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Principles of Accounting

Volume 2

Managerial Accounting

of a product or service and includes the expected, or standard, cost for the various cost components of each unit, such as materials, labor, and overhead.

8.1 Explain How and Why a Standard Cost Is Developed

A syllabus is one way an instructor can communicate expectations to students. Students can use the syllabus to plan their studying to maximize their grade and to coordinate the amount and timing of studying for each course. Knowing what is expected, and when it is expected, allows for better plans and performance. When your performance does not match your expectations, a **variance** arises—a difference between the standard and the actual performance. You then need to determine why the difference occurred. You want to know why you did not receive the grade you expected so you can make adjustments for the next assignment to earn a better grade.

Companies operate in a similar manner. They have an expectation, or **standard**, for production. For example, if a company is producing tables, it might establish standards for such components as the amount of board feet of lumber expected to be used in producing each table or the number of hours of direct labor hours it expected to use in the table's production. These standards can then be used in establishing standard costs that can be used in creating an assortment of different types of budgets.

When a variance occurs in its standards, the company investigates to determine the causes, so they can perform better in the future. For example, General Motors has standards for each item on a vehicle. It can determine the cost and selling price of a power antenna by knowing the standard material cost for the antenna and the standard labor cost of adding the antenna to the vehicle. General Motors also can add up all of the standard times for all vehicles it makes to determine if too much or too little labor was used in production.

LINK TO LEARNING

Developing standards is a complicated and costly process. Review this article on how to develop a standard cost system (https://openstax.org/l/50StandardCost) for more details.

Fundamentals of Standard Costs

It is important to establish standards for cost at the beginning of a period to prepare the budget; manage material, labor, and overhead costs; and create a reasonable sales price for a good. A **standard cost** is an expected cost that a company usually establishes at the beginning of a fiscal year for prices paid and amounts used. The standard cost is an expected amount paid for materials costs or labor rates. The standard quantity is the expected usage amount of materials or labor. A standard cost may be determined by past history or industry norms. The company can then compare the standard costs against its actual results to measure its efficiency. Sometimes when comparing standard costs against actual results, there is a difference.

This difference can be attributed to many reasons. For example, the coffee company mentioned in the opening vignette may expect to pay $0.50 per ounce for coffee grounds. After the company purchased the coffee grounds, it discovered it paid $0.60 per ounce. This variance would need to be accounted for, and possible operational changes would occur as a result. Cost accounting systems become more useful to management when they include budgeted amounts to serve as a point of comparison with actual results.

Many departments help determine standard cost. Product design, in conjunction with production, purchasing, and sales, determines what the product will look like and what materials will be used. Production works with purchasing to determine what material will work best in production and will be the most cost efficient. Sales will also help decide the material in terms of customer demand. Production will work with personnel to determine labor costs for the product, which is based on how long it will take to make the product, which departments will be involved, and what type and number of employees it will take.

Consider how many different materials can go into a product. For example, there are approximately 14,000 parts that comprise the average automobile. The manufacturer will set a standard price and a quantity used per automobile for each part, and it will determine the labor required to install the part. At Fiat Chrysler Automobiles' Belvidere Assembly Plant, for example, there are approximately 5,000 employees assembling automobiles.[1] In addition to having standard costs associated with each part, each employee has standards for the job he or she performs.

Standard costs are typically established for reasonably attainable levels of efficiency (production). They serve as a target and are useful in motivating standard performance. An **ideal standard** level is set assuming that everything is perfect, machines do not break down, employees show up on time, there are no defects, there is no scrap, and materials are perfect. This level of standard is not the best motivator, because employees may see this level as unattainable. For example, consider whether you would take a course if the letter grades were as follows: an A is 99–100%, a B is 98–99%, a C is 97–98%, a D is 96–97%, and below 96% is an F. These standards are unreasonable and unrealistic, and they would not motivate students to do well in the course.

At the other end of the spectrum, if the standards are too easy, there is little motivation to do better, and products may not be properly built, may be built with inferior materials, or both. For example, consider how you would handle the following grading scale for your course: an A is 50–100%, a B is 35–50%, a C is 10–35%, a D is 2–10%, and below 2% is an F. Would you learn anything? Would you try very hard? The same considerations come into play for employees with standards that are too easy.

Instead of these two extremes, a company would set an **attainable standard**, which is one that employees can reach with reasonable effort. The standards are not so high that employees will not try to reach them and not so low that they do not give any incentive for employees to achieve profitability.

In order for a company to establish its attainable standard cost for each product, it must consider the standard costs for materials, labor, and overhead. The material standard cost consists of a standard price per unit of material and a standard amount of material per unit. Returning to the opening vignette, let us say the coffee shop is trying to establish the standard materials cost for one cup of regular coffee. To keep the example simple, we are not incorporating the cost of water or the ceramic cup cost (since they are reused). Two components for the cup of coffee will need to be considered:

1. Price per ounce of coffee grounds
2. Amount of coffee grounds (materials) used per cup of coffee

To determine the standards for labor, the coffee shop would need to consider two additional components:

1. Labor rate per minute
2. Amount of time to make one cup of regular coffee

To determine the standard for overhead, the coffee shop would first need to consider the fact that it has two types of overhead as shown in Figure 8.2. Greater detail about the calculation of the variable and fixed overhead is provided in Compute and Evaluate Overhead Variances.

1 "Belvidere Assembly Plant and Belvidere Satellite Stamping Plant." Fiat Chrysler Automobiles. June 2018. http://media.fcanorthamerica.com/newsrelease.do?id=323&mid=1

1. Fixed overhead (does not change in total with production)
2. Variable overhead (does change in total with production)

All of this information is entered on a standard cost card.

STANDARD COST CARD

Product: 1 Cup of Coffee

Manufacturing Cost Information	Standard Quantity	×	Standard Cost per Unit	=	Cost Summary
Direct Materials					
Material (coffee grounds)	0.5 ounces		$.50 per ounce		$0.25
Direct Labor					
Barista	1 minute		$0.20 per minute		$0.20
Manufacturing Overhead					
Variable overhead	1 minute		$0.05 per direct labor minute		$0.05
Fixed overhead	1 minute		$0.10 per direct labor minute		$0.10
Standard Cost per cup of coffee					**$0.60**

Figure 8.2 Standard Cost Card for a Coffee Shop. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Once a company determines a standard cost, they can then evaluate any variances. A variance is the difference between a standard cost and actual performance. There are favorable and unfavorable variances. A **favorable variance** involves spending less, or using less, than the anticipated or estimated standard. An **unfavorable variance** involves spending more, or using more, than the anticipated or estimated standard. Before determining whether the variance is favorable or unfavorable, it is often helpful for the company to determine why the variance exists.

YOUR TURN

Developing a Standard Cost Card

Use the information provided to create a standard cost card for production of one deluxe bicycle from Bicycles Unlimited.

To make one bicycle it takes four pounds of material. The material can usually be purchased for $5.25 per pound. The labor necessary to build a bicycle consists of two types. The first type of labor is assembly, which takes 2.75 hours. These workers are paid $11.00 per hour. The second type of labor is finishing, which takes 4 hours. These workers are paid $15.00 per hour. Overhead is applied using labor hours. The variable overhead rate is $5.00 per labor hour. The fixed overhead rate is $3.00 per hour.

Solution

Manufacturing Cost Information	Standard Quantity	×	Standard Cost per Unit	=	Cost Summary
Direct Materials					
Grade A material	4 pounds		$5.25 per pound		$21.00
Direct Labor					
Assembly	2.75 hours		$11.00 per hour		$30.25
Finish	4 hours		$15.00 per hour		$60.00
Manufacturing Overhead					
Variable overhead	6.75 hours		$5.00 per direct labor hour		$33.75
Fixed overhead	6.75 hours		$3.00 per direct labor hour		$20.25
Standard Cost					$165.25

ETHICAL CONSIDERATIONS

Ethical Variance Analysis

Variance analysis allows managers to see whether costs are different than planned. Once a difference between expected and actual costs is identified, variance analysis should delve into why the costs differ and what the magnitude of the difference means. To determine why a cost differs, it should be established if the additional cost provides a benefit or detriment to an organization's stakeholders, the people or entities that are affected by the organization's actions or inactions. Not all stakeholders are equal in the analysis, but an organization should recognize each stakeholder's interest in the organization's business and operational decisions, while ranking the importance of the stakeholder in relation to any decision made.

Ranking should look to how stakeholders are affected by costs and any decisions related to cost variance, or why the variance occurred. For example, if a cost variance is due to an additional cost to make a product eco-friendly, then an organization may determine that incurring the cost is a benefit to its stakeholders. However, if the additional cost creates an unfavorable situation for a stakeholder, the process incurring the cost should be investigated. Remember that the owners of a company, including shareholders, are also stakeholders. To determine the best course of action for an organization, cost analysis should help inform stakeholder analysis—the process of systematically gathering and analyzing all of the information related to a business decision.

Different factors may produce a variance. The company could have paid too much or too little for production. It may have purchased the wrong grade of material or hired employees with more or less experience than required. Sometimes the variances are interrelated. For example, purchasing substandard materials may lead to using more time to make the product and may produce more scrap. The substandard material may have been more difficult to work with or had more defects than the proper grade material. In such a situation, a favorable material price variance could cause an unfavorable labor efficiency variance and an unfavorable material quantity variance. Employees who do not have the expected experience level may save money in the wage rate but may require more hours to be worked and more material to be used because of their inexperience.

Another situation in which a variance may occur is when the cost of labor and/or material changes after the

standard was established. Toward the end of the fiscal year, standards often become less reliable because time has passed and the environment has changed. It is not reasonable to expect the price of all materials and labor to remain constant for 12 months. For example, the grade of material used to establish the standard may no longer be available.

Manufacturing Cost Variances

As you've learned, the standard price and standard quantity are anticipated amounts. Any change from these budgeted amounts will produce a variance. There can be variances for materials, labor, and overhead. Direct materials may have a variance in price of materials or quantity of materials used. Direct labor may have a variance in the rate paid to workers or the amount of time used to make a product. Overhead may produce a variance in expected fixed or variable costs, leading to possible differences in production capacity and management's ability to control overhead. More specifics on the formulas, processes, and interpretations of the direct materials, direct labor, and overhead variances are discussed in each of this chapter's following sections.

CONCEPTS IN PRACTICE

Qualcomm[2]

Qualcomm Inc. is a large producer of telecommunications equipment focusing mainly on wireless products and services. As with any company, Qualcomm sets labor standards and must address any variances in labor costs to stay on budget, and control overall manufacturing costs.

In 2018, Qualcomm announced a reduction to its labor force, affecting many of its full-time and temporary workers. The reduction in labor was necessary to suppress rising expenses that could not be controlled through overhead or materials cost-cutting measures. The variances between standard labor rates and actual labor rates, and diminishing profit margins will have contributed to this decision. It is important for Qualcomm management to keep labor variances minimal in the future so that large workforce reductions are not required to control costs.

THINK IT THROUGH

Chocolate Cow Ice Cream Company

The Chocolate Cow Ice Cream Company has grown substantially recently, and management now feels the need to develop standards and compute variances. A consulting firm was hired to develop the standards and the format for the variance computation. One standard in particular that the consulting firm developed seemed too excessive to plant management. The consulting firm's standard was production of 100 gallons of ice cream every 45 minutes. The plant's middle level of management thought the standard should be 100 gallons every 55 minutes, while the top management of the

2 Munsif Vengattil. "Qualcomm Begins Layoffs as Part of Cost Cuts." *Reuters*. April 18, 2018. https://www.reuters.com/article/us-qualcomm-layoffs/qualcomm-begins-layoffs-as-part-of-cost-cuts-idUSKBN1HP33L

company thought that the consulting firm's standard would provide more motivation to the employees.

1. Why is the company establishing a standard for production?
2. What are some factors the company may need to consider before selecting one of the proposed standards?

8.2 Compute and Evaluate Materials Variances

As you've learned, direct materials are those materials used in the production of goods that are easily traceable and are a major component of the product. The amount of materials used and the price paid for those materials may differ from the standard costs determined at the beginning of a period. A company can compute these materials variances and, from these calculations, can interpret the results and decide how to address these differences.

CONCEPTS IN PRACTICE

Buttering Popcorn

In a movie theater, management uses standards to determine if the proper amount of butter is being used on the popcorn. They train the employees to put two tablespoons of butter on each bag of popcorn, so total butter usage is based on the number of bags of popcorn sold. Therefore, if the theater sells 300 bags of popcorn with two tablespoons of butter on each, the total amount of butter that should be used is 600 tablespoons. Management can then compare the predicted use of 600 tablespoons of butter to the actual amount used. If the actual usage of butter was less than 600, customers may not be happy, because they may feel that they did not get enough butter. If more than 600 tablespoons of butter were used, management would investigate to determine why. Some reasons why more butter was used than expected (unfavorable outcome) would be because of inexperienced workers pouring too much, or the standard was set too low, producing unrealistic expectations that do not satisfy customers.

Fundamentals of Direct Materials Variances

The direct materials variances measure how efficient the company is at using materials as well as how effective it is at using materials. There are two components to a **direct materials variance**, the direct materials price variance and the direct materials quantity variance, which both compare the actual price or amount used to the standard amount.

