, Hercules may need to schedule an additional class to ensure quality instruction, thereby increasing its costs. Sales staff at the **Gap** is another example of step costs because it is not possible to hire sales persons by the minute.

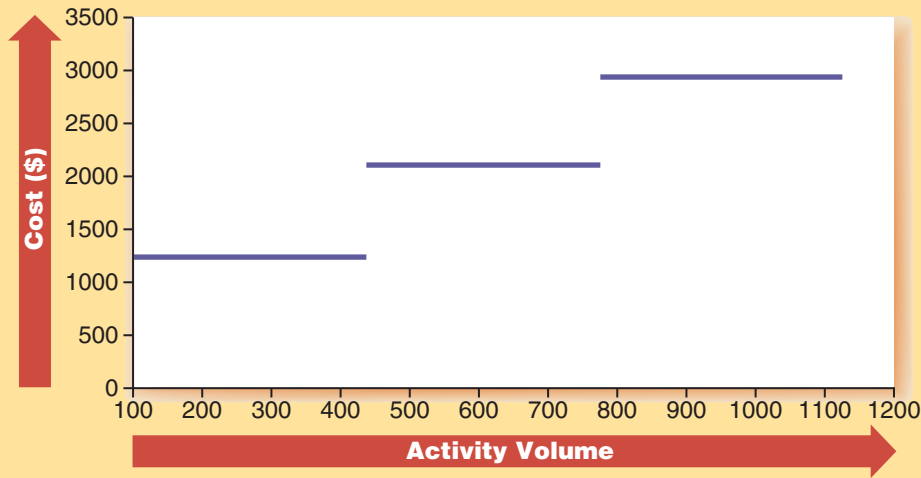
Step costs relate to fixed costs and variable costs in a straightforward way. A step cost behaves more like a variable cost as the step size decreases. It behaves more like a fixed cost as the step size increases. For example, consider bicycles, buses, and trains as modes of transportation. **Trek** bicycles have a step size of one rider, a **Greyhound** bus has a step size of 50 passengers or more, and an **Amtrak** train has a step size in the hundreds. Like a variable cost, the number of bicycles needed increases for each additional person; the number of buses required increases with about every 50 passengers, behaving like a step cost; and we only need one train over a very large range of passenger volume, a fixed cost.

In sum, when we classify all costs as fixed or variable with respect to sales volume, we are saying that *all* costs are either independent of or proportional to sales volume.

**LEARNING OBJECTIVE 4**

**Describe the hierarchical nature of costs and its implications for cost measurement.**

**Exhibit 2.8** Step Costs Are Neither Fixed nor Variable



### Check It! Exercise #3

Suppose fixed costs are \$600, the unit variable cost is \$7, and step costs are \$250 for every 50 units produced. Verify that the total cost of producing 43 units is \$1,151 and that the total cost of producing 112 units is \$2,134.

Volume	Total Variable Costs	Total Step Costs	Total Fixed Costs	Total Cost
43 units	_____	_____	_____	_____
112 units	_____	_____	_____	_____

Solution at end of chapter.

While practical and frequently used, this assumption often results in imprecise measurements. As a result, when decision makers need finer estimates, they use the cost hierarchy. Generalizing the classification by using the cost hierarchy allows us to consider *unit-, batch-, product-, and facility-level activities*, which in turn helps us to estimate better the costs of a decision option.

Consider the cost structure for **Deluxe Checks**, which prints customized checkbooks (see Exhibit 2.9). For each printing job, the cost of the paper and direct labor varies proportionally with production volume. We refer to such costs, which we earlier termed variable costs, as **unit-level costs**. Unit-level costs increase or decrease in direct proportion to the number of units produced. The step size for these costs is a unit.

Each job produced, however, requires some setup and production planning. **Deluxe** has to prepare the printing machine for the next job by loading a new program. Setup costs include all changeover costs incurred to prepare the production process for the next product. These costs vary with the number of setups done, not with the number of units produced. That is, the setup costs are the same whether **Deluxe** produces 200, 500, or 1,000 checks after the setup. Because the step for such

**Exhibit 2.9**

*Using the Cost Hierarchy Allows **Deluxe Checks** to Improve the Accuracy of Cost Estimates*



costs depends on the number of batches produced (number of setups) instead of units, we refer to these costs as **batch-level costs**.


Each job also requires some artwork. This work does not depend on the number of batches and units. Such **product-level costs** include advertising, research and development, and the cost of specialized equipment. For example, if **Deluxe** adds more fonts and backgrounds for customizing checks, this increases its product-level costs, as the firm will need to reprogram its computers and update its product catalogs. These costs change only as the company changes the number of products.

Finally, costs that do not vary at the unit level, the batch level, or the product level are **facility-level costs**. Examples include the fixed costs of operating a factory, such as rent and property taxes, which firms incur to sustain their place of business. Even these costs, however, might vary in the long term; they change with the number of plants operated by **Deluxe**, meaning that the step size is an entire factory.

For Hercules, the cost of serving members is a unit-level (member-level) cost. This cost will proportionately rise as the club attracts new members. The yoga instructor's salary is an example of a batch-level cost that will only increase with every 30 members in the yoga class. The money spent on buying a massage table is a product-level cost because the cost relates to offering massage services. The rent paid by Tom and Lynda is a facility-level cost.


Understanding Hercules' cost structure will help you in measuring the yoga class's costs and benefits more accurately. But where do we go to get the data to measure these costs and benefits? In the next chapter, we discuss the accounting systems that provide the data for measuring costs and benefits.





### CHAPTER CONNECTIONS

*Understanding the cost hierarchy is important when using activity-based costing (ABC) to estimate the cost of products and services over an extended horizon. We discuss activity-based costing in Chapter 11.*



## Connecting to Practice

### ART.COM

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**Art.com** is an e-tailer that specializes in selling framed and unframed prints. An analysis of the firm’s operations revealed the following cost structure:

Cost type	% of total cost	Examples
Unit-level costs	31%	Materials, labor, packing, and freight
Batch-level costs	7%	Purchasing, receiving, order processing
Product-level costs	49%	Web site, inventory management, marketing
Facility-level costs	13%	Administration

**COMMENTARY:** At **Art.com**, product-level costs comprise approximately half of total costs. Thus, classifying costs as purely fixed or variable could lead to poor decisions in this setting. Accordingly, management may wish to use both product- and unit-level activities when estimating costs.

### APPLYING THE DECISION FRAMEWORK

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<b>What Is the Problem?</b>	Tom and Lynda want to increase Hercules’ profitability, both by attracting new members and by preventing existing members from leaving Hercules for Apex.
<b>What Are the Options?</b>	Members have suggested many ideas, including running different types of contests, offering more programs and services, and renovating the spa and steam rooms.
<b>What Are the Costs and Benefits?</b>	The costs and benefits differ greatly across individual decisions—the number of controllable costs and benefits for renovating the spa and steam rooms exceeds the number for running a contest.
<b>Make the Decision!</b>	Tom and Lynda classify renovating as a long-term decision and offering more classes and running contests as short-term decisions. This grouping enables Tom and Lynda to understand when the costs and benefits of each decision will materialize and, in turn, estimate the costs and benefits of each option.