Direct Materials Price Variance

The **direct materials price variance** compares the actual price per unit (pound or yard, for example) of the direct materials to the standard price per unit of direct materials. The formula for direct materials price variance is calculated as:

$$\text{Direct Materials Price Variance} = \left(\begin{matrix}\text{Actual Quantity Used} \\ \times \\ \text{Actual Price Paid}\end{matrix}\right) - \left(\begin{matrix}\text{Actual Quantity Used} \\ \times \\ \text{Standard Price}\end{matrix}\right)$$

Factoring out actual quantity used from both components of the formula, it can be rewritten as:

$$\text{Direct Materials Price Variance} = \left(\begin{matrix}\text{Actual Price per} \\ \text{Unit of Materials}\end{matrix} - \begin{matrix}\text{Standard Price per} \\ \text{Unit of Materials}\end{matrix}\right) \times \begin{matrix}\text{Actual Quantity of} \\ \text{Materials Used}\end{matrix}$$

With either of these formulas, the actual quantity used refers to the actual amount of materials used to create one unit of product. The standard price is the expected price paid for materials per unit. The actual price paid is the actual amount paid for materials per unit. If there is no difference between the standard price and the actual price paid, the outcome will be zero, and no price variance exists.

If the actual price paid per unit of material is lower than the standard price per unit, the variance will be a favorable variance. A favorable outcome means you spent less on the purchase of materials than you anticipated. If, however, the actual price paid per unit of material is greater than the standard price per unit, the variance will be unfavorable. An unfavorable outcome means you spent more on the purchase of materials than you anticipated.

The actual price can differ from the standard or expected price because of such factors as supply and demand of the material, increased labor costs to the supplier that are passed along to the customer, or improvements in technology that make the material cheaper. The producer must be aware that the difference between what it expects to happen and what actually happens will affect all of the goods produced using these particular materials. Therefore, the sooner management is aware of a problem, the sooner they can fix it. For that reason, the material price variance is computed at the time of purchase and not when the material is used in production.

Let us consider an example. Connie's Candy Company produces various types of candies that they sell to retailers. Connie's Candy establishes a standard price for candy-making materials of $7.00 per pound. Each box of candy is expected to use 0.25 pounds of candy-making materials. Connie's Candy found that the actual price of materials was $6.00 per pound. They still actually use 0.25 pounds of materials to make each box. The direct materials price variance computes as:

$$\text{Direct Materials Price Variance} = (\$6.00 - \$7.00) \times 0.25 \text{ lb.} = \$0.25 \text{ or } \$0.25 \text{ (Favorable)}$$

In this case, the actual price per unit of materials is $6.00, the standard price per unit of materials is $7.00, and the actual quantity used is 0.25 pounds. This computes as a favorable outcome. This is a favorable outcome because the actual price for materials was less than the standard price. As a result of this favorable outcome information, the company may consider continuing operations as they exist, or could change future budget projections to reflect higher profit margins, among other things.

Let us take the same example except now the actual price for candy-making materials is $9.00 per pound. The direct materials price variance computes as:

$$\text{Direct Materials Price Variance} = (\$9.00 - \$7.00) \times 0.25 \text{ lbs.} = \$0.50 \text{ or } \$0.50 \text{ (Unfavorable)}$$

In this case, the actual price per unit of materials is $9.00, the standard price per unit of materials is $7.00, and the actual quantity used is 0.25 pounds. This computes as an unfavorable outcome. This is an unfavorable outcome because the actual price for materials was more than the standard price. As a result of this unfavorable outcome information, the company may consider using cheaper materials, changing suppliers, or

increasing prices to cover costs.

Another element this company and others must consider is a direct materials quantity variance.

THINK IT THROUGH

Don't "Skirt" the Issue

You run a fabric store and order materials through a supplier. At the end of the month, you review your materials cost and discover that your direct materials price and quantity variances produced unfavorable results. What could be attributed to these unfavorable outcomes? How would these unfavorable outcomes impact the total direct materials variance?

Direct Materials Quantity Variance

The **direct materials quantity variance** compares the actual quantity of materials used to the standard materials that were expected to be used to make the actual units produced. The variance is calculated using this formula:

$$\text{Direct Materials Quantity Variance} = \left(\begin{array}{c}\text{Actual Quantity Used} \\ \times \\ \text{Standard Price}\end{array}\right) - \left(\begin{array}{c}\text{Standard Quantity} \\ \times \\ \text{Standard Price}\end{array}\right)$$

Factoring out standard price from both components of the formula, it can be rewritten as:

$$\text{Direct Materials Quantity Variance} = \left(\begin{array}{c}\text{Actual Quantity of} \\ \text{Materials Used} \\ \text{for Units Produced}\end{array} - \begin{array}{c}\text{Standard Quantity} \\ \text{of Materials Expected} \\ \text{for the Units Produced}\end{array}\right) \times \begin{array}{c}\text{Standard} \\ \text{Price}\end{array}$$

With either of these formulas, the actual quantity used refers to the actual amount of materials used at the actual production output. The standard price is the expected price paid for materials per unit. The standard quantity is the expected amount of materials used at the actual production output. If there is no difference between the actual quantity used and the standard quantity, the outcome will be zero, and no variance exists.

If the actual quantity of materials used is less than the standard quantity used at the actual production output level, the variance will be a favorable variance. A favorable outcome means you used fewer materials than anticipated, to make the actual number of production units. If, however, the actual quantity of materials used is greater than the standard quantity used at the actual production output level, the variance will be unfavorable. An unfavorable outcome means you used more materials than anticipated to make the actual number of production units.

The actual quantity used can differ from the standard quantity because of improved efficiencies in production, carelessness or inefficiencies in production, or poor estimation when creating the standard usage.

Consider the previous example with Connie's Candy Company. Connie's Candy established a standard price for candy-making materials of $7.00 per pound. Each box of candy is expected to use 0.25 pounds of candy-making materials. Connie's Candy found that the actual quantity of candy-making materials used to produce one box of candy was 0.20 per pound. The direct materials quantity variance computes as:

$$\text{Direct Materials Quantity Variance} = (0.20\text{ lb.} - 0.25\text{ lb.}) \times \$7.00 = -\$0.35 \text{ or } \$0.35 \text{ (Favorable)}$$

In this case, the actual quantity of materials used is 0.20 pounds, the standard price per unit of materials is $7.00, and the standard quantity used is 0.25 pounds. This computes as a favorable outcome. This is a favorable outcome because the actual quantity of materials used was less than the standard quantity expected at the actual production output level. As a result of this favorable outcome information, the company may consider continuing operations as they exist, or could change future budget projections to reflect higher profit margins, among other things.

Let us take the same example except now the actual quantity of candy-making materials used to produce one box of candy was 0.50 per pound. The direct materials quantity variance computes as:

$$\text{Direct Materials Quantity Variance} = (0.50\text{ lb.} - 0.25\text{ lb.}) \times \$7.00 = \$1.75 \text{ or } \$1.75 \text{ (Unfavorable)}$$

In this case, the actual quantity of materials used is 0.50 pounds, the standard price per unit of materials is $7.00, and the standard quantity used is 0.25 pounds. This computes as an unfavorable outcome. This is an unfavorable outcome because the actual quantity of materials used was more than the standard quantity expected at the actual production output level. As a result of this unfavorable outcome information, the company may consider retraining workers to reduce waste or change their production process to decrease materials needs per box.

The combination of the two variances can produce one overall total direct materials cost variance.

LINK TO LEARNING

Watch this video featuring a professor of accounting walking through the steps involved in calculating a material price variance and a material quantity variance (https://openstax.org/l/50Variances) to learn more.

Total Direct Materials Cost Variance

When a company makes a product and compares the actual materials cost to the standard materials cost, the result is the **total direct materials cost variance**.

$$\text{Total Direct Materials Variance} = \left(\begin{matrix}\text{Actual Quantity} \\ \times \\ \text{Actual Price}\end{matrix}\right) - \left(\begin{matrix}\text{Standard Quantity} \\ \times \\ \text{Standard Price}\end{matrix}\right)$$

An unfavorable outcome means the actual costs related to materials were more than the expected (standard) costs. If the outcome is a favorable outcome, this means the actual costs related to materials are less than the expected (standard) costs.

The total direct materials cost variance is also found by combining the direct materials price variance and the direct materials quantity variance. By showing the total materials variance as the sum of the two components, management can better analyze the two variances and enhance decision-making.

Figure 8.3 shows the connection between the direct materials price variance and direct materials quantity variance to total direct materials cost variance.

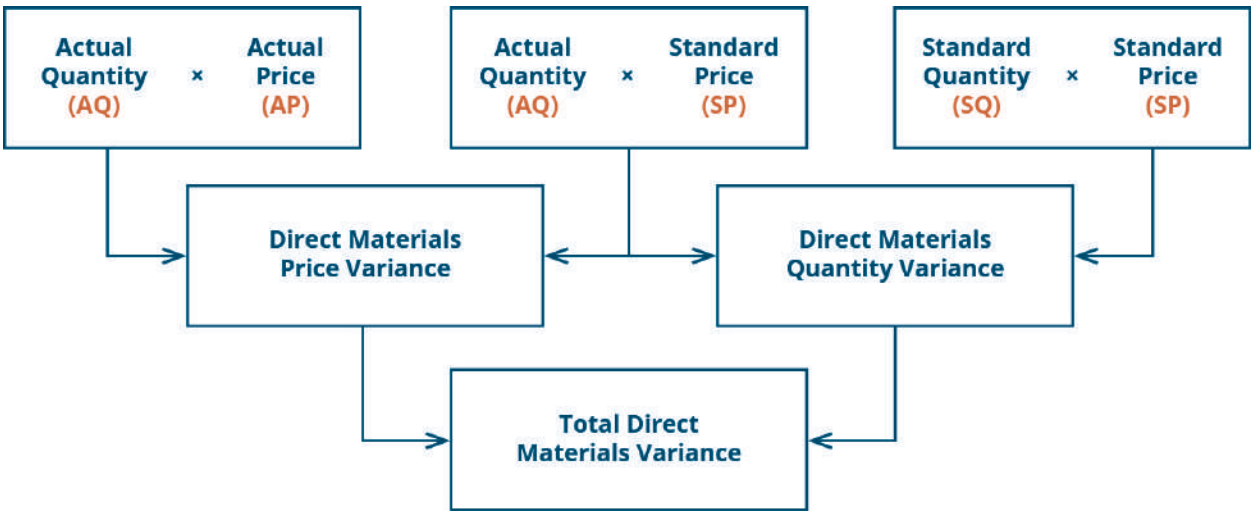


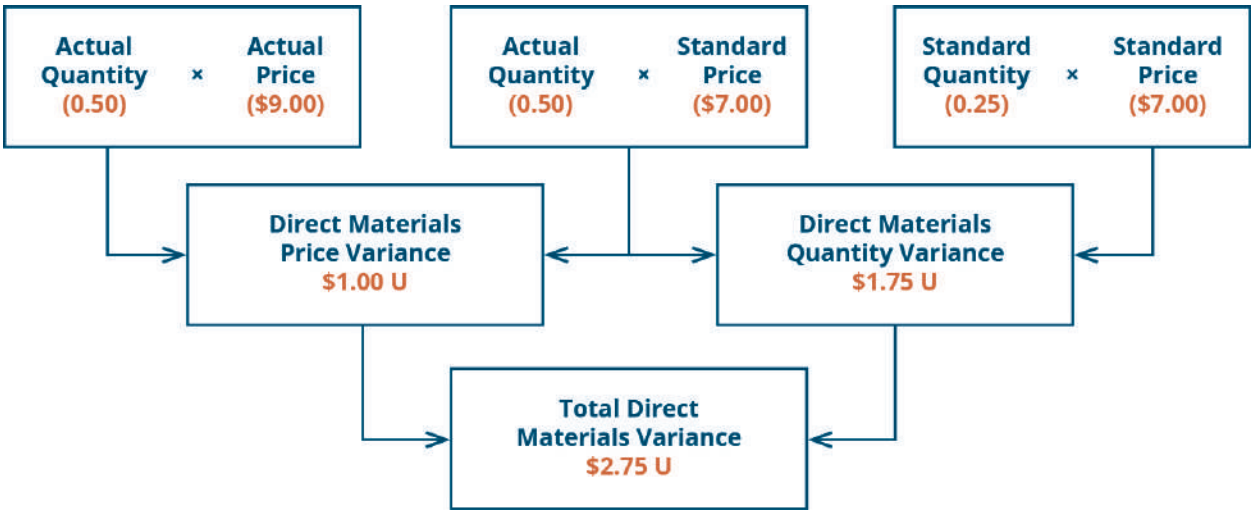
Figure 8.3 Direct Materials Variance.

For example, Connie's Candy Company expects to pay $7.00 per pound for candy-making materials but actually pays $9.00 per pound. The company expected to use 0.25 pounds of materials per box but actually used 0.50 per box. The total direct materials variance is computed as:

$$\text{Total Direct Materials Variance} = (0.50 \text{ lbs.} \times \$9.00) - (0.25 \text{ lbs.} \times \$7.00) = \$4.50 - \$1.75 = \$2.75 \text{ (Unfavorable)}$$

In this case, two elements contribute to the unfavorable outcome. Connie's Candy paid $2.00 per pound more for materials than expected and used 0.25 pounds more of materials than expected to make one box of candy.

The same calculation is shown using the outcomes of the direct materials price and quantity variances.



As with the interpretations for the materials price and quantity variances, the company would review the individual components contributing to the overall unfavorable outcome for the total direct materials variance, and possibly make changes to production elements as a result.