## SUMMARY

The primary role of management accounting is to *measure* the costs and benefits of decision options. This step consists of two tasks—*identifying* the costs and benefits to measure, and then *estimating* the amount of each identified cost and benefit.

In this chapter, we described the two principles, controllability and relevance, for identifying the costs and benefits of decision options. We established an important link between controllability and time. Based on this link, we distinguished between short- and long-term decisions. We next considered the two principles, variability and traceability, that are used to estimate costs and benefits. Finally, we broadened the principle of variability to develop a hierarchy of costs.

A firm's accounting system is the natural spot that we look to for help with identifying and estimating costs and benefits. How do firms accumulate and report costs, revenues, and profit? We take up this task in Chapter 3.

## RAPID REVIEW

### LEARNING OBJECTIVE 1

#### Understand how to identify the costs and benefits of decision options.

- A cost or benefit for a decision option is controllable if it differs from *current* expenditures and revenues. The value of a decision option equals such incremental benefits less incremental costs and is the change in profit relative to current profit.
- A cost or benefit is relevant if its amount differs across decision options. Focusing on relevant costs and benefits provides the relative value of the decision options.

### LEARNING OBJECTIVE 2

#### Consider how time affects the realization of costs and benefits.

- A decision maker's control over costs and benefits increases with the passage of time because commitments and obligations expire with time.
- The ability to change the levels of *capacity resources* related to plant, equipment, and salaried staff distinguishes short-term decisions from long-term decisions. In the short term, these resources are fixed and non-controllable—that is, organizations cannot substantially alter their abilities to deliver products or services. In the long term, organizations have a greater ability to do so.

### LEARNING OBJECTIVE 3

#### Explain the principles for estimating costs and benefits.

- The core idea underlying estimation is that controllable costs and benefits are the outcomes of activities.
- Variability is the relation between a cost or a benefit and the chosen activity. A cost or benefit is (1) variable if it is

proportional to the volume of activity; (2) fixed if it does not change as the volume of activity changes; and (3) mixed if it contains both fixed and variable components.

- Revenues are variable in units sold. Costs can be variable, fixed, or mixed with respect to sales volume.
- Traceability is the degree to which we can relate a cost or a benefit with a decision option. We can attribute the entire amount of a direct cost or a direct benefit to a decision option. If only a portion of the cost or revenue pertains to a particular decision option, then it is an indirect cost or an indirect benefit.
- While variability allows us to convert activity estimates to estimates of costs and benefits, traceability influences our confidence in our estimates.

### LEARNING OBJECTIVE 4

#### Describe the hierarchical nature of costs and its implications for cost measurement.

- The cost hierarchy broadens the principle of variability, allowing us to consider multiple activities. The cost hierarchy recognizes four types of costs: (1) unit-level costs; (2) batch-level costs; (3) product-level costs, and (4) facility-level costs.
- Unit-level costs increase or decrease in proportion to the number of units produced. Unit-level costs are synonymous with variable costs.
- Batch-level costs increase or decrease in proportion to the number of batches of units made. Many refer to batch-level costs as step costs.
- Product-level costs increase or decrease in proportion to the number of products.
- Facility-level costs are required to sustain the business. They do not vary at the unit-, batch-, or product-level.
- Misclassification of costs across the cost hierarchy introduces errors in cost estimation.

## ANSWERS TO CHECK IT! EXERCISES

**Exercise #1:** (1) Noncontrollable, not relevant; (2) Noncontrollable, not relevant; (3) Controllable, not relevant; (4) Controllable, relevant; (5) Controllable, relevant; (6) Controllable, not relevant. Notice that item (3), the ticket price, and item (6), the amount spent on popcorn, are controllable but irrelevant to Jason's decision. They are controllable because Jason has yet to pay for the movie and the popcorn. They are not relevant because Jason will pay the same amount regardless of which theater he attends.

**Exercise #2:** Unit variable cost = \$12. Fixed cost per unit = \$10, \$8, \$5, and \$4.

**Exercise #3:**  $\$600 + (43 \times \$7) + (\$250 \times 1 \text{ step}) = \$1,151$ ;  $\$600 + (112 \times \$7) + (\$250 \times 3 \text{ steps}) = \$2,134$ .

## SELF-STUDY PROBLEMS

### SELF-STUDY PROBLEM #1: Controllability and Relevance

For a new product, Mega Manufacturing is deciding whether to buy 500 units of a component from an outside supplier or to make them in-house. If Mega buys the component from an outside supplier, it will pay the supplier \$12 per unit. Mega will also pay \$1 per unit to inspect the component and spend an additional \$9 per unit in materials and labor to convert each component into a finished product. Mega will sell the finished product to consumers for \$30 per unit.

Making the component in-house requires \$6 worth of steel and \$3 worth of a special alloy. Mega routinely purchases and uses steel in its operations, and it does not currently have any steel in inventory. The special alloy is unique to the component in question, and Mega currently has \$2,000 worth in stock. If it chooses the buy option, Mega will dispose of the special alloy. Disposal costs equal salvage value, meaning that Mega's net proceeds from disposal are \$0. Making the component in-house also requires that Mega hire new workers at a cost of \$16 per hour—workers can make four units of the component per hour.

As under the buy option, Mega will pay \$1 per unit to inspect the component and spend an additional \$9 per unit in materials and labor to convert each component into a finished product. Mega will then sell the finished product to consumers for \$30 per unit.

**a.** *What are the controllable costs and benefits associated with the buy option? What are the controllable costs and benefits associated with the make option?*

As discussed in the text, a cost or benefit is controllable if it changes relative to current expenses and revenues. Compared to current profit, the following costs and benefits change under the buy and make options:

Item	Amount per unit	Total (500 units)
Revenues—Finished Units	\$30	\$15,000
<i>Total Controllable Benefits</i>		<u>\$15,000</u>
Purchase Price	\$12	\$6,000
Inspection	\$1	\$500
Additional Materials and Labor	\$9	\$4,500
<i>Total Controllable Costs</i>		<u>\$11,000</u>
<i>Value (benefits – costs)</i>		<u>\$4,000</u>

Costs and Benefits—Make Option

<i>Item</i>	<i>Amount per unit</i>	<i>Total (500 units)</i>
Revenues—Finished Units	\$30	\$15,000
<i>Total Controllable Benefits</i>		<u>\$15,000</u>
Steel	\$6	\$3,000
Special Alloy*	\$0	\$0
Labor**	\$4	\$2,000
Inspection	\$1	\$500
Additional Materials and Labor	\$9	<u>\$4,500</u>
<i>Total Controllable Costs</i>		<u>\$10,000</u>
<i>Value (benefits-costs)</i>		\$5,000

\* The \$2,000 of special alloy in inventory is a sunk cost, and Mega does not plan to purchase additional special alloy if it makes the component in house. Thus, the cost is non-controllable.

\*\* \$4 per unit = \$16 per hour/4 units per hour.

- b. *What is the value of the make option? What is the value of the buy option?*

Value = Controllable benefits – Controllable costs. Based on our calculations in part (a):

Value (buy) = \$15,000 – \$11,000 = \$4,000

Value (make) = \$15,000 – \$10,000 = \$5,000

Mega should choose the make option because it has the higher value.

- c. *Compared to the buy option, what are the relevant costs and revenues associated with the make option?*

The revenues received from the finished product do not differ between the two options. Given this, *the relevant revenues are \$0.*

In addition, three of the costs do not differ between the make and buy options: (1) the inspection cost, (2) the additional labor and materials required to convert the component to a finished product, and (3) the sunk cost of the special alloy. Accordingly, these costs are irrelevant. The three costs that differ are: (1) the steel, (2) the labor, and (3) the purchase price. Thus, we have:

Relevant Costs—Make Option

<i>Item</i>	<i>Amount per Unit</i>	<i>Total (500 units)</i>
Steel	\$6	\$3,000
Labor	\$4	\$2,000
Purchase Price	(\$12)	<u>(\$6,000)</u>
<i>Total Relevant Costs</i>		<u>(\$1,000)</u>

Using the principle of relevance, we find that Mega still prefers the make option because its cost is \$1,000 less than the cost of the buy option. Notice that we subtracted the purchase price in our computations. We did so because, compared to buying, Mega *saves* \$12 per unit by making the component.

Thus, the principles of relevance and controllability give us the same ranking of options. Relevance also preserves the difference in value between the two options, or \$1,000. Finally, notice that compared to controllability, relevance allows us to focus our attention on fewer items.

- d. *Suppose Mega did not have the alloy in stock and had to purchase it. How does this information change your analysis?*

This information means that the cost of alloys is now controllable. It also is relevant. Thus, the controllable costs of the make option would increase to \$11,500, making the buy option more attractive. Likewise, the relevant cost of making versus buying is \$500, again meaning that buy is the preferred option. Both analyses show that Mega gains \$500 by buying the component over making it, if the firm has to purchase the alloy.

**SELF-STUDY PROBLEM #2:****Variability, Traceability, Cost Hierarchy**

Dudley Brothers offers waste management services, specializing in construction waste. The firm has two product lines: regular waste disposal and hazardous waste disposal. Because hazardous waste requires extra handling and care, Dudley Brothers has specialized equipment for handling materials such as asbestos and lead-based paint.

In a typical engagement, Dudley places one or more dumpsters at the client's construction site. These dumpsters are emptied every week. The dumpsters may be emptied sooner if the construction crew informs Dudley that the dumpster is full. Dudley then hauls the waste to the landfill, disposing of it properly. The landfill charges Dudley a fee based on the number of pounds dumped as well as the type of waste dumped (the landfill fee for hazardous waste is higher than the fee for regular waste).

The following table lists eight costs incurred by Dudley:

<i>Cost #</i>	<i>Description of Cost</i>
1	Gasoline costs for hauling waste to the landfill
2	Landfill fee for dumping regular waste
3	Landfill fee for dumping hazardous waste
4	Cost of weekly scheduled pickups
5	Annual city permit fee to handle hazardous materials
6	Cost of the truck to haul waste (Dudley's truck can haul dumpsters with either regular or hazardous waste)
7	Cost of new dumpster to handle hazardous waste
8	Salary to receptionist at the firm's office

*Classify each cost as per the cost hierarchy—that is, classify each cost as being a unit-, batch-, product-, or facility-level cost. In addition, classify each cost as being direct (D) or indirect (I) with respect to Dudley's two product lines. Provide a brief rationale for each classification.*

The following listing provides the cost classifications, including comments pertaining to the rationale underlying each classification:

- Gasoline costs for hauling waste to the landfill **Unit level, Indirect**  
This cost depends on the volume of waste (more waste = more trips). This cost is indirect because Dudley can make multiple trips with a single tank of gas. However, one could argue that this is a batch-level cost inasmuch as regularly scheduled pickups must be made regardless of actual volume.
- Landfill fee for dumping regular waste **Unit level, Direct (regular waste)**  
The cost varies in the volume of waste handled and is traceable to the regular waste product line.
- Landfill fee for dumping hazardous waste **Unit level, Direct (hazardous waste)**  
The cost varies in the volume of waste handled and is traceable to the hazardous waste product line.
- Cost of weekly scheduled pickups **Batch level, Indirect**  
The cost is incurred once a week, regardless of how full the dumpster is. Furthermore, the cost is indirect because a single customer may have both types of waste.
- Annual city permit fee to handle hazardous materials **Product level, Direct (hazardous)**  
This cost does not vary in the number of loads or the volume handled. Dudley incurs the cost to operate the hazardous product line.
- Cost of the truck to haul waste **Facility level, Indirect**  
This is a facility-level cost because it pertains to *all* of Dudley's product lines. If Dudley were to get into another line of business that does not use the truck, then it would be a product-level cost.
- Cost of new dumpster to handle hazardous waste **Product level, Direct (hazardous)**  
This is a product level cost because it does not vary in the amount of waste or the number of loads. The cost is traceable to the hazardous waste product line.
- Salary to receptionist at the firm's office **Facility level, Indirect**  
This cost is incurred to sustain the business, and is not traceable to either product line.

This problem shows that, in many cases, costs do not fall neatly into fixed and variable categories. The cost hierarchy helps managers structure their thinking about the underlying reason

for a cost and suggests why a given cost would increase or decrease. In turn, such understanding can facilitate decision making, as misclassifications could lead to poor estimates of cost (e.g., assuming a cost is variable or fixed when, in fact, it is a batch- or product-level cost).

Nonetheless, for many decisions, organizations do classify costs as being purely fixed or purely variable, because the ease of resulting computations outweighs the errors introduced by the classification.

This problem also helps with the distinction between direct and indirect costs. It is important to remember that traceability depends on the unit of analysis. For example, while the salary of the receptionist is an indirect cost with respect to Dudley's two product lines, it is a direct cost with respect to the firm as whole.

## GLOSSARY

**Batch-level cost** A cost that varies in proportion to the number of batches of units made (used synonymously with step cost).

**Controllable cost, controllable benefit** A cost or benefit that a decision maker chooses to incur, relative to doing nothing.

**Cost hierarchy** The classification of costs into unit-, batch-, product-, and facility-level.

**Direct cost, direct benefit** A cost or benefit that is uniquely related to a decision option.

**Facility-level cost** Cost that does not vary at the unit-, batch-, or product-level. Cost required to sustain the organization.

**Fixed cost** A cost that does not change as the volume of activity changes.

**Indirect cost, indirect benefit** A cost or benefit that is not unique to a decision option—only a portion relates to a decision option.

**Mixed cost** A cost that contains both fixed and variable components.

**Overhead** The costs of capacity resources.

**Product-level cost** A cost that varies in proportion to the number of products.

**Relevant cost, relevant benefit** A cost or benefit that differs across decision options.

**Step cost** A cost that increases in discrete steps as the volume of activity increases.

**Sunk cost** A past expenditure that cannot be changed.

**Traceability** The degree to which we can directly relate a cost or a revenue to a decision option.

**Unit-level cost** A cost that increases or decreases in direct proportion to the number of units produced (used synonymously with variable cost).