YOUR TURN

Sweet and Fresh Shampoo Materials

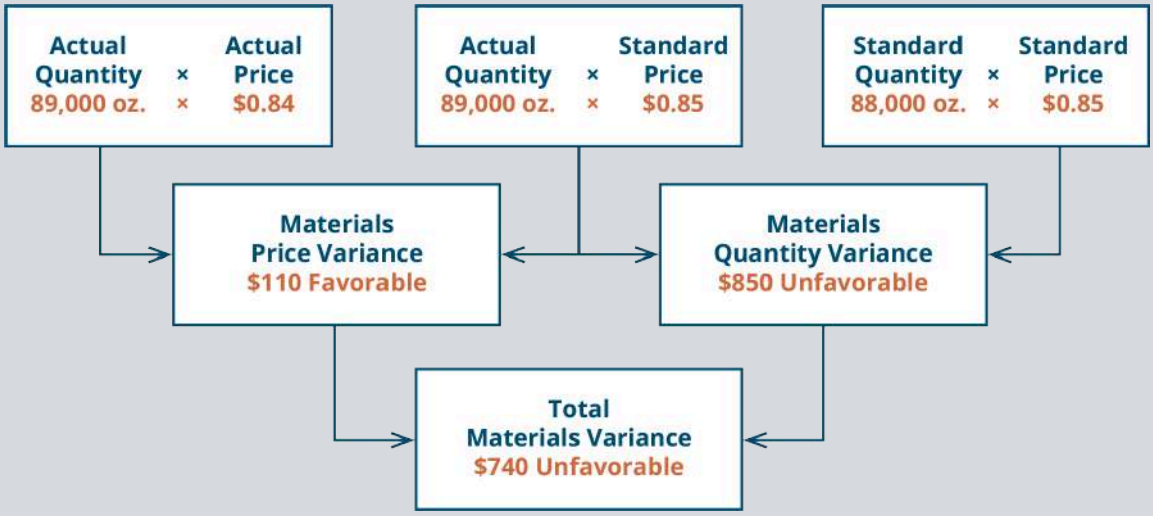
Biglow Company makes a hair shampoo called Sweet and Fresh. Each bottle has a standard material cost of 8 ounces at $0.85 per ounce. During May, Biglow manufactured 11,000 bottles. They bought 89,000 ounces of material at a cost of $74,760. All 89,000 ounces were used to make the 11,000 bottles. Calculate the material price variance and the material quantity variance.

Solution

Actual price per pound: 74,760/89,000 = $0.84

Material price variance: 89,000 × (0.84 − 0.85) = $890 favorable

Material quantity variance: 0.85 × (89,000 − 88,000) = $850 unfavorable



8.3 Compute and Evaluate Labor Variances

In addition to evaluating materials usage, companies must assess how efficiently and effectively they are using labor in the production of their products. Direct labor is a cost associated with workers working directly in the production process. The company must look at both the quantity of hours used and the rate of the labor and compare outcomes to standard costs. Determining efficiency and effectiveness of labor leads to individual labor variances. A company can compute these labor variances and make informed decisions about labor operations based on these differences.

Fundamentals of Direct Labor Variances

The **direct labor variance** measures how efficiently the company uses labor as well as how effective it is at pricing labor. There are two components to a labor variance, the direct labor rate variance and the direct labor time variance.

Direct Labor Rate Variance

The **direct labor rate variance** compares the actual rate per hour of direct labor to the standard rate per hour of labor for the hours worked. The direct labor rate variance is calculated using this formula:

$$\text{Direct Labor Rate Variance} = \left(\begin{matrix}\text{Actual Hours Worked} \\ \times \\ \text{Actual Rate per Hour}\end{matrix}\right) - \left(\begin{matrix}\text{Actual Hours Worked} \\ \times \\ \text{Standard Rate per Hour}\end{matrix}\right)$$

Factoring out the actual hours worked from both components of the formula, it can be rewritten as

$$\text{Direct Labor Rate Variance} = \left(\begin{matrix}\text{Actual Rate} \\ \text{per Hour}\end{matrix} - \begin{matrix}\text{Standard Rate} \\ \text{per Hour}\end{matrix}\right) \times \begin{matrix}\text{Actual Hours} \\ \text{Worked}\end{matrix}$$

With either of these formulas, the actual rate per hour refers to the actual rate of pay for workers to create one unit of product. The standard rate per hour is the expected rate of pay for workers to create one unit of product. The actual hours worked are the actual number of hours worked to create one unit of product. If there is no difference between the standard rate and the actual rate, the outcome will be zero, and no variance exists.

If the actual rate of pay per hour is less than the standard rate of pay per hour, the variance will be a favorable variance. A favorable outcome means you paid workers less than anticipated. If, however, the actual rate of pay per hour is greater than the standard rate of pay per hour, the variance will be unfavorable. An unfavorable outcome means you paid workers more than anticipated.

The actual rate can differ from the standard or expected rate because of supply and demand of the workers, increased labor costs due to economic changes or union contracts, or the ability to hire employees at a different skill level. Once the manufacturer makes the products, the labor costs will follow the goods through production, so the company should evaluate how the difference between what it expected to happen and what actually happened will affect all the goods produced using these particular labor rates.

Let us again consider Connie's Candy Company with respect to labor. Connie's Candy establishes a standard rate per hour for labor of $8.00. Each box of candy is expected to require 0.10 hours of labor (6 minutes). Connie's Candy found that the actual rate of pay per hour for labor was $7.50. They still actually required 0.10 hours of labor to make each box. The direct labor rate variance computes as:

$$\text{Direct Labor Rate Variance} = (\$7.50 - \$8.00) \times 0.10 \text{ hours} = -\$0.05 \text{ or } \$0.05 \text{ (Favorable)}$$

In this case, the actual rate per hour is $7.50, the standard rate per hour is $8.00, and the actual hour worked is 0.10 hours per box. This computes as a favorable outcome. This is a favorable outcome because the actual rate of pay was less than the standard rate of pay. As a result of this favorable outcome information, the company may consider continuing operations as they exist, or could change future budget projections to reflect higher profit margins, among other things.

Let us take the same example except now the actual rate of pay per hour is $9.50. The direct labor rate variance computes as:

$$\text{Direct Labor Rate Variance} = (\$9.50 - \$8.00) \times 0.10 \text{ hours} = \$0.15 \text{ or } \$0.15 \text{ (Unfavorable)}$$

In this case, the actual rate per hour is $9.50, the standard rate per hour is $8.00, and the actual hours worked per box are 0.10 hours. This computes as an unfavorable outcome. This is an unfavorable outcome because the actual rate per hour was more than the standard rate per hour. As a result of this unfavorable outcome

information, the company may consider using cheaper labor, changing the production process to be more efficient, or increasing prices to cover labor costs.

Another element this company and others must consider is a direct labor time variance.

Direct Labor Time Variance

The **direct labor time variance** compares the actual labor hours used to the standard labor hours that were expected to be used to make the actual units produced. The variance is calculated using this formula:

$$\text{Direct Labor Time Variance} = \begin{pmatrix}\text{Actual Hours Worked}\\ \times \\ \text{Standard Rate per Hour}\end{pmatrix} - \begin{pmatrix}\text{Standard Hours}\\ \times \\ \text{Standard Rate per Hour}\end{pmatrix}$$

Factoring out the standard rate per hour from both components of the formula, it can be rewritten as:

$$\text{Direct Labor Time Variance} = \begin{pmatrix}\text{Actual Hours}\\ \text{Worked}\end{pmatrix} - \begin{pmatrix}\text{Standard Hours Expected}\\ \text{for the Units Produced}\end{pmatrix} \times \begin{pmatrix}\text{Standard Rate}\\ \text{per Hour}\end{pmatrix}$$

With either of these formulas, the actual hours worked refers to the actual number of hours used at the actual production output. The standard rate per hour is the expected hourly rate paid to workers. The standard hours are the expected number of hours used at the actual production output. If there is no difference between the actual hours worked and the standard hours, the outcome will be zero, and no variance exists.

If the actual hours worked are less than the standard hours at the actual production output level, the variance will be a favorable variance. A favorable outcome means you used fewer hours than anticipated to make the actual number of production units. If, however, the actual hours worked are greater than the standard hours at the actual production output level, the variance will be unfavorable. An unfavorable outcome means you used more hours than anticipated to make the actual number of production units.

The actual hours used can differ from the standard hours because of improved efficiencies in production, carelessness or inefficiencies in production, or poor estimation when creating the standard usage.

Consider the previous example with Connie's Candy Company. Connie's Candy establishes a standard rate per hour for labor of $8.00. Each box of candy is expected to require 0.10 hours of labor (6 minutes). Connie's Candy found that the actual hours worked per box were 0.05 hours (3 minutes). The actual rate per hour for labor remained at $8.00 to make each box. The direct labor time variance computes as:

$$\text{Direct Labor Time Variance} = (0.05 - 0.10) \times \$8.00 \text{ per hour} = -\$0.40 \text{ or } \$0.40 \text{ (Favorable)}$$

In this case, the actual hours worked are 0.05 per box, the standard hours are 0.10 per box, and the standard rate per hour is $8.00. This computes as a favorable outcome. This is a favorable outcome because the actual hours worked were less than the standard hours expected. As a result of this favorable outcome information, the company may consider continuing operations as they exist, or could change future budget projections to reflect higher profit margins, among other things.

Let us take the same example except now the actual hours worked are 0.20 hours per box. The direct labor time variance computes as:

$$\text{Direct Labor Time Variance} = (\$0.20 - \$0.10) \times \$8.00 \text{ per hour} = \$0.80 \text{ or } \$0.80 \text{ (Unfavorable)}$$

In this case, the actual hours worked per box are 0.20, the standard hours per box are 0.10, and the standard

rate per hour is $8.00. This computes as an unfavorable outcome. This is an unfavorable outcome because the actual hours worked were more than the standard hours expected per box. As a result of this unfavorable outcome information, the company may consider retraining its workers, changing the production process to be more efficient, or increasing prices to cover labor costs.

The combination of the two variances can produce one overall total direct labor cost variance.

THINK IT THROUGH

Package Deliveries

UPS drivers are evaluated on how many miles they drive and how quickly they deliver packages. The drivers are given the route and time they are expected to take, so they are expected to complete their route in a timely and efficient manner. They also work until all packages are delivered. A GPS tracking system tracks the trucks throughout the day. The system keeps track of how much they back up and if they take any left turns because right turns are much more time efficient.[3] Tracking drivers like this does not leave them very much time to deal with customers. Customer service is a major part of the driver's job. Can the driver service the customer and drive the route in the time and distance allotted? Which is more important: customer service or driving the route in a timely and efficient manner?

LINK TO LEARNING

Watch this video presenting an instructor walking through the steps involved in calculating direct labor variances (https://openstax.org/l/50DirLaborVar) to learn more.

Total Direct Labor Variance

When a company makes a product and compares the actual labor cost to the standard labor cost, the result is the **total direct labor variance**.

$$\text{Total Direct Labor Variance} = (\text{Actual Hours} \times \text{Actual Rate}) - (\text{Standard Hours} \times \text{Standard Rate})$$

If the outcome is unfavorable, the actual costs related to labor were more than the expected (standard) costs. If the outcome is favorable, the actual costs related to labor are less than the expected (standard) costs.

The total direct labor variance is also found by combining the direct labor rate variance and the direct labor time variance. By showing the total direct labor variance as the sum of the two components, management can better analyze the two variances and enhance decision-making.

Figure 8.4 shows the connection between the direct labor rate variance and direct labor time variance to total

3 Graham Kendall. "Why UPS Drivers Don't Turn Left and Why You Shouldn't Either." *The Conversation*. January 20, 2017. http://theconversation.com/why-ups-drivers-dont-turn-left-and-you-probably-shouldnt-either-71432

direct labor variance.

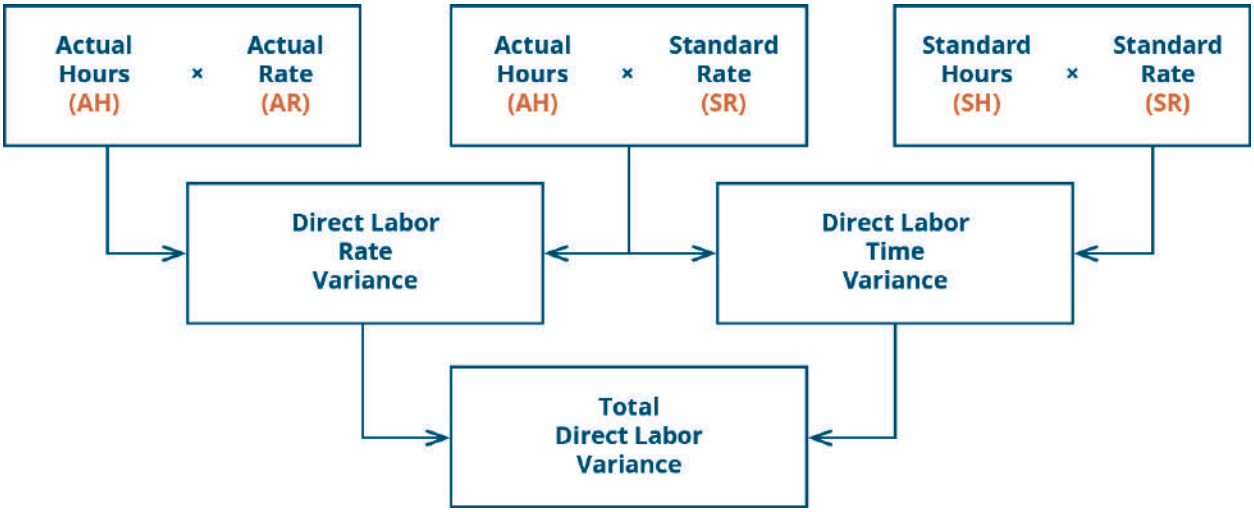
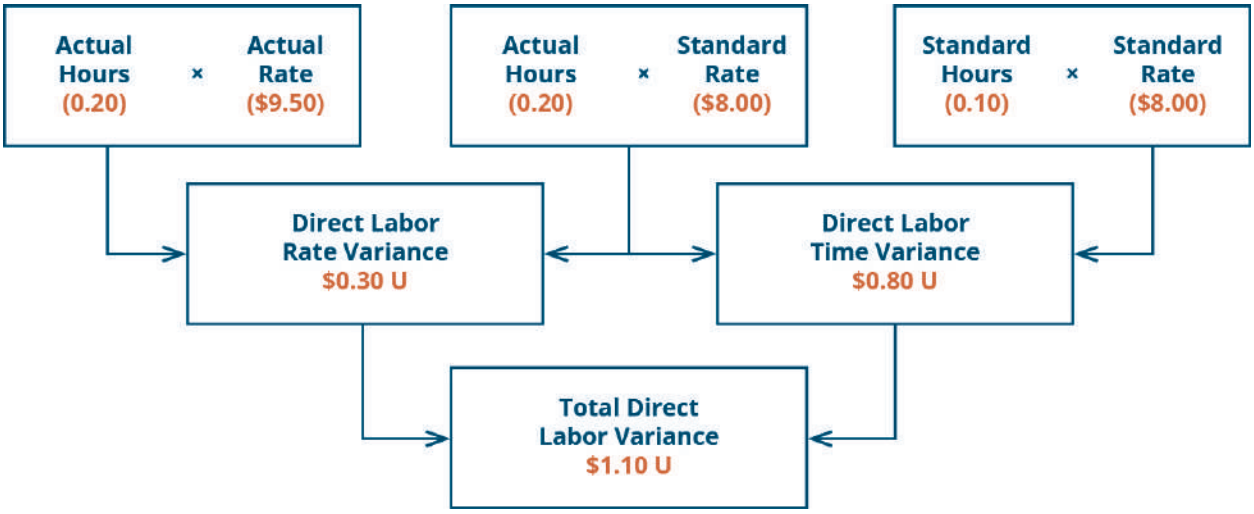