**Variability** The relation between a cost or a benefit and an activity.

**Variable cost** A cost that is proportional to the volume of activity.

## REVIEW QUESTIONS

**2.1 LO1.** What does it mean for a cost or benefit to be controllable?

**2.2 LO1.** How is value related to controllable costs and benefits?

**2.3 LO1.** What does it mean for a cost or benefit to be relevant?

**2.4 LO1.** When is a controllable cost relevant? When is a controllable cost not relevant?

**2.5 LO2.** Why does time influence the controllability of costs and benefits?

**2.6 LO2.** What is the key difference between a long-term and a short-term decision?

**2.7 LO2.** Why is it not possible to sharply distinguish between short- and long-term decisions?

**2.8 LO3.** What is the central principle underlying the estimation of revenues and costs?

**2.9 LO3.** Are revenues usually variable, mixed, or fixed? Why?

**2.10 LO3.** What are variable, fixed, and mixed costs?

**2.11 LO3.** What is traceability?

**2.12 LO3.** What are direct and indirect costs?

**2.13 LO4.** What is a step cost?

**2.14 LO4.** How many kinds of costs are there in the cost hierarchy? List these kinds of costs.

## DISCUSSION QUESTIONS

- 2.15 LO1.** We know that the controllable benefits less the controllable costs of an option equals its value. Can focusing only on relevant costs and benefits ever give us value?
- 2.16 LO1.** Many decisions often involve qualitative factors. How can you reconcile this fact with the concept of relevant costs?
- 2.17 LO1.** Every relevant cost is controllable. However, not all controllable costs are relevant. Why are these two statements correct?
- 2.18 LO1.** When might the magnitude of a sunk cost be relevant for a decision? How do you reconcile this answer with the maxim that a sunk cost is not relevant for decision making? (*Hint:* Consider taxes or a decision maker's reputation.)
- 2.19 LO2.** Identify a personal decision that could affect your life for 10 years or more. Discuss how this decision sets the stage for subsequent decisions that may only span a few years or perhaps even a few months.
- 2.20 LO2.** Consider your school. How would you classify the following decisions as per their time horizon: (a) whether to open an additional section for an existing class or to reassign rooms among classes, (b) whether to offer a new program of study, and (c) whether to remodel the cafeteria in the dormitory?
- 2.21 LO2.** Television manufacturers such as Pioneer, Sony, Toshiba, and Mitsubishi introduce new models constantly. In your judgment, how long is the short-term horizon for such television companies? Identify two short-term decisions that these companies might make to improve their profit.
- 2.22 LO2.** Consider the decision to purchase an automobile to commute to school and/or to work. What costs do you commit to/do not commit to when making your choice?
- 2.23 LO2.** From your life experience, identify a decision that appeared to have a short-term horizon but had unintended long-term consequences.
- 2.24 LO3.** If a firm drops a product line, it will lose the revenue from that product. This loss is controllable and direct with respect to the decision to keep or drop the product. Dropping a product might also affect the sales of the firm's other products. Give two examples—one in which the spillover effect increases the revenue from other products and one in which the spillover effect decreases the revenue from other products. Are these spillover effects controllable and direct to the decision to drop the product?
- 2.25 LO3.** We can think of a cost or revenue estimate as a draw from many possible values of some distribution. Evaluate the following statement, "Variability is helpful in assessing the mean of the probability distribution while traceability speaks to the variance."
- 2.26 LO4.** Some companies impose a minimum charge for services. For example, a caterer may charge \$12 per person, with a minimum charge of \$120 to host a small dinner party. What is the rationale for a minimum charge? (*Hint:* Think about the caterer's costs in terms of the cost hierarchy)
- 2.27 LO4.** Batch- and product-level costs are not relevant for decisions that only affect the volume of production. Do you agree with this assertion? Why or why not.
- 2.28 LO4.** Some costs, such as a dedicated field service agent, might be specific to a given customer. How does the cost hierarchy accommodate these customer level costs? Describe decisions for which grouping costs per an alternate hierarchical classification (i.e., by customer rather than by product) might be useful.

## EXERCISES

- 2.29 Controllability and relevance (LO1).** Sarah is not currently using the fitness loft, a special area of the gym that houses state-of-the-art cardio and strength training equipment. Based on a visit as a friend's guest, Sarah has decided to enroll in the loft. She is deciding between buying a pass to the fitness loft (cost: \$120 per semester) and buying a pass for each use (cost: \$4 per visit). She wants to work out at least three times a week, which translates to 45 times for the semester. Towel rental at the loft is \$0.50 per use. Sarah pays a facilities fee of \$175 per semester with her tuition; this fee entitles her to "free" use of one locker.

*Required:*

- Is the facilities fee of \$175 relevant or controllable for Sarah's decision?
- Is the towel rental of \$0.50 per visit controllable or relevant for this decision?
- Is the per-use fee controllable or relevant for this decision?

**2.30 Controllability and relevance (LO1).** Alex has just graduated from college and has accepted a job at a different city. Rather than move his furniture, Alex decides to sell it. Alex sets his price by noting that removing the bolts that now anchor his bunk bed to the wall will leave unsightly holes. Alex estimates that the property owner will deduct \$100 from his refundable deposit to cover the cost of repairs. Thus, Alex prices the furniture at \$100. He considers this a “steal” because he had spent nearly \$500 to buy the furniture three years ago.

Much to his surprise, he does not receive any takers. Indeed, Alex has even lost all hope of getting anyone to take the furniture for free. Tomorrow is moving day, and Alex has to turn the apartment over to the owner. Alex knows that he will need to rent a truck and pay landfill fees if he wants to put the furniture in the city’s landfill. Another option is to discard the furniture on the street. Although many students junk their furniture in this fashion, Alex knows that it is illegal. He also knows that the city incurs considerable expenses to clean up after moving day.

*Required:*

- Is the amount that Alex paid for the furniture (\$500) controllable for his decision? Is it relevant?
- Is the estimated cost of repairs (\$100) controllable for the decision? Is it relevant?
- List two relevant costs for Alex’s decision. Why are these costs relevant?
- When and how could the value of a decision be negative?

**2.31 Controllability (LO1).** Suppose that Tom and Lynda are considering reducing Hercules’ membership fee by 10%.



*Required:*

List Tom and Lynda’s two options. Next, identify two costs and benefits that are controllable for this decision.

**2.32 Controllability and relevance (LO1).** Sam Walters is leaving tomorrow for a three-day business trip and is trying to decide the most economical way to get to and from the airport and his home. Sam could either drive (using his own car) or take the shuttle. If Sam drives, then he estimates that it will cost \$0.30 per mile driven in operating costs (e.g., for gas and oil) and \$7.50 per day for parking. The one-way cost of the shuttle is \$25. Sam’s home is exactly 30 miles from the airport.

*Required:*

- What are the controllable costs for Sam’s decision?
- What are the relevant costs and benefits for Sam’s decision?
- Are the controllable costs the same as the relevant costs for Sam’s decision? If so, why? Can controllability and relevance give the same costs and benefits even when the status quo is not a feasible option?

**2.33 Controllability and relevance (LO1).** Akawasi Sudawa is a production manager for HAL, a firm that specializes in manufacturing high-precision aircraft components. For a new product, Akawasi is trying to decide whether his company should make a particular component internally or whether he should buy it from an outside supplier. In either case, HAL would supply all of the needed materials and connectors to ensure that the finished component meets quality standards. Akawasi expects the supplier to use 5% more in materials than HAL would for in-house manufacturing because the supplier would not have access to the same specialized machines as HAL does. However, the number of connectors used would be the same under both options. Finally, the status quo of doing nothing is not feasible—HAL will either make or buy the component.