Figure 8.4 Direct Labor Variance. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

For example, Connie's Candy Company expects to pay a rate of $8.00 per hour for labor but actually pays $9.50 per hour. The company expected to use 0.10 hours of labor per box but actually used 0.20 hours per box. The total direct labor variance is computed as:

$$\text{Total Direct Labor Time Variance} = (0.20\,\text{hours} \times \$9.50) - (0.10\,\text{hours} \times \$8.00) = \$1.90 - \$0.80 = \$1.10\,(\text{Unfavorable})$$

In this case, two elements are contributing to the unfavorable outcome. Connie's Candy paid $1.50 per hour more for labor than expected and used 0.10 hours more than expected to make one box of candy. The same calculation is shown as follows using the outcomes of the direct labor rate and time variances.



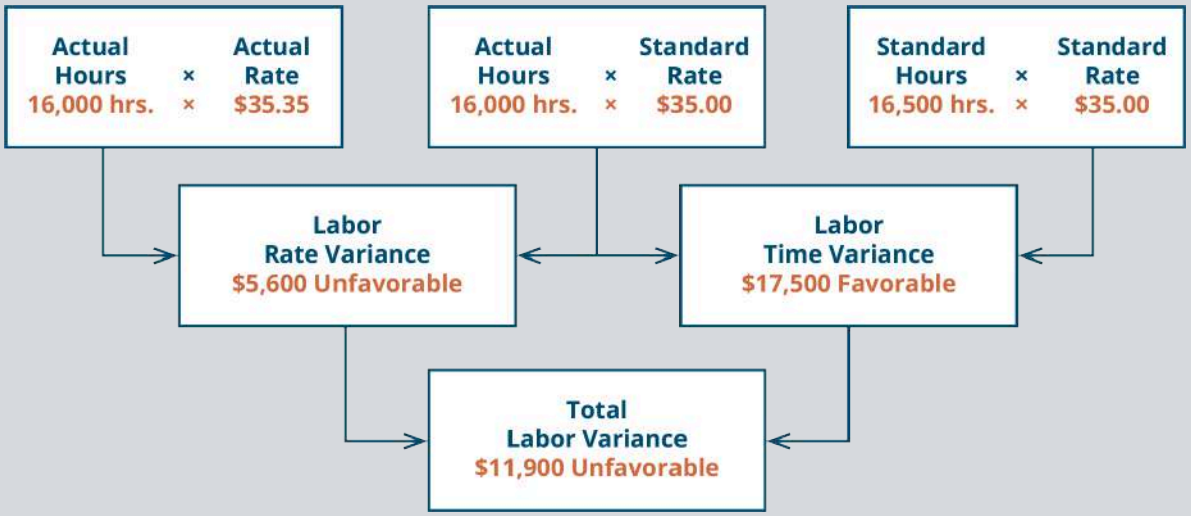
As with the interpretations for the labor rate and time variances, the company would review the individual components contributing to the overall unfavorable outcome for the total direct labor variance, and possibly make changes to production elements as a result.

YOUR TURN

Sweet and Fresh Shampoo Labor

Biglow Company makes a hair shampoo called Sweet and Fresh. Each bottle has a standard labor cost of 1.5 hours at $35.00 per hour. During May, Biglow manufactured 11,000 bottles. They used 16,000 hours at a cost of $565,600. Calculate the labor rate variance, labor time variance, and total labor variance.

Solution



CONCEPTS IN PRACTICE

Labor Costs in Service Industries

In the service industry, labor is the main cost. Doctors, for example, have a time allotment for a physical exam and base their fee on the expected time. Insurance companies pay doctors according to a set schedule, so they set the labor standard. They pay a set rate for a physical exam, no matter how long it takes. If the exam takes longer than expected, the doctor is not compensated for that extra time. This would produce an unfavorable labor variance for the doctor. Doctors know the standard and try to schedule accordingly so a variance does not exist. If anything, they try to produce a favorable variance by seeing more patients in a quicker time frame to maximize their compensation potential.

8.4 Compute and Evaluate Overhead Variances

Recall that the standard cost of a product includes not only materials and labor but also variable and fixed overhead. It is likely that the amounts determined for standard overhead costs will differ from what actually occurs. This will lead to overhead variances.

Determination and Evaluation of Overhead Variance

In a standard cost system, overhead is applied to the goods based on a standard overhead rate. This is similar to the predetermined overhead rate used previously. The standard overhead rate is calculated by dividing budgeted overhead at a given level of production (known as normal capacity) by the level of activity required for that particular level of production.

$$\text{Standard Overhead Rate} = \frac{\text{Budgeted Overhead Rate}}{\text{Level of Activity}}$$

Usually, the level of activity is either direct labor hours or direct labor cost, but it could be machine hours or units of production.

Creation of Flexible Overhead Budget

To determine the overhead standard cost, companies prepare a **flexible budget** that gives estimated revenues and costs at varying levels of production. The standard overhead cost is usually expressed as the sum of its component parts, fixed and variable costs per unit. Note that at different levels of production, total fixed costs are the same, so the standard fixed cost per unit will change for each production level. However, the variable standard cost per unit is the same per unit for each level of production, but the total variable costs will change.

We continue to use Connie's Candy Company to illustrate. Suppose Connie's Candy budgets capacity of production at 100% and determines expected overhead at this capacity. Connie's Candy also wants to understand what overhead cost outcomes will be at 90% capacity and 110% capacity. The following information is the flexible budget Connie's Candy prepared to show expected overhead at each capacity level.

Percent of capacity	90%	100%	110%
Direct labor hours	1,800	2,000	2,200
Units of output	900	1,000	1,100
Variable overhead	$3,600	$ 4,000	$ 4,400
Fixed overhead	$6,000	$ 6,000	$ 6,000
Total overhead	$9,600	$10,000	$10,400

Normal capacity = 100% and overhead is applied based on direct labor hours
Standard Overhead Rate = $10,000/2,000 = $5 per direct labor hour

Units of output at 100% is 1,000 candy boxes (units). The standard overhead rate is the total budgeted overhead of $10,000 divided by the level of activity (direct labor hours) of 2,000 hours. Notice that fixed overhead remains constant at each of the production levels, but variable overhead changes based on unit output. If Connie's Candy only produced at 90% capacity, for example, they should expect total overhead to be $9,600 and a standard overhead rate of $5.33 (rounded). If Connie's Candy produced 2,200 units, they should expect total overhead to be $10,400 and a standard overhead rate of $4.73 (rounded). In addition to the total standard overhead rate, Connie's Candy will want to know the variable overhead rates at each activity level.

Using the flexible budget, we can determine the standard variable cost per unit at each level of production by taking the total expected variable overhead divided by the level of activity, which can still be direct labor hours or machine hours.

$$\text{Variable Overhead Rate} = \frac{\text{Budgeted Variable Overhead}}{\text{Level of Activity}}$$

Looking at Connie's Candies, the following table shows the variable overhead rate at each of the production capacity levels.

Production Capacity	Variable/Unit
90%	$3,600/1,800 = $2
100%	$4,000/2,000 = $2
110%	$4,400/2,200 = $2

Sometimes these flexible budget figures and overhead rates differ from the actual results, which produces a variance.

Determination of Variable Overhead Variances

There are two components to variable overhead rates: the overhead application rate and the activity level against which that rate was applied. If we compare the actual variable overhead to the standard variable overhead, by analyzing the difference between actual overhead costs and the standard overhead for current production, it is difficult to determine if the variance is due to application rate differences or activity level differences. Thus, there are two variable overhead variances that will better provide these answers: the variable overhead rate variance and the variable overhead efficiency variance.

Determination of Variable Overhead Rate Variance

The **variable overhead rate variance**, also known as the spending variance, is the difference between the actual variable manufacturing overhead and the variable overhead that was expected given the number of hours worked. The variable overhead rate variance is calculated using this formula:

$$\text{Variable Overhead Rate Variance} = \left(\begin{array}{c}\text{Actual Hours Worked}\\ \times \\ \text{Actual Variable Overhead Rate per Hour}\end{array}\right) - \left(\begin{array}{c}\text{Actual Hours Worked}\\ \times \\ \text{Standard Variable Overhead Rate per Hour}\end{array}\right)$$

Factoring out actual hours worked, we can rewrite the formula as

$$\text{Variable Overhead Rate Variance} = \left(\begin{array}{c}\text{Actual Variable}\\ \text{Overhead Rate}\end{array} - \begin{array}{c}\text{Standard Variable}\\ \text{Overhead Rate}\end{array}\right) \times \begin{array}{c}\text{Actual Hours}\\ \text{Worked}\end{array}$$

If the outcome is favorable (a negative outcome occurs in the calculation), this means the company spent less than what it had anticipated for variable overhead. If the outcome is unfavorable (a positive outcome occurs in the calculation), this means the company spent more than what it had anticipated for variable overhead.

Connie's Candy Company wants to determine if its variable overhead spending was more or less than anticipated. Connie's Candy had this data available in the flexible budget:

Percent of capacity	100%
Direct labor hours	2,000
Units of output	1,000
Variable overhead	$ 4,000
Fixed overhead	$ 6,000
Total overhead	$10,000

Connie's Candy also had this actual output information:

Percent of capacity	100%
Direct labor hours	2,500
Units of output	1,000
Variable overhead	$ 7,000
Fixed overhead	$ 6,000
Total overhead	$13,000

To determine the variable overhead rate variance, the standard variable overhead rate per hour and the actual variable overhead rate per hour must be determined. The standard variable overhead rate per hour is $2.00 ($4,000/2,000 hours), taken from the flexible budget at 100% capacity. The actual variable overhead rate is $2.80 ($7,000/2,500), taken from the actual results at 100% capacity. Therefore,

$$\text{Variable Overhead Rate Variance} = (\$2.80 - \$2.00) \times 2{,}500 = \$2{,}000\,(\text{Unfavorable})$$

This produces an unfavorable outcome. This could be for many reasons, and the production supervisor would need to determine where the variable cost difference is occurring to make production changes.

Let us look at another example producing a favorable outcome. Connie's Candy had this data available in the flexible budget:

Percent of capacity	100%
Direct labor hours	2,000
Units of output	1,000
Variable overhead	$ 4,000
Fixed overhead	$ 6,000
Total overhead	$10,000

Connie's Candy also had this actual output information:

Percent of capacity	100%
Direct labor hours	2,000
Units of output	1,000
Variable overhead	$3,500
Fixed overhead	$6,000
Total overhead	$9,500

To determine the variable overhead rate variance, the standard variable overhead rate per hour and the actual variable overhead rate per hour must be determined. The standard variable overhead rate per hour is $2.00 ($4,000/2,000 hours), taken from the flexible budget at 100% capacity. The actual variable overhead rate is $1.75 ($3,500/2,000), taken from the actual results at 100% capacity. Therefore,

$$\text{Variable Overhead Rate Variance} = (\$1.75 - \$2.00) \times \$2{,}000 = -\$500 \text{ or } \$500\,(\text{Favorable})$$

This produces a favorable outcome. This could be for many reasons, and the production supervisor would

need to determine where the variable cost difference is occurring to better understand the variable overhead reduction.

Interpretation of the variable overhead rate variance is often difficult because the cost of one overhead item, such as indirect labor, could go up, but another overhead cost, such as indirect materials, could go down. Often, explanation of this variance will need clarification from the production supervisor. Another variable overhead variance to consider is the variable overhead efficiency variance.

Determination of Variable Overhead Efficiency Variance

The **variable overhead efficiency variance**, also known as the controllable variance, is driven by the difference between the actual hours worked and the standard hours expected for the units produced. This variance measures whether the allocation base was efficiently used. The variable overhead efficiency variance is calculated using this formula:

$$\text{Variable Overhead Efficiency Variance} = \left(\begin{array}{c}\text{Actual Hours Worked}\\ \times \\ \text{Standard Variable Overhead Rate per Hour}\end{array}\right) - \left(\begin{array}{c}\text{Standard Hours}\\ \times \\ \text{Standard Variable Overhead Rate per Hour}\end{array}\right)$$

Factoring out standard overhead rate, the formula can be written as

$$\text{Variable Overhead Efficiency Variance} = (\text{Actual Labor Hours} - \text{Standard Labor Hours}) \times \text{Standard Overhead Rate}$$

If the outcome is favorable (a negative outcome occurs in the calculation), this means the company was more efficient than what it had anticipated for variable overhead. If the outcome is unfavorable (a positive outcome occurs in the calculation), this means the company was less efficient than what it had anticipated for variable overhead.

Connie's Candy Company wants to determine if its variable overhead efficiency was more or less than anticipated. Connie's Candy had the following data available in the flexible budget:

Percent of capacity	**100%**
Direct labor hours	2,000
Units of output	1,000
Variable overhead	$ 4,000
Fixed overhead	$ 6,000
Total overhead	$10,000

Connie's Candy also had the following actual output information:

Percent of capacity	**100%**
Direct labor hours	2,500
Units of output	1,000
Variable overhead	$ 7,000
Fixed overhead	$ 6,000
Total overhead	$13,000

To determine the variable overhead efficiency variance, the actual hours worked and the standard hours worked at the production capacity of 100% must be determined. Actual hours worked are 2,500, and standard

hours are 2,000. The standard variable overhead rate per hour is $2.00 ($4,000/2,000 hours), taken from the flexible budget at 100% capacity. Therefore,

$$\text{Variable Overhead Efficiency ariance} = (2{,}500 - 2{,}000) \times \$2.00 = \$1{,}000\,(\text{Unfavorable})$$

This produces an unfavorable outcome. This could be for many reasons, and the production supervisor would need to determine where the variable cost difference is occurring to make production changes.

Let us look at another example producing a favorable outcome. Connie's Candy had the following data available in the flexible budget:

Percent of capacity	100%
Direct labor hours	2,000
Units of output	1,000
Variable overhead	$ 4,000
Fixed overhead	$ 6,000
Total overhead	$10,000

Connie's Candy also had the following actual output information:

Percent of capacity	100%
Direct labor hours	1,800
Units of output	1,000
Variable overhead	$3,500
Fixed overhead	$6,000
Total overhead	$9,500

To determine the variable overhead efficiency variance, the actual hours worked and the standard hours worked at the production capacity of 100% must be determined. Actual hours worked are 1,800, and standard hours are 2,000. The standard variable overhead rate per hour is $2.00 ($4,000/2,000 hours), taken from the flexible budget at 100% capacity. Therefore,

$$\text{Variable Overhead Efficiency ariance} = (1{,}800 - 2{,}000) \times \$2.00 = -\$400 \text{ or } \$400\,(\text{Favorable})$$

This produces a favorable outcome. This could be for many reasons, and the production supervisor would need to determine where the variable cost difference is occurring to better understand the variable overhead efficiency reduction.

The **total variable overhead cost variance** is also found by combining the variable overhead rate variance and the variable overhead efficiency variance. By showing the total variable overhead cost variance as the sum of the two components, management can better analyze the two variances and enhance decision-making.

Figure 8.5 shows the connection between the variable overhead rate variance and variable overhead efficiency variance to total variable overhead cost variance.

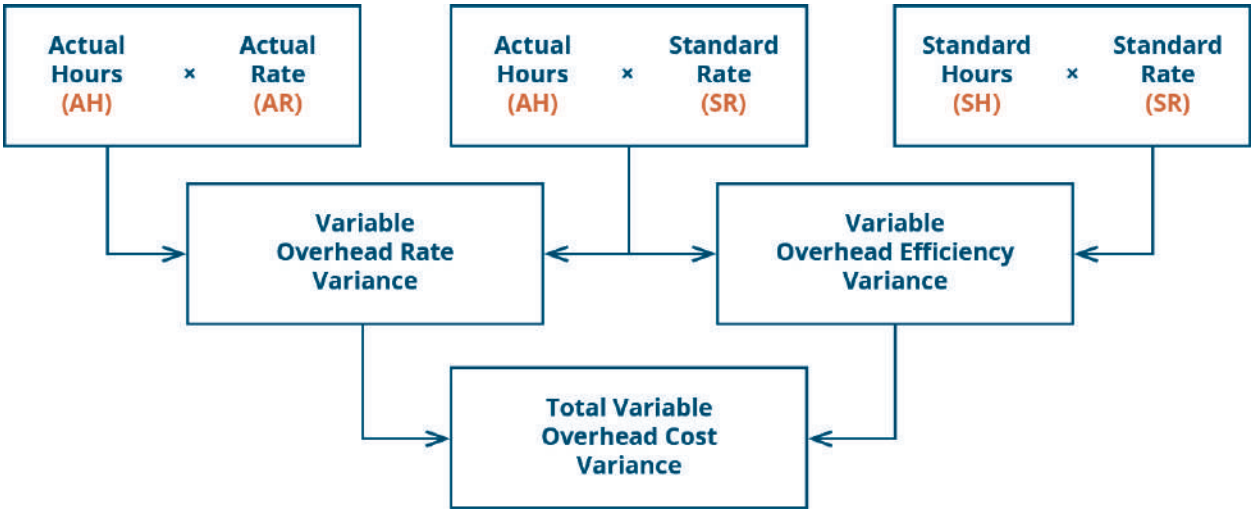


Figure 8.5 Variable Overheard Cost Variance. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

For example, Connie's Candy Company had the following data available in the flexible budget:

Percent of capacity	100%
Direct labor hours	2,000
Units of output	1,000
Variable overhead	$ 4,000
Fixed overhead	$ 6,000
Total overhead	$10,000

Connie's Candy also had the following actual output information:

Percent of capacity	100%
Direct labor hours	1,800
Units of output	1,000
Variable overhead	$3,500
Fixed overhead	$6,000
Total overhead	$9,500

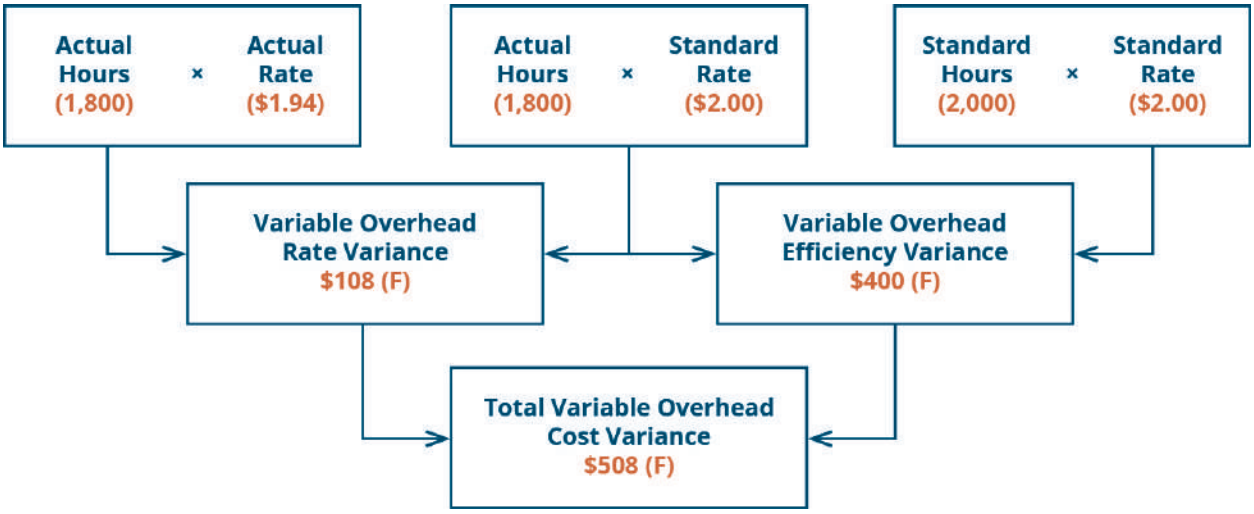
The variable overhead rate variance is calculated as (1,800 × $1.94) – (1,800 × $2.00) = –$108, or $108 (favorable). The variable overhead efficiency variance is calculated as (1,800 × $2.00) – (2,000 × $2.00) = –$400, or $400 (favorable).

The total variable overhead cost variance is computed as:

$$\text{Total Variable Overhead Cost Variance} = (–\$108) + (–\$400) = –\$508 \text{ or } \$508 \text{ (Favorable)}$$

In this case, two elements are contributing to the favorable outcome. Connie's Candy used fewer direct labor hours and less variable overhead to produce 1,000 candy boxes (units).

The same calculation is shown as follows in diagram format.



As with the interpretations for the variable overhead rate and efficiency variances, the company would review the individual components contributing to the overall favorable outcome for the total variable overhead cost variance, before making any decisions about production in the future. Other variances companies consider are fixed factory overhead variances.

Fundamentals of Fixed Factory Overhead Variances

The **fixed factory overhead variance** represents the difference between the actual fixed overhead and the applied fixed overhead. There are two fixed overhead variances. One variance determines if too much or too little was spent on fixed overhead. The other variance computes whether or not actual production was above or below the expected production level.

YOUR TURN

Sweet and Fresh Shampoo Overhead

Biglow Company makes a hair shampoo called Sweet and Fresh. They have the following flexible budget data:

	90%	100%	110%
Direct labor hours	14,000	16,000	18,000
Units of output	10,000	10,000	10,000
Direct labor	$525,000	$ 346,500	$ 378,000
Variable overhead	$315,000	$ 346,000	$ 378,000
Fixed overhead	$ 45,500	$ 45,500	$ 45,500
Total	$953,500	$1,044,300	$1,135,100

What is the standard variable overhead rate at 90%, 100%, and 110% capacity levels?

Solution

90% = $315,000/14,000 = $22.50, 100% = $346,000/16,000 = $21.63 (rounded), 110% = $378,000/18,000 =

$21.00.

THINK IT THROUGH

Purchasing Planes

The XYZ Firm is bidding on a contract for a new plane for the military. As the management team is going over the bid, they come to the conclusion it is too high on a per-plane basis, but they cannot find any costs they feel can be reduced. The information from the military states they will purchase between 50 and 100 planes, but will more likely purchase 50 planes rather than 100 planes. XYZ's bid is based on 50 planes. The controller suggests that they base their bid on 100 planes. This would spread the fixed costs over more planes and reduce the bid price. The lower bid price will increase substantially the chances of XYZ winning the bid. Should XYZ Firm keep the bid at 50 planes or increase its bid to 100 planes? What are the pros and cons to keeping the bid at 50 or increasing to 100 planes?

8.5 Describe How Companies Use Variance Analysis

Companies use variance analysis in different ways. The starting point is the determination of standards against which to compare actual results. Many companies produce variance reports, and the management responsible for the variances must explain any variances outside of a certain range. Some companies only require that unfavorable variances be explained, while many companies require both favorable and unfavorable variances to be explained.

Requiring managers to determine what caused unfavorable variances forces them to identify potential problem areas or consider if the variance was a one-time occurrence. Requiring managers to explain favorable variances allows them to assess whether the favorable variance is sustainable. Knowing what caused the favorable variance allows management to plan for it in the future, depending on whether it was a one-time variance or it will be ongoing.

Another possibility is that management may have built the favorable variance into the standards. Management may overestimate the material price, labor rate, material quantity, or labor hours per unit, for example. This method of overestimation, sometimes called *budget slack*, is built into the standards so management can still look good even if costs are higher than planned. In either case, managers potentially can help other managers and the company overall by noticing particular problem areas or by sharing knowledge that can improve variances.

Often, management will manage "to the variances," meaning they will make decisions that may not be advantageous to the company's best interests over the long run, in order to meet the variance report threshold limits. This can occur when the standards are improperly established, causing significant differences between actual and standard numbers.

ETHICAL CONSIDERATIONS

Ethical Long-Term Decisions in Variance Analysis

The proper use of variance analysis is a significant tool for an organization to reach its long-term goals. When its accounting system recognizes a variance, an organization needs to understand the significant influence of accounting not only in recording its financial results, but also in how reacting to that variance can shape management's behavior toward reaching its goals.[4] Many managers use variance analysis only to determine a short-term reaction, and do not analyze why the variance occurred from a long-term perspective. A more long-term analysis of variances allows an approach that "is responsibility accounting in which authority and accountability for tasks is delegated downward to those managers with the most influence and control over them."[5] It is important for managers to analyze the reported variances with more than just a short-term perspective.

Managers sometimes focus only on making numbers for the current period. For example, a manager might decide to make a manufacturing division's results look profitable in the short term at the expense of reaching the organization's long-term goals. A recognizable cost variance could be an increase in repair costs as a percentage of sales on an increasing basis. This variance could indicate that equipment is not operating efficiently and is increasing overall cost. However, the expense of implementing new, more efficient equipment might be higher than repairing the current equipment. In the short term, it might be more economical to repair the outdated equipment, but in the long term, purchasing more efficient equipment would help the organization reach its goal of eco-friendly manufacturing. If the system use for controlling costs is not aligned to reinforce management of the organization with a long-term perspective, "the manager has no organizational incentive to be concerned with important issues unrelated to anything but the immediate costs"[6] related to the variance. A manager needs to be cognizant of his or her organization's goals when making decisions based on variance analysis.

Management can use standard costs to prepare the budget for the upcoming period, using the past information to possibly make changes to production elements. Standard costs are a measurement tool and can thus be used to evaluate performance. As you've learned, management may manage "to the variances" and can manipulate results to meet expectations. To reduce this possibility, performance should be measured on multiple outcomes, not simply on standard cost variances.

As shown in Table 8.1, standard costs have pros and cons to consider when using them in the decision-making and evaluation processes.