*Required:*

- Classify: (1) the cost of the materials used to make the components, (2) the cost of the connectors used to make the components, and (3) Akawasi’s annual salary of \$105,000 as being controllable (C) or noncontrollable (NC), and relevant (R) or not relevant (NR) for the above decision. Provide a brief rationale for each of your classifications.
- Assume the status quo of not doing anything is a viable option. That is, HAL does not have to make or buy the component—it can choose to do neither. How does this change in the opportunity set affect your classifications in part (a)?



- c. Assume HAL currently makes the component internally. Thus, the status quo is the “make” option as this represents the existing state of affairs. How does this change affect your classifications in part (a)?

**2.34 Controllability and relevance (LO1).** Seeking to find gainful part-time employment, Sarah Spencer is choosing between two job offers. The first, a sales position at a department store, pays a flat salary of \$8 per hour. As Sarah plans to work 80 hours per month, she expects to earn \$640 per month. The second job, at a stereo store, pays a monthly salary of \$400 for a 1/2 time position (20 hours per week or 80 hours per month) plus commissions. The store manager informs Sarah that, on average, 1/2 time salespeople earn commissions of \$300 per month.

Both job sites are about 25 miles from Sarah’s home, and Sarah estimates that, regardless of the position taken, she will incur about \$125 in travel costs per month. Sarah currently shares an apartment with three friends. Her share of the rent and utilities is \$250 per month.

*Required:*

- a. Classify the following costs and benefits as to their controllability and relevance for Sarah’s decision: (1) Job salaries; (2) commissions; (3) transportation costs; (4) rent and utilities.
- b. Using controllable costs and benefits, estimate the value and opportunity cost of Sarah’s two decision options.
- c. Evaluate Sarah’s decision using relevant costs and benefits.

**2.35 Classifying decisions according to their time horizon (LO2).** The following table lists nine decisions you are likely to make during your college career:

Decision #	Description of Decision
1	Choosing a major.
2	Choosing whether to wake up at 7:30 a.m. when your alarm goes off or hit the snooze button and wake up in another 9 minutes at 7:39 a.m.
3	Choosing whether to buy a desktop or a laptop computer.
4	Choosing whether to bring a car to campus or use university and local transportation (i.e., the “bus”).
5	Choosing whether to take a required course this semester or next semester.
6	Choosing whether to have pizza or a sub-sandwich for dinner this coming Friday.
7	Choosing whether to stay at your current school or transfer to another school.
8	Choosing whether to lease a two-bedroom apartment or stay in the dormitory next year.
9	Choosing whether to buy a semester pass for the fitness center or pay on a per-use basis.

*Required:*

- a. Classify each decision according to its horizon, short term or long term. Provide a brief rationale for each classification.
- b. It is easy to find examples where a short-term decision has long-term consequences. The lecture you attended to be with a friend might spur your interest in a career path and shape the rest of your life. Given this linkage, what is the benefit from classifying decisions according to their time horizon? (*Hint:* Think about the benefits of breaking down a large assignment into manageable pieces).

**2.36 Classifying decisions according to their time horizon (LO2).** Saburo and Akiko Watanabe have been married for a bit less than three years and just had their first baby. They want to have another child within two or three years and look forward to “settling down” into the classic American dream of a home with a large yard, a dog, and BBQs on lazy summer afternoons.

Both Saburo and Akiko have professional degrees and well-paying jobs. Each of them earns roughly \$80,000 per year, which has allowed them to save up for a down payment on a nice house. Currently, they are wondering if one of them should take some time off (for say, five to ten years) from work and devote the freed-up time to

building a family. They both care deeply about instilling the right mixture of Japanese and American values in their children and are worried that without adequate parental involvement, their children may lose track of their Japanese heritage.

The following lists nine decisions that Saburo and Akiko will be facing in the near future:

Decision #	Description of Decision
1	Reconsidering the decision to give up one income (neither person has quit yet).
2	Deciding whether to buy a second car (Saburo and Akiko currently only have one car because they live in the city).
3	Deciding whether to pay this month's mortgage payment by check or electronic transfer.
4	Deciding whether to hire a housekeeper.
5	Deciding the type of dog to get.
6	Deciding whether to spend \$10,000 on a 4-week tour to Japan and Southeast Asia.
7	Deciding whether to have the stay-at-home spouse look for part-time, home-based employment.
8	Deciding whether to grill steak or fish for their dinner party this coming Saturday.
9	Deciding which house to buy.

*Required:*

- Classify each decision according to its time horizon, short term or long term. Provide a brief rationale for each classification.
- As discussed in the text, many short-term decisions have longer-term implications. Given this linkage, what is the benefit from classifying decisions according to their time horizon? (*Hint:* Think about the benefits of breaking down a large assignment into manageable pieces.)

**2.37 Variability and traceability (LO3).** The following are some common statements that we find students making.

- A variable cost is always controllable.
- A fixed cost is always noncontrollable.
- A direct cost is always a variable cost.
- Fixed costs are always indirect.
- Virtually every cost is variable with respect to some activity.

*Required:*

Classify each statement as True or False, and justify your response.

**2.38 Variability (LO3).** Excalibur Steel incurs three types of costs (*a*, *b*, and *c*) in its manufacturing process. The following table presents total costs for each type for two different activity levels.

	Cost		
	A	B	C
5,000 units	\$25,000	\$28,000	\$50,000
7,500 units	\$37,500	\$35,000	\$50,000

*Required:*

Identify whether each cost is variable, fixed, or mixed.

**2.39 Variability: choice of activity (LO3).** The following table lists 10 costs commonly incurred by manufacturing firms.

Cost #	Description of Cost
1	Cost of raw materials used
2	Electricity used to operate machines
3	Cost of packing materials
4	Equipment maintenance

Cost #	Description of Cost
5	Janitorial supplies used to clean the factory
6	Cost of human resources department
7	Cost of purchasing department
8	Sales commission paid
9	Travel expenses for sales persons
10	CEO salary

*Required:*

- For each cost, identify and justify the underlying activity whose volume determines the amount incurred for that cost. That is, what activity, if any, makes the cost variable?
- Is there one activity that “stands out?” Does this help us understand why organizations often use sales or production levels to assess cost variability?

**2.40 Traceability (LO3).** The Greek Corporation makes two products: Kappa and Gamma. Although each product uses a different type of raw material, the firm produces both products in its Eastern plant. The products make use of the same equipment as well. Greek Corporation produces Kappa during the day shift and Gamma during the night shift.

The following list presents six costs incurred by the Greek Corporation to produce Kappa:

Cost #	Description of Cost
1	Eastern plant rent
2	Raw materials purchased to produce Kappa
3	Eastern plant utilities and water
4	Salary of the Eastern plant manager
5	Equipment maintenance
6	Salary of a production employee who works the day shift at the Eastern plant

*Required:*

For each cost, classify whether it is direct (D) or indirect (I) with respect to Greek’s decision to produce the Kappa product. Provide a brief rationale for each classification.