4 Jeffrey R. Cohen and Laurie W. Pant. "The Only Thing That Counts Is That Which Is Counted: A Discussion of Behavioral and Ethical Issues in Cost Accounting That Are Relevant for the OB Professor." September 18, 2018. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1026.5569&rep=rep1&type=pdf

5 Jeffrey R. Cohen and Laurie W. Pant. "The Only Thing That Counts Is That Which Is Counted: A Discussion of Behavioral and Ethical Issues in Cost Accounting That Are Relevant for the OB Professor." September 18, 2018. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1026.5569&rep=rep1&type=pdf

6 Jeffrey R. Cohen and Laurie W. Pant. "The Only Thing That Counts Is That Which Is Counted: A Discussion of Behavioral and Ethical Issues in Cost Accounting That Are Relevant for the OB Professor." September 18, 2018. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1026.5569&rep=rep1&type=pdf

Standard Costs

Pros	Cons
• Useful when developing a future budget • Can be used as a benchmark for performance and quality expectations • Can individually identify areas of success and areas for improvement	• Might ignore customer and employee satisfaction rates • Information could be historical data and not useful in real-time decision-making needs • The system to manage and develop standard costs requires a lot of resources, which could be costly and time consuming

Table 8.1

Standard costing provides many benefits and challenges, and a thorough analysis of each variance and the possible unfavorable or favorable outcomes is required to set future expectations and adjust current production goals.

The following is a summary of all direct materials variances (Figure 8.6), direct labor variances (Figure 8.7), and overhead variances (Figure 8.8) presented as both formulas and tree diagrams. Note that for some of the formulas, there are two presentations of the same formula, for example, there are two presentations of the direct materials price variance. While both arrive at the same answer, students usually prefer one formula structure over the other.

$$\text{Direct Materials Price Variance} = \left(\begin{matrix}\text{Actual Quantity Used} \\ \times \\ \text{Actual Price Paid}\end{matrix}\right) - \left(\begin{matrix}\text{Actual Quantity Used} \\ \times \\ \text{Standard Price}\end{matrix}\right)$$

$$\text{Direct Materials Price Variance} = \left(\begin{matrix}\text{Actual Price per} \\ \text{Unit of Materials}\end{matrix} - \begin{matrix}\text{Standard Price per} \\ \text{Unit of Materials}\end{matrix}\right) \times \begin{matrix}\text{Actual Quantity of} \\ \text{Materials Used}\end{matrix}$$

$$\text{Direct Materials Quantity Variance} = \left(\begin{matrix}\text{Actual Quantity Used} \\ \times \\ \text{Standard Price}\end{matrix}\right) - \left(\begin{matrix}\text{Standard Quantity} \\ \times \\ \text{Standard Price}\end{matrix}\right)$$

$$\text{Direct Materials Quantity Variance} = \left(\begin{matrix}\text{Actual Quantity of} \\ \text{Materials Used} \\ \text{for Units Produced}\end{matrix} - \begin{matrix}\text{Standard Quantity} \\ \text{of Materials Expected} \\ \text{for the Units Produced}\end{matrix}\right) \times \begin{matrix}\text{Standard} \\ \text{Price}\end{matrix}$$

$$\text{Total Direct Materials Variance} = \left(\begin{matrix}\text{Actual Quantity} \\ \times \\ \text{Actual Price}\end{matrix}\right) - \left(\begin{matrix}\text{Standard Quantity} \\ \times \\ \text{Standard Price}\end{matrix}\right)$$

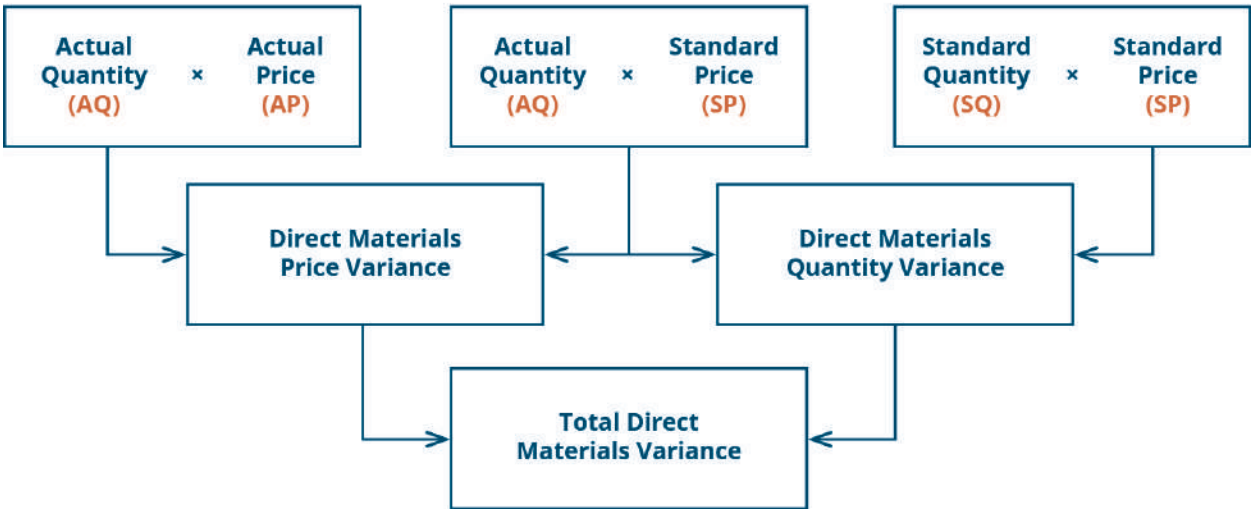


Figure 8.6 Direct Materials Variances. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

$$\text{Direct Labor Rate Variance} = \left(\begin{matrix}\text{Actual Hours Worked} \\ \times \\ \text{Actual Rate per Hour}\end{matrix}\right) - \left(\begin{matrix}\text{Actual Hours Worked} \\ \times \\ \text{Standard Rate per Hour}\end{matrix}\right)$$

$$\text{Direct Labor Rate Variance} = \left(\begin{matrix}\text{Actual Rate} \\ \text{per Hour}\end{matrix} - \begin{matrix}\text{Standard Rate} \\ \text{per Hour}\end{matrix}\right) \times \begin{matrix}\text{Actual Hours} \\ \text{Worked}\end{matrix}$$

$$\text{Direct Labor Time Variance} = \left(\begin{matrix}\text{Actual Hours Worked} \\ \times \\ \text{Standard Rate per Hour}\end{matrix}\right) - \left(\begin{matrix}\text{Standard Hours} \\ \times \\ \text{Standard Rate per Hour}\end{matrix}\right)$$

$$\text{Direct Labor Time Variance} = \left(\begin{matrix}\text{Actual Hours} \\ \text{Worked}\end{matrix} - \begin{matrix}\text{Standard Hours Expected} \\ \text{for the Units Produced}\end{matrix}\right) \times \begin{matrix}\text{Standard Rate} \\ \text{per Hour}\end{matrix}$$

$$\text{Total Direct Labor Variance} = (\text{Actual Hours} \times \text{Actual Rate}) - (\text{Standard Hours} \times \text{Standard Rate})$$

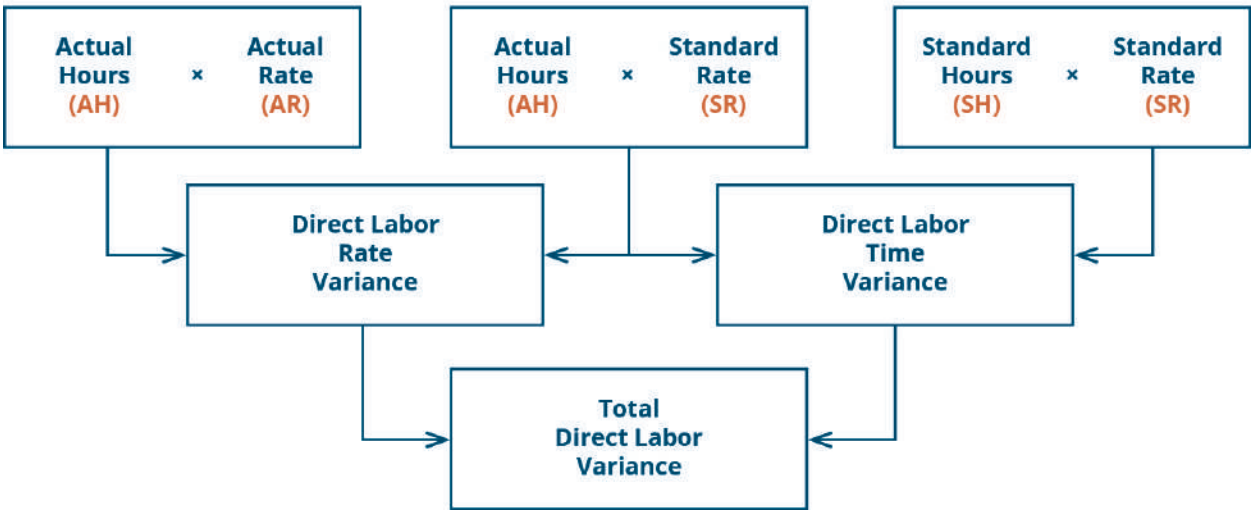


Figure 8.7 Direct Labor Variances. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

$$\text{Standard Overhead Rate} = \frac{\text{Budgeted Overhead Rate}}{\text{Level of Activity}}$$

$$\text{Variable Overhead Rate} = \frac{\text{Budgeted Variable Overhead}}{\text{Level of Activity}}$$

$$\text{Variable Overhead Rate Variance} = \left(\begin{array}{c}\text{Actual Hours Worked}\\ \times \\ \text{Actual Variable Overhead Rate per Hour}\end{array}\right) - \left(\begin{array}{c}\text{Actual Hours Worked}\\ \times \\ \text{Standard Variable Overhead Rate per Hour}\end{array}\right)$$

$$\text{Variable Overhead Rate Variance} = \left(\begin{array}{c}\text{Actual Variable}\\ \text{Overhead Rate}\end{array} - \begin{array}{c}\text{Standard Variable}\\ \text{Overhead Rate}\end{array}\right) \times \begin{array}{c}\text{Actual Hours}\\ \text{Worked}\end{array}$$

$$\text{Variable Overhead Efficiency Variance} = \left(\begin{array}{c}\text{Actual Hours Worked}\\ \times \\ \text{Standard Variable Overhead Rate per Hour}\end{array}\right) - \left(\begin{array}{c}\text{Standard Hours}\\ \times \\ \text{Standard Variable Overhead Rate per Hour}\end{array}\right)$$

$$\text{Variable Overhead Efficiency Variance} = \left(\text{Actual Labor Hours} - \text{Standard Labor Hours}\right) \times \begin{array}{c}\text{Standard}\\ \text{Overhead Rate}\end{array}$$

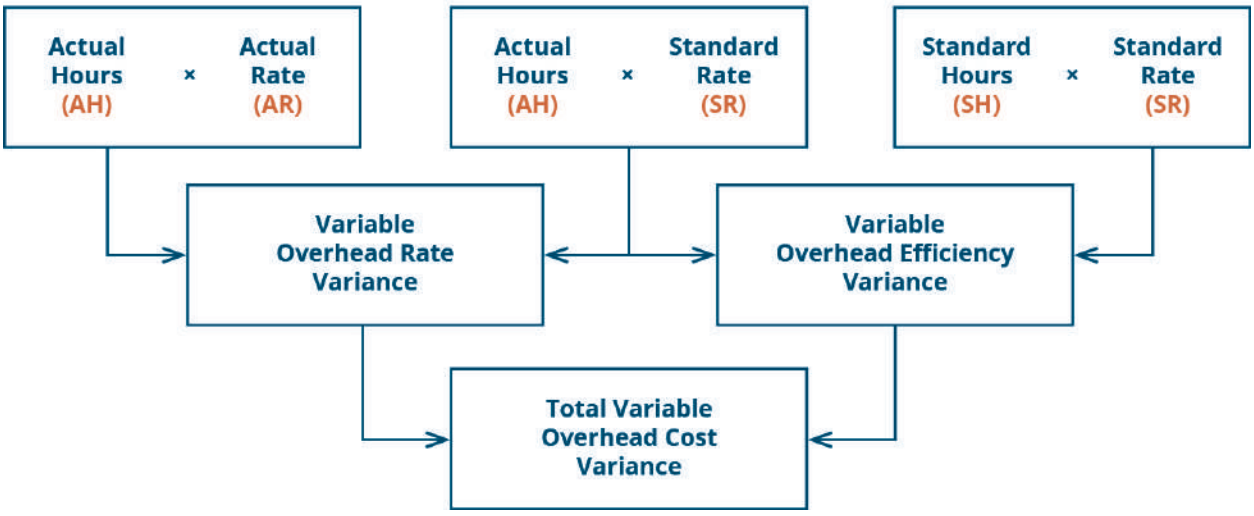


Figure 8.8 Overhead Variances. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

YOUR TURN

Barley, Inc. Production

Barley, Inc., produces a product and has the following as standard costs per unit for materials and labor:

Materials	4 pounds @ $15 per pound
Labor	2 hours @ $20 per hour

For the month of October, the following information was gathered related to production:

Beginning inventory	0
Units completed	10,000
Budgeted output units	12,000
Materials used (50,000 pounds)	$800,000
Labor (25,000 hours)	$450,000

Compute:

A. The materials price and quantity variances
B. The labor rate and efficiency variances

Provide possible explanations for each variance.

Solution

A.

Materials price variance:

$50,000 unfavorable = ($16* – $15) × 50,000 lb.

*$800,000/50,000

An unfavorable materials price variance occurred because the actual cost of materials was greater than the expected or standard cost. This could occur if a higher-quality material was purchased or the suppliers raised their prices.

Materials quantity variance:

$150,000 unfavorable = (50,000 lb. – 40,000* lb.) × $15 per lb.

*4 lb. × 10,000 units

An unfavorable materials quantity variance occurred because the pounds of materials used were greater than the pounds expected to be used. This could occur if there were inefficiencies in production or the quality of the materials was such that more needed to be used to meet safety or other standards.

Materials inputs:

B.

Labor rate variance:

$50,000 favorable = ($18* per hour – $20 per hour) × 25,000 hours

*$450,000/25,000

A favorable labor rate variance occurred because the rate paid per hour was less than the rate expected to be paid (standard) per hour. This could occur because the company was able to hire workers at a lower rate, because of negotiated union contracts, or because of a poor labor rate estimate used in creating the standard.

Labor quantity variance:

$100,000 unfavorable = (25,000 hours – 20,000* hours) × $20 per hour

*2 hours × 10,000 units

An unfavorable labor quantity variance occurred because the actual hours worked to make the 10,000 units were greater than the expected hours to make that many units. This could occur because of inefficiencies of the workers, defects and errors that caused additional time reworking items, or the use of new workers who were less efficient.

Labor inputs:

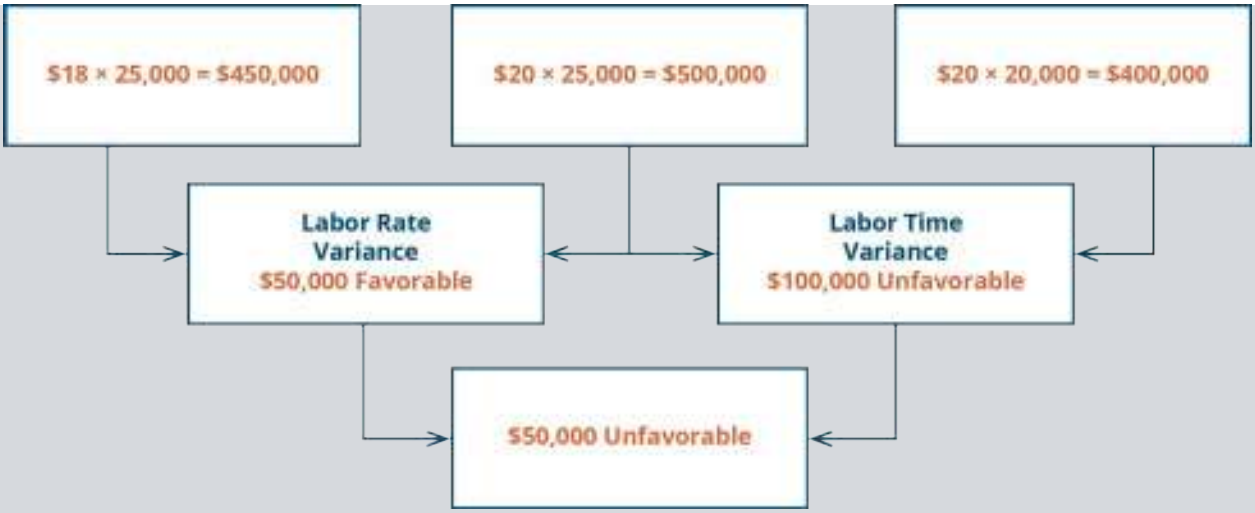


Figure 8.9 Labor variance for Barley, Inc. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

THINK IT THROUGH

Explaining Differences in Expected and Actual Operational Outcomes

The manager of a plant has called operations, purchasing, and personnel into her office to discuss the results of the last month. She notes that there was more than normal scrap, and employees worked more hours than expected. She is looking for an explanation for these results. What system might she have used to determine these material and labor issues? Why might these variances have occurred? What should she do about it for future periods?

LINK TO LEARNING

Standard Costing Advantages Explained

See this article on the four major advantages of standard costing (https://openstax.org/l/50StandCosting) to learn more.

Key Terms

attainable standard level that may be reached with reasonable effort
direct labor rate variance difference between the actual rate paid and the standard rate that should have been paid based on the actual hours worked
direct labor time variance difference between the actual hours worked and the standard hours that should have been worked for the actual units produced
direct labor variance measures how efficiently the company uses labor as well as how effective it is at pricing labor
direct materials price variance difference between the actual price paid per unit for materials and what should have been paid per the standards
direct materials quantity variance difference between the actual quantity of materials used and the standard materials that were expected to be used to make the actual units produced
direct materials variance difference between the actual price or amount used and the standard amount
favorable variance difference involving spending less, or using less, than the standard amount
fixed factory overhead variance difference between the actual fixed overhead and applied fixed overhead
flexible budget measurement and prediction of estimated revenues and costs at varying levels of production
ideal standard level that could be achieved if everything ran perfectly
standard expectation for a component used in production
standard cost cost expectation for price paid and amount (quantities) used
total direct labor variance actual labor costs compared to standard labor costs
total direct materials cost variance difference between actual materials cost and standard materials cost
total variable overhead cost variance total cost variance found by combining variable overhead rate variance and variable overhead efficiency variance
unfavorable variance difference involving spending more or using more than the standard amount
variable overhead efficiency variance difference between the actual hours worked and the standard hours expected for the units produced
variable overhead rate variance difference between the actual variable manufacturing overhead and the variable overhead that was expected given the number of hours worked
variance difference between standard and actual performance

Summary

8.1 Explain How and Why a Standard Cost Is Developed

- Standards are budgeted unit amounts for price paid and amount used.
- Variances are the difference between actual and standard amounts.
- A favorable variance is when the actual price or quantity is less than the standard amount.
- An unfavorable variance is when the actual price or amount is greater than the standard amount.

8.2 Compute and Evaluate Materials Variances

- There are two components to material variances: the direct materials price variance and the direct materials quantity variance.
- The direct materials price variance is caused by paying too much or too little for material.
- The direct materials quantity variance is caused by using too much or too little material.

8.3 Compute and Evaluate Labor Variances

- There are two labor variances: the direct labor rate variance and the direct labor time variance.
- The direct labor rate variance determines if the rate paid is greater than or less than the standard rate.
- The direct labor time variance determines if the actual hours used are greater than or less than the standards that should have been used.

8.4 Compute and Evaluate Overhead Variances

- There are two sets of overhead variances: variable and fixed.
- The variable variances are caused by the overhead application rate and the activity level against which the rate was applied.
- The variable overhead rate variance is the difference between the actual variable manufacturing overhead and the variable overhead that was expected given the number of hours worked.
- The variable overhead efficiency variance is driven by the difference between the actual hours worked and the standard hours expected for the units produced.
- There are two fixed overhead variances. One is caused by spending too much or too little on fixed overhead. The other is caused by actual production being above or below the expected production level.

8.5 Describe How Companies Use Variance Analysis

- The key to analyzing variances is to determine why the variance occurred.
- If a company cannot determine why there is a variance, it will not know if the variance is indicative of a problem or not.
- All firms—manufacturing, retail, and service—use standards and variances.

Multiple Choice

1. LO 8.1 Why does a company use a standard costing system?

A. to identify variances from actual cost that assist them in maintaining profits
B. to identify nonperformers in the workplace
C. to identify what vendors are unreliable
D. to identify defective materials

2. LO 8.1 This standard is set at a level that may be reached with reasonable effort.

A. ideal standard
B. attainable standard
C. unattainable standard
D. variance from standard

3. LO 8.1 This standard is set at a level that could be achieved if everything ran perfectly.

A. ideal standard
B. attainable standard
C. unattainable standard
D. variance from standard

4. LO 8.1 This variance is the difference involving spending more or using more than the standard amount.
A. favorable variance
B. unfavorable variance
C. no variance
D. variance

5. LO 8.1 This variance is the difference involving spending less, or using less than the standard amount.
A. favorable variance
B. unfavorable variance
C. no variance
D. variance

6. LO 8.2 What are some possible reasons for a material price variance?
A. substandard material
B. labor rate increases
C. labor rate decreases
D. labor efficiency

7. LO 8.2 When is the material price variance unfavorable?
A. when the actual quantity used is greater than the standard quantity
B. when the actual quantity used is less than the standard quantity
C. when the actual price paid is greater than the standard price
D. when the actual price is less than the standard price

8. LO 8.2 When is the material price variance favorable?
A. when the actual quantity used is greater than the standard quantity
B. when the actual quantity used is less than the standard quantity
C. when the actual price paid is greater than the standard price
D. when the actual price is less than the standard price

9. LO 8.2 What are some reasons for a material quantity variance?
A. building rental charges increase
B. labor rate decreases
C. more qualified workers
D. labor efficiency increases

10. LO 8.2 When is the material quantity variance favorable?
A. when the actual quantity used is greater than the standard quantity
B. when the actual quantity used is less than the standard quantity
C. when the actual price paid is greater than the standard price
D. when the actual price is less than the standard price

11. LO 8.2 When is the material quantity unfavorable?
A. when the actual quantity used is greater than the standard quantity
B. when the actual quantity used is less than the standard quantity
C. when the actual price paid is greater than the standard price
D. when the actual price is less than the standard price

12. LO 8.3 What are some possible reasons for a labor rate variance?
A. hiring of less qualified workers
B. an excess of material usage
C. material price increase
D. utilities usage change

13. LO 8.3 When is the labor rate variance unfavorable?
A. when the actual quantity used is greater than the standard quantity
B. when the actual quantity used is less than the standard quantity
C. when the actual price paid is greater than the standard price
D. when the actual price is less than the standard price

14. LO 8.3 When is the labor rate variance favorable?
A. when the actual quantity used is greater than the standard quantity
B. when the actual quantity used is less than the standard quantity
C. when the actual price paid is greater than the standard price
D. when the actual price is less than the standard price

15. LO 8.3 What are some possible reasons for a direct labor time variance?
A. utility usage decrease
B. less qualified workers
C. office supplies spending
D. sales decline

16. LO 8.3 When is the direct labor time variance favorable?
A. when the actual quantity used is greater than the standard quantity
B. when the actual quantity used is less than the standard quantity
C. when the actual price paid is greater than the standard price
D. when the actual price is less than the standard price

17. LO 8.3 When is the direct labor time variance unfavorable?
A. when the actual quantity used is greater than the standard quantity
B. when the actual quantity used is less than the standard quantity
C. when the actual price paid is greater than the standard price
D. when the actual price is less than the standard price

18. LO 8.4 A flexible budget _____.
A. predicts estimated revenues and costs at varying levels of production
B. gives actual figures for selling price
C. gives actual figures for variable and fixed overhead
D. is not used in overhead variance calculations

19. LO 8.4 The variable overhead rate variance is caused by the sum between which of the following?
A. actual and standard allocation base
B. actual and standard overhead rates
C. actual and budgeted units
D. actual units and actual overhead rates

20. LO 8.4 The variable overhead efficiency variance is caused by the difference between which of the following?

A. actual and budgeted units
B. actual and standard allocation base
C. actual and standard overhead rates
D. actual units and actual overhead rates

21. LO 8.4 The fixed factory overhead variance is caused by the difference between which of the following?

A. actual and standard allocation base
B. actual and budgeted units
C. actual fixed overhead and applied fixed overhead
D. actual and standard overhead rates

22. LO 8.5 Which of the following is a possible cause of an unfavorable material price variance?

A. purchasing too much material
B. purchasing higher-quality material
C. hiring substandard workers
D. buying substandard material

23. LO 8.5 Which of the following is a possible cause of an unfavorable material quantity variance?

A. purchasing substandard material
B. hiring higher-quality workers
C. paying more than should have for workers
D. purchasing too much material

24. LO 8.5 Which of the following is a possible cause of an unfavorable labor efficiency variance?

A. hiring substandard workers
B. making too many units
C. buying higher-quality material
D. paying too much for workers

25. LO 8.5 Which of the following is a possible cause of an unfavorable labor rate variance?

A. hiring too many workers
B. hiring higher-quality workers at a higher wage
C. making too many units
D. purchasing too much material

Questions

1. LO 8.1 What two components are needed to determine a standard for materials?

2. LO 8.1 What two components are needed to determine a standard for labor?

3. LO 8.1 What elements require consideration before establishing an overhead standard?

4. LO 8.1 What is a variance?

5. LO 8.2 What causes the material price variance?

6. LO 8.2 What causes the material quantity variance?

7. LO 8.2 What are some possible causes of a material price variance?

8. LO 8.2 What are some possible causes of a material quantity variance?

9. LO 8.3 What is the direct labor rate variance?

10. LO 8.3 What is the direct labor time variance?

11. LO 8.3 What are some possible causes of a direct labor rate variance?

12. LO 8.3 What are some possible causes of a direct labor time variance?

13. LO 8.3 How is the total direct labor variance calculated?

14. LO 8.4 What causes the variable overhead rate variance?

15. LO 8.4 What causes the variable overhead efficiency variance?

16. LO 8.4 What is the main difference between a flexible budget and a master budget?

17. LO 8.5 What causes a favorable variance?

18. LO 8.5 What causes an unfavorable variance?

19. LO 8.5 When might a favorable variance not be a good outcome?

20. LO 8.5 When might an unfavorable variance be a good outcome?

21. LO 8.5 Identify several causes of a favorable material price variance.

22. LO 8.5 Identify several causes of an unfavorable material price variance.

23. LO 8.5 Identify several causes of a favorable material quantity variance.

24. LO 8.5 Identify several causes of an unfavorable material quantity.

25. LO 8.5 Identify several causes of a favorable labor rate variance.

26. LO 8.5 Identify several causes of an unfavorable labor rate variance.

27. LO 8.5 Identify several causes of a favorable labor efficiency variance.

28. LO 8.5 Identify several causes of an unfavorable labor efficiency variance.

Exercise Set A

EA1. LO 8.1 Moisha is developing material standards for her company. The operations manager wants grade A widgets because they are the easiest to work with and are the quality the customers want. Grade B will not work because customers do not want the lower grade, and it takes more time to assemble the product than with grade A materials. Moisha calls several suppliers to get prices for the widget. All are within $0.05 of each other. Since they will use millions of widgets, she decides that the $0.05 difference is important. The supplier who has the lowest price is known for delivering late and low-quality materials. Moisha decides to use the supplier who is $0.02 more but delivers on time and at the right quality. This supplier charges $0.48 per widget. Each unit of product requires four widgets. What is the standard cost per unit for widgets?