**2.41 Revenue variability and traceability, not for profit (LO3).** The Johnson County Arts Foundation aims to promote the appreciation and practice of art in Johnson County and surrounding areas. Consistent with this mission, the foundation sponsors a number of exhibitions, conducts art classes, and promotes local artists. The foundation is considering three ways to raise money toward covering its operating expenses.

- Issue lottery tickets (\$50 each) for a “dream art vacation” for two to the “world-famous museums of London and Paris.” The foundation estimates the cost of the vacation at \$6,000.
- Host a charity dinner, with each ticket costing \$100. The caterer has offered the foundation a \$2,000 discount of his usual price. Select donors (who are likely to give money in the future as well) would be recognized and honored during the dinner.
- Conduct a silent auction for works by local artists. The artists and the foundation will share equally in the proceeds. The silent auction is a way for artists to gain exposure and potentially sell more of their work.

*Required:*

Identify the controllable benefits for each of three fund-raising options. Classify each benefit as being direct (D) or indirect (I) to the decision option. In addition, classify each revenue source as variable (V) or fixed (F).

**2.42 Hierarchical cost structure: cost classifications (LO4).** Creative Tiles produces tiles embossed with leaf prints and other images in silhouette. When used on a wall or a floor, these tiles add color and texture, in addition to providing a focal point for the eye.

The process for making a tile is relatively straightforward. The first step is to prepare a clay-like bisque containing aluminum silicates, sand, and other commodity inputs. Since each type of tile designed is a unique product (Creative Tiles’ customers can choose from over 100 leaf prints), the tiles are formed using a custom mold and printed via a custom screen-printing process. The next step is to fire (i.e., bake) a batch of up to 1,000 tiles in an oven at temperatures that exceed 2,000° F. After cooling, the tiles

are finished, packed, and palletted. Using a forklift, workers move each pallet to the storeroom.

The following table lists eight costs incurred by Creative Tiles:

Cost #	Description of Cost
1	Sand used
2	Oven rental for the year
3	Power for firing the oven
4	Molds used
5	Hourly wages to employees who mix the clay
6	CEO salary
7	Prepare leaf print for image
8	Using forklifts to move finished goods from the factory floor to the storeroom.

*Required:*

Classify each cost as per the cost hierarchy. (i.e., classify each cost as being a unit-, batch-, product-, or facility-level cost). Provide a brief rationale for each classification.

- 2.43 Hierarchical cost structure: cost classifications (LO4).** Sun and Sand Hotels (S&S), an exclusive beach resort, offers all-inclusive vacations—the package price includes the room, food, and access to all facilities. However, alcoholic beverages and special services (e.g., boat tours) are extra. S&S offers many attractions such as an enclosed lagoon within which guests may pet dolphins. The resort also offers snorkeling and diving tours at a nearby coral reef. Sun and Sand is interested in calculating its cost to host a typical member. Customers usually are couples, and the average couple stays for three nights and four days.

*Required:*

Treating the number of couples as a unit of activity, identify a unit-, batch-, product- and facility level cost for Sun and Sand.

- 2.44 Step costs (LO4).** Consider the following two settings. Setting 1: Westin, Inc., is estimating the cost of supervision at its many plants. The firm's policy is to have one supervisor per 15 employees. Westin's cost analyst mistakenly classified the supervision costs as a unit-level cost that varies in the number of employees.
- Setting 2: Westin also employs one product engineer per product line. The cost analyst also incorrectly classified this product-level cost as a unit-level cost. He then divided the cost by the number of units Westin expects to produce to calculate a product engineering cost per unit.

*Required:*

- Suppose Westin uses the analyst's estimate of the cost of supervision per employee to estimate supervision cost. Would you expect the estimate to be higher, lower, or the same as the true cost?
- Suppose Westin uses the analyst's estimate of the product engineering cost to estimate the cost associated with the product engineer. Would you expect the estimate to be higher, lower, or the same as the true cost?

## PROBLEMS

- 2.45 Controllability and relevance (LO1).** Rams Ramachandran is considering the wisdom of reducing the number of suppliers his firm uses. Currently, Rams uses 25 suppliers to purchase goods worth \$2,500,000 per year. To manage the orders and coordinate with suppliers, Rams employs one manager and two clerical staff. The manager earns \$65,000 per year and each clerical staff person earns \$35,000 per year. (As VP, Rams earns \$175,000 annually.) Reducing the number of suppliers from 25 to 6 would allow Rams' firm to free up one of the clerical staff. While the manager would supervise fewer people, she also would interact more with each supplier; thus, her workload would not change appreciably.

Rams bargains aggressively with suppliers, and, with 25 suppliers, he was anticipating a 3% savings in purchase costs next year. With only six suppliers, however, each supplier would have greater bargaining power, eliminating Rams' ability to reduce the

prices paid for goods. Finally, Rams believes that better coordination with fewer suppliers would increase service quality (e.g., a lower risk of stock outs and other problems), and he estimates the cost savings at \$100,000 per year.

*Required:*

- a. Classify the following costs as to their controllability and relevance for Rams' decision: (1) Cost of goods purchased; (2) Clerical staff salaries; (3) Manager's salary; (4) Service quality cost savings; and (5) Rams' salary.
- b. Should Rams use 25 or 6 suppliers?

**2.46 Controllability and relevance (LO1).** Brandt Heating and Cooling is a reputed HVAC (heating, ventilation, and air-conditioning) contractor. Tim Brandt has a reputation for doing quality work and for treating the customer "right." Brandt serves both homeowners and building contractors. The following table presents Brandt's income statement for the most recent year:

<i>Item</i>	<i>Amount</i>	<i>Detail</i>
Revenues from homeowners	\$275,000	
Revenues from contractors	525,000	
Direct costs	500,000	Materials used in jobs plus the cost of hourly labor.
Rental cost	30,000	For the office building.
Trucks and other equipment	65,000	Brandt has a fleet of trucks used by technicians to travel to job sites. This amount also includes costs for operating and maintaining trucks and other equipment.
Administrative costs	85,000	For the part-time accountant, receptionist, and supervisor.
Profit	<u>\$120,000</u>	

Tim believes that while contractors are important from a volume perspective, homeowners are more profitable. Unlike homeowners, building contractors "know the business" and negotiate aggressively.

*Required:*

For each of the following three decisions, classify whether each item on Brandt's income statement is controllable and/or relevant. Explain why an item may be controllable/relevant for some decisions but not for other decisions.

1. Whether to give a \$50 discount to a regular homeowner customer who complained about the technician showing up late.
2. Whether to send a technician to obtain training in high-voltage work. (This service would appeal to contractors but not homeowners.)
3. Whether to replace an aging truck with a newer model.

**2.47 Controllability and relevance (LO1).** Motown Manufacturing makes trumpets and other fine musical instruments. Motown currently is deciding whether to buy 100 units of a component for piccolos from an outside supplier or to make them in-house. The status quo option of doing nothing is not feasible—Motown will either buy the component or make the component.

If Motown buys the component from an outside supplier, it will pay the supplier \$500 per unit. Motown will also pay \$50 per unit to inspect the component and spend an additional \$400 per unit in materials and labor to convert each component into a finished product. Motown sells the finished piccolos to consumers for \$1,500 each.

Making the component in-house requires \$200 worth of brass and \$175 worth of a special African Blackwood called Mpingo. Motown routinely purchases and uses brass in its operations, and it does not currently have any brass in inventory. The special wood is unique to the component in question, and Motown currently has \$10,000 worth in stock. Motown will dispose of the Mpingo wood (at a net value of zero) if the company

pursues the buy option. Making the component in-house also requires labor at a cost of \$25 per hour. It takes employees 10 hours to make one component.

As under the buy option, Motown will pay \$50 per unit to inspect the component if it is made in-house and spend an additional \$400 per unit in materials and labor to convert each component into a finished product. Motown will then sell the finished piccolos to consumers for \$1,500 each.

*Required:*

- a. What are the controllable costs and benefits associated with the buy option? What are the controllable costs and benefits associated with the make option?
- b. What are the relevant costs and benefits associated with the make option? What are the relevant costs and benefits associated with the buy option?

**2.48 Controllability and relevance (LO1).** Exactly one year ago, Gamma Machinery purchased a lathe for \$300,000. At the time of purchase, Gamma expected the lathe to generate a net cash inflow of \$120,000 per year for three years. Recently, another firm located in the same industrial park went into bankruptcy. The bankrupt firm's liquidators have offered to sell their client's sophisticated lathe to Gamma for \$400,000 even though their client paid \$800,000 for it one year ago.

The bankrupt firm's lathe has a superior control system that would significantly improve Gamma's machining capabilities. Moreover, if Gamma replaces its current lathe, it will be able to increase its net cash inflow to \$250,000 per year for each of the next two years. If Gamma purchases the lathe, the company can either retain its current lathe for miscellaneous jobs or sell it. The miscellaneous jobs will produce an additional net cash inflow of \$50,000 per year for the next two years. Gamma can sell its current lathe today for \$170,000. Both lathes will be worth \$0 in two years.

Gamma must decide whether to purchase the bankrupt firm's lathe and, if it does, what to do with its own lathe. Gamma's goal is to maximize its net cash flow over the next two years. (As discussed in Chapter 1, the goal of maximizing profits is, in the long run, equivalent to the goal of maximizing cash flows).

*Note:* A lathe is a machine tool that spins a block of material, such as steel or wood, about a horizontal axis. Applying cutting tools to the block produces an object symmetric with respect to the axis of rotation. Sophisticated lathes use many tools and can shape the material along all three axes. Examples of products produced using lathes include candlesticks, table legs, and baseball bats.

*Required:*

- a. Identify Gamma's decision options. Is the status quo a feasible option?
- b. What are the controllable and relevant costs and benefits for Gamma's decision?
- c. Assume that Gamma is committed to buying the new lathe. Thus, the status quo is not a feasible option. In this case, what are the controllable and relevant costs and benefits for Gamma's decision?

**2.49 Controllability of revenues and decision horizons (LO1, LO2, Advanced).** The Terrapin Coffeehouse currently has one downtown location. The shop offers a number of different types of coffees and espressos, brewed to the customer's order. Terrapin also offers a limited selection of cakes and pastries.

*Required:*

Classify each of the following decisions as to its horizon. Indicate whether the effect on revenue arises primarily from the decision's impact on the *price* of goods and services, the *quantity* of goods and services demanded, or *both*. What conclusions do you draw about the controllability of price and quantity (the components of revenue) across decision horizons?

1. How much to spend on advertising in the local newspaper. Terrapin is relatively new to the area and does not have the name recognition enjoyed by some of the other coffeehouses competing in the same market.
2. Offering a points program with 1 point for each dollar spent in the store. Customers can redeem 25 points for a beverage of their choice.
3. Increasing the variety in the types of coffees offered from four to eight. Management has noticed that about 10% of customers would not find their chosen flavor and would have to settle for their second (and occasionally third) choice.
4. Adding to product variety by offering goat milk and soymilk-based drinks.

5. Increasing the flow of customers by reconfiguring the counter layout. Currently, having as few as five customers in line can block the entrance and make the shop look full from the outside even though plenty of seating is available inside.
6. Opening a branch in a suburb renowned for housing many “single and affluent professionals.”

**2.50 Controllability and time (LO1).** The following are three decisions that Joel Stager needs to make. Joel manages an up-market restaurant in Miami, Florida, and has considerable discretion over its operations.

**Decision 1:** Whether to convert the restaurant from a European to an Asian theme. This change will require substantial redecoration.

**Decision 2:** Which celebrity chefs to showcase? The restaurant usually invites three or four celebrity chefs during the year to take over the restaurant for a week. In consultation with the regular chef, the celebrity chef designs the menu for that fortnight, often contributing several secret recipes or helping build a theme.

**Decision 3:** Whether to accept a booking for a wedding reception. The reception will take over the entire restaurant for one evening. While some costs will increase (e.g., for rearranging seating), others will decrease (everyone will have the same meal).

*Required:*

- a. Classify each of the three decisions as per their time horizon.
- b. Classify the following costs and benefits as being controllable or noncontrollable with respect to the three decisions.
  1. Average revenue per patron
  2. Cost of meals served
  3. Cost of printing restaurant menus
  4. Salaries for chef and other kitchen staff
  5. Building rental cost

**2.51 Classifying decisions by time; cost commitment (LO2).** Anne Larson graduated from Prestige U. three years ago with a degree in accounting. She currently is a rising star in a national accounting firm. Although she enjoys her job, Anne has decided to leave and pursue an MBA as a way to accelerate her career. To this end, Anne has procured admission to two top-tier MBA programs in California. Having grown up in Baltimore, Maryland, and currently stationed in Cleveland, Ohio, Anne is eager to spread her wings and explore sunny California!

The following table lists nine decisions that Anne likely will be making in the near future:

Decision #	Description of Decision
1	Reconsider the decision to get an MBA. (Anne has not yet quit her job!)
2	Decide whether to pay first-semester tuition by check or by credit card. (Each month, Anne pays off her credit card balance in full.)
3	Choose a major (accounting, finance, or marketing).
4	Choose the courses to take in the first semester.
5	Decide whether to buy new clothes (to fit the student lifestyle) or to make do with her current business clothes.
6	Decide whether to have a part-time job while in the MBA program.
7	Decide whether to spend the next few weeks brushing up on math and economics or to spend the time taking a vacation before school starts.
8	Decide whether to live in a studio apartment or to share a two-bedroom apartment.
9	Choosing which of the two MBA programs to join.

*Required:*

- a. Classify each decision according to its time horizon (short term or long term). Provide a brief rationale for each classification.

- b. Consider the following three costs associated with going to school: (1) tuition, (2) housing, and (3) books. For decisions 1 and 2 (i.e., reconsidering whether to get the MBA and deciding how to pay tuition), classify whether or not each of these three costs is controllable. What relation do you observe between the decision horizon and cost controllability?

**2.52 Variability and controllability (LO1, LO3).** The Malabar Company specializes in imported novelty items from Asian countries such as Thailand, Indonesia, and China. The firm, headquartered in San Jose, California, has franchised over 70 stores in upscale malls throughout the United States. Currently, Malabar's management is deciding whether to open a new store in a large mall in Chicago, Illinois.