EA2. LO 8.1 Rene is working with the operations manager to determine what the standard labor cost is for a spice chest. He has watched the process from start to finish and taken detailed notes on what each employee does. The first employee selects and mills the wood, so it is smooth on all four sides. This takes the employee 1 hour for each chest. The next employee takes the wood and cuts it to the proper size. This takes 30 minutes. The next employee assembles and sands the chest. Assembly takes 2 hours. The chest then goes to the finishing department. It takes 1.5 hours to finish the chest. All employees are cross-trained so they are all paid the same amount per hour, $17.50.

A. What are the standard hours per chest?
B. What is the standard cost per chest for labor?

EA3. LO 8.1 Fiona cleans offices. She is allowed 5 seconds per square foot. She cleans building A, which is 3,000 square feet, and building B, which is 2,460 square feet. Will she finish these two buildings in an 8-hour shift? Will she have time for a break?

EA4. LO 8.1 Use the information provided to create a standard cost card for production of one glove box switch. To make one switch it takes 16 feet of plastic-coated copper wire and 0.5 pounds of plastic material. The plastic material can usually be purchased for $20.00 per pound, and the wire costs $2.50 per foot. The labor necessary to assemble a switch consists of two types. The first type of labor is assembly, which takes 3.5 hours. These workers are paid $27.00 per hour. The second type of labor is finishing, which takes 2 hours. These workers are paid $29.00 per hour. Overhead is applied using labor hours. The variable overhead rate is $14.90 per labor hour. The fixed overhead rate is $15.60 per hour.

EA5. LO 8.2 Sitka Industries uses a cost system that carries direct materials inventory at a standard cost. The controller has established these standards for one ladder (unit):

	Standard Quantity	×	Standard Price	=	Standard Cost
Direct materials	3 pounds		$4.50 per pound		$13.50
Direct labor	2.00 hours		$12.00 per hour		$24.00
Total cost					$37.50

Sitka Industries made 3,000 ladders in July and used 8,800 pounds of material to make these units. Smith Industries bought 15,500 pounds of material in the current period. There was a $250 unfavorable direct materials price variance.

A. How much in total did Sitka pay for the 15,500 pounds?
B. What is the direct materials quantity variance?
C. What is the total direct material cost variance?
D. What if 9,500 pounds were used to make these ladders, what would be the direct materials quantity variance?
E. If there was a $340 favorable direct materials price variance, how much did Sitka pay for the 15,500 pounds of material?

EA6. LO 8.2 Use the information provided to answer the questions.

Actual price paid per pound of material	$ 14.50
Total standard pounds for units produced this period	12,500
Pounds of material used	13,250
Direct materials price variance favorable	$4,637.50

All material purchased was used in production.

A. What is the standard price paid for materials?
B. What is the direct materials quantity variance?
C. What is the total direct materials cost variance?
D. If the direct materials price variance was unfavorable, what would be the standard price?

EA7. LO 8.2 Dog Bone Bakery, which bakes dog treats, makes a special biscuit for dogs. Each biscuit uses 0.75 cup of pure semolina flour. They buy 4,000 cups of flour at $0.55 per cup. They use 3,550 cups of flour to make 4,750 biscuits. The standard cost per cup of flour is $0.53.

A. What are the direct materials price variance, the direct materials quantity variances, and the total direct materials cost variance?
B. What is the standard cost per biscuit for the semolina flour?

EA8. LO 8.3 Queen Industries uses a standard costing system in the manufacturing of its single product. It requires 2 hours of labor to produce 1 unit of final product. In February, Queen Industries produced 12,000 units. The standard cost for labor allowed for the output was $90,000, and there was an unfavorable direct labor time variance of $5,520.

A. What was the standard cost per hour?
B. How many actual hours were worked?
C. If the workers were paid $3.90 per hour, what was the direct labor rate variance?

EA9. LO 8.3 Penny Company manufactures only one product and uses a standard cost system. The following information is from Penny's records for May:

Direct labor rate variance	$15,000 favorable
Direct labor time variance	$25,000 unfavorable
Standard hours per unit produced	2.5
Standard rate per hour	$25

During May, the company used 12.5% more hours than the standard allowed.

A. What were the total standard hours allowed for the units manufactured during the month?
B. What were the actual hours worked?
C. How many actual units were produced during May?

EA10. LO 8.4 ThingOne Company has the following information available for the past year. They use machine hours to allocate overhead.

Actual total overhead	$75,000
Actual fixed overhead	$32,500
Actual machine hours	10,000
Standard hours for the units produced	9,500
Standard variable overhead rate	$ 4.50

What is the variable overhead efficiency variance?

EA11. LO 8.4 A manufacturer planned to use $78 of variable overhead per unit produced, but in the most recent period, it actually used $76 of variable overhead per unit produced. During this same period, the company planned to produce 500 units but actually produced 540 units. What is the variable overhead spending variance?

EA12. LO 8.5 Acme Inc. has the following information available:

Actual price paid for material	$1.00
Standard price for material	$1.20
Actual quantity purchased and used in production	100
Standard quantity for units produced	110
Actual labor rate per hour	$ 15
Standard labor rate per hour	$ 16
Actual hours	200
Standard hours for units produced	220

A. Compute the material price and quantity, and the labor rate and efficiency variances.
B. Describe the possible causes for this combination of favorable and unfavorable variances.

EA13. LO 8.5 Acme Inc. has the following information available:

Actual price paid for material	$1.00
Standard price for material	$0.90
Actual quantity purchased and used in production	100
Standard quantity for units produced	110
Actual labor rate per hour	$ 15
Standard labor rate per hour	$ 16
Actual hours	200
Standard hours for units produced	220

A. Compute the material price and quantity, and the labor rate and efficiency variances.
B. Describe the possible causes for this combination of favorable and unfavorable variances.

EA14. LO 8.5 Acme Inc. has the following information available:

Actual price paid for material	$1.00
Standard price for material	$0.90
Actual quantity purchased and used in production	100
Standard quantity for units produced	110
Actual labor rate per hour	$ 15
Standard labor rate per hour	$ 14
Actual hours	200
Standard hours for units produced	220

A. Compute the material price and quantity, and the labor rate and efficiency variances.
B. Describe the possible causes for this combination of favorable and unfavorable variances.

Exercise Set B

EB1. LO 8.1 Bristol is developing material standards for her company. The operations manager wants grade A plastic tops because they are the easiest to work with and are the quality the customers want. Grade B will not work because customers do not want the lower grade, and it takes more time to assemble the product than with grade A materials. Bristol calls several suppliers to get prices for the plastic top. All are within $0.10 of each other. Since the company will use millions of the plastic tops, she decides that the $0.10 difference is important. The supplier who has the lowest price is known for delivering late and low-quality materials. Bristol decides to use the supplier who is $0.04 more but delivers on time and at the right quality. This supplier charges $0.52 per plastic top. Each unit of product requires six plastic tops. What is the standard cost per unit for plastic tops?

EB2. LO 8.1 Salley is developing material and labor standards for her company. She finds that it costs $0.55 per pound of material per widget. Each widget requires 6 pounds of material per widget. Salley is also working with the operations manager to determine what the standard labor cost is for a widget. Upon observation, Salley notes that it takes 3 hours in the assembly department and 1 hour in the finishing department to complete one widget. All employees are paid $10.50 per hour.

A. What is the standard materials cost per unit for a widget?
B. What is the standard labor cost per unit for a widget?

EB3. LO 8.1 Use the following information to create a standard cost card for production of one photography drone from Drone Experts.

To make one drone it takes 2 pounds of plastic material. The material can usually be purchased for $25.00 per pound. The labor necessary to build a drone consists of two types. The first type of labor is assembly, which takes 10.5 hours. These workers are paid $21.00 per hour. The second type of labor is finishing, which takes 7 hours. These workers are paid $25.00 per hour. Overhead is applied using labor hours. The variable overhead rate is $14.00 per labor hour. The fixed overhead rate is $16.00 per hour.

EB4. LO 8.1 Mateo makes gizmos. He would like to set up a system to help him manage his business. The gizmos are made in a standard process. There is a certain amount of material and labor that goes into each gizmo. The only difference between the gizmo is the color of the material. What information should Mateo collect, how should he format it, and what kind of reports should he prepare to help him run his business?

EB5. LO 8.2 Smith Industries uses a cost system that carries direct materials inventory at a standard cost. The controller has established these standards for the cost of one basket (unit):

	Standard Quantity	×	Standard Price	=	Standard Cost
Direct materials	5 pounds		$2.60 per pound		$18.00
Direct labor	1.25 hours		$12.00 per hour		$15.00
Total prime cost					$33.00

Smith Industries made 3,000 baskets in July and used 15,500 pounds of material to make these units. Smith Industries paid $39,370 for the 15,500 pounds of material.

A. What was the direct materials price variance for July?
B. What was the direct materials quantity variance for July?
C. What is the total direct materials cost variance?
D. If Smith Industries used 15,750 pounds to make the baskets, what would be the direct materials quantity variance?

EB6. LO 8.2 Lizbeth, Inc., makes ice cream. The toffee coffee ice cream takes 4 quarts of cream, 3 cups of sugar, 2 tablespoons of toffee flavoring, and 1.5 tablespoons of coffee flavoring per gallon. The standard prices are $2.00 per quart of cream, $0.40 per cup of sugar, $0.50 per tablespoon of toffee flavoring, and $0.75 per tablespoon of coffee flavoring.

A. What is the standard material cost for a gallon of toffee coffee ice cream?
B. If Lizbeth makes 35 gallons of toffee coffee ice cream, how much of each of the ingredients should she use?
C. If Lizbeth uses 105 quarts of cream to make 25 gallons of ice cream, what would be the cream (direct materials) quantity variance?
D. If Lizbeth uses 45 tablespoons of toffee flavoring to make 25 gallons of ice cream, what would be the toffee flavoring (direct materials) quantity variance?

EB7. LO 8.2 Woodpecker manufactures sawmill equipment. They use a standard costing system and recognize material price variance at the time of material purchases. They use carbide to make the teeth on their band-saw blades. They received an order for 250 band-saw blades, but they did not have any carbide in stock. They purchased 3,500 pounds of carbide for $14,875 but should have spent $16,275. Each saw blade has a standard carbide direct materials quantity of 7.8 pounds.

A. If they used 8 pounds per blade, what would be the direct materials quantity variance?
B. If they used 7.5 pounds per blade, what would be the direct materials quantity variance?
C. Compute the direct materials price variance based on 7.5 pounds of carbide per blade actually used.

EB8. LO 8.3 Case made 24,500 units during June, using 32,000 direct labor hours. They expected to use 31,450 hours per the standard cost card. Their employees were paid $15.75 per hour for the month of June. The standard cost card uses $15.50 as the standard hourly rate.

A. Compute the direct labor rate and time variances for the month of June, and also calculate the total direct labor variance.
B. If the standard rate per hour was $16.00, what would change?

EB9. LO 8.3 Eagle Inc. uses a standard cost system. During the most recent period, the company manufactured 115,000 units. The standard cost sheet indicates that the standard direct labor cost per unit is $1.50. The performance report for the period includes an unfavorable direct labor rate variance of $3,700 and a favorable direct labor time variance of $10,275.
What was the total actual cost of direct labor incurred during the period?

EB10. LO 8.4 A manufacturer planned to use $45 of variable overhead per unit produced, but in the most recent period, it actually used $47 of variable overhead per unit produced. During this same period, the company planned to produce 200 units but actually produced 220 units. What is the variable overhead spending variance?

EB11. LO 8.4 Fitzgerald Company manufactures sewing machines, and they produced 2,500 this past month. The standard variable manufacturing overhead (MOH) rate used by the company is $6.75 per machine hour. Each sewing machine requires 13.5 machine hours. Actual machine hours used last month were 33,500, and the actual variable MOH rate last month was $7.00.

Calculate the variable overhead rate variance and the variable overhead efficiency variance.

EB12. LO 8.5 Acme Inc. has the following information available:

Actual price paid for material	$1.00
Standard price for material	$0.90
Actual quantity purchased and used in production	100
Standard quantity for units produced	90
Actual labor rate per hour	$ 15
Standard labor rate per hour	$ 14
Actual hours	200
Standard hours for units produced	190

A. Compute the material price and quantity, and the labor rate and efficiency variances.
B. Describe the possible causes for this combination of favorable and unfavorable variances.

EB13. LO 8.5 Acme Inc. has the following information available:

Actual price paid for material	$1.00
Standard price for material	$1.10
Actual quantity purchased and used in production	100
Standard quantity for units produced	110
Actual labor rate per hour	$ 15
Standard labor rate per hour	$ 14
Actual hours	200
Standard hours for units produced	190

A. Compute the material price and quantity, and the labor rate and efficiency variances.
B. Describe the possible causes for this combination of favorable and unfavorable variances.

EB14. LO 8.5 Acme Inc. has the following information available:

Actual price paid for material	$1.00
Standard price for material	$0.90
Actual quantity purchased and used in production	100
Standard quantity for units produced	90
Actual labor rate per hour	$ 15
Standard labor rate per hour	$ 16
Actual hours	200
Standard hours for units produced	220

A. Compute the material price and quantity, and the labor rate and efficiency variances.
B. Describe the possible causes for this combination of favorable and unfavorable variances.

Problem Set A

PA1. LO 8.1 The comptroller wants to set the standards according to a study done by a consulting firm for a company. The consulting firm used the following assumptions: The machines never break down. Workers never take a break. The material used is perfect. The material arrives on time. No one takes a day off. Workers are well trained. Workers do not make defective units. What kinds of standards are these? Will the workers be motivated to achieve these standards?

PA2. LO 8.1 Stan is opening a coffee shop next to Big State University. He knows that controlling his costs will be important to the success of the shop. He will not be able to work all the hours the shop is open, so the employees will need some guidelines to perform their jobs