The following table lists ten of Malabar's costs:

Cost #	Description of Cost
1	Sales commissions
2	Cost of merchandise
3	Salaries to sales staff
4	Salary to store manager
5	Display and stocking expenses
6	Advertising on national television
7	Advertising in local newspapers
8	Store cleaning and maintenance
9	Transportation of goods to stores
10	Central purchasing department

*Required:*

Classify each cost as being fixed (F), mixed (M), or variable (V) with respect to the sales volume in any given store. In addition, classify each cost as being controllable (C) or noncontrollable (NC) for the decision regarding whether to open the new store in Chicago. Provide a brief explanation of your answers.

**2.53 Cost traceability and decision contexts (LO3).** Kyle Corp. is a diversified firm with numerous plants. Each plant is devoted to producing one or two product lines. Management is considering several options concerning the plant in Grand Junction, Nebraska. This plant currently makes toy farm equipment and miniature cars.

**Decision 1:** Whether to continue producing a deluxe version of the farm toys? The deluxe version uses the same machines as used by the regular models, but it has additional finishing and accessories.

**Decision 2:** Whether to continue making farm toys? The firm will dispose of the machines used for this product line if the firm discontinues the line. Most of the machines used for making farm toys are unique to the line but some of the die-casting machines are also used to stamp out miniature cars.

**Decision 3:** Whether to close the Grand Junction plant?

*Required:*

Classify the following costs with respect to their traceability for the three decisions listed.

1. Cost of special die used to make the deluxe version of farm toys. Each die can make enough toys to meet a year's demand.
2. Labor used to make the deluxe farm toy.
3. Cost of dedicated machines used to make farm toys.
4. Engineering support provided solely to maintain the farm toy line.
5. Advertising for farm toys.
6. Salary paid to the manager of the Grand Junction plant.
7. IT support provided by the head office to the Grand Junction plant.

**2.54 Controllability and cost hierarchy (LO1, LO4).** Consider the following list of costs and decisions for a retail store.

Cost items:

- a. Cost of goods purchased for resale
- b. Conducting orientation session for new employees.
- c. Setting up seasonal display of items
- d. Cost of shelving used in store.



Decisions:

1. Whether to offer a 10% price discount on specific items?
2. Whether to schedule orientation sessions on a weekly or bi-weekly basis.
3. How often to change seasonal displays.
4. Whether to change store layout to improve traffic patterns.

*Required:*

- a. Classify each cost as per the cost hierarchy.
- b. Classify the decisions as to their time horizon.
- c. Prepare a table that indicates the costs controllable for the given decision. Designate the four costs by letters, a through d.
- d. Based on your answers to the above parts, what inferences could you draw about the controllability of costs and the cost hierarchy?

**2.55 Traceability and cost hierarchy (LO3, LO4, Advanced).** “I don’t understand the purpose of the cost hierarchy,” complained Erika Vjih, a seasoned plant manager at a Fortune 500 firm. Erika argues that, ultimately, the units produced in her factory must cover all of the costs in the plant. Otherwise, the head office will shutter the plant. In other words, she argues that it makes sense to somehow charge each unit of the product with its “fair” share of all costs, wherever the cost appears in the cost hierarchy.

*Required:*

How would you respond to Erika’s criticism? Your answer should include how the items in the cost hierarchy relate to the concepts of controllability and traceability, and how the relations help managers make effective decisions.

**2.56 Traceability and variability (LO1, LO3, Advanced).** It is difficult to distinguish between direct and indirect labor in many modern manufacturing plants. An employee might participate in a design review team, work on maintenance, and produce components, all in the same day. Moreover, these plants are organized as a “factory within a factory,” meaning that each production line might be dedicated to a single product line. Thus, rather than grouping like machines together, the factory is organized around production processes for an individual product line. Each line would have its own labor, supervisors, production engineers, and so on, enabling it almost to act as a separate factory. This organization contrasts sharply with traditional systems where many product lines might share the machines.

*Required:*

What implication does the modern organization have for the traceability of costs? How does this change affect the controllability of costs for decisions that affect the volume of production? Decisions to add or drop products?

**2.57 Traceability and variability (LO1, LO3, Advanced).** Many firms outsource jobs today to countries with lower labor costs. Firms such as **Apple** outsource virtually all of their production. Over the last decade, U.S. firms also have outsourced business functions (e.g., telephone support, document processing) to firms in India and China.

*Required:*

What are the implications of outsourcing for the variability and traceability of costs? For concreteness, consider the outsourcing of (1) a product based on a piece-rate contract, and (2) a business process for a fixed-fee contract.

## MINI-CASES

**2.58 Traceability, variability, controllability, and relevance (LO1, LO3).** You and your four closest friends all love winter sports. Accordingly, you decide to spend some time during winter break at a nearby ski resort. You have reserved a chalet that will sleep six people, and you have paid a nonrefundable deposit for three nights (the resort has informed you that, if you decide to extend your trip, you can rent the chalet for up to three more nights at the same daily rate). You are contemplating driving as a group to the resort,

even though it would be a cramped ride. Finally, you decide that while each person will pay for his or her own food and drinks during the trip, you will equally share all common expenses.

*Required:*

- a. Classify (1) the cost of gasoline for driving, (2) the cost of food and drink, and (3) the cost of the chalet rental (for the first three nights) as being direct (D) or indirect (I) with respect to both the trip as a whole and each person.
- b. Classify (1) the cost of gasoline, (2) the cost of food and drinks, (3) the cost of the chalet rental for the first three nights, and (4) the cost of the chalet rental after the first three nights as being variable (V) or fixed (F). If the cost is variable, what activity determines the magnitude of the cost? How can you use these classifications to estimate the total cost of the vacation?
- c. Classify the following costs as per the cost hierarchy.
  1. Cost of food and drink during the trip
  2. Cost of the chalet rental
  3. Cost of obtaining premium TV channels in chalet
  4. Cost of time spent in planning trip
- d. Suppose that, instead of driving, you and your friends could take a bus to the ski resort. In this case, each person will pay his or her own bus fare. Classify the following costs as being controllable (C) or noncontrollable (NC) and relevant (R) or not relevant (NR) with respect to the friends' two transportation options (drive or take the bus) for the trip.
  1. Costs of operating the car
  2. Cost of the bus fare
  3. Cost of the chalet rental for the first three nights
  4. Cost of the chalet rental after the first three nights

**2.59 Cost variability, step costs (LO3, LO4).** Christine Mbai owns and operates an extremely popular Montessori school in suburban Chicago. The school has its own private pickup and drop-off facilities. The following lists 12 costs Christine incurs in running her school:

Cost #	Description of Cost
1	Rent on school building
2	Lunches and lunch supplies (lunches are catered-in)
3	Teacher salaries
4	Utilities and water
5	Bus driver salaries
6	Art supplies
7	Janitorial services
8	Brochures and pamphlets (including monthly newsletter)
9	Receptionist salary
10	Field trip to the Museum of Science and Industry
11	Repainting the hallway
12	Fuel for buses

*Required:*

For each cost, classify and discuss whether you believe it will be fixed (F), variable (V), mixed (M), or jump in steps (S) with respect to the number of enrolled students in the coming term (semester). In addition, discuss any arguments that support a classification other than the one you have assigned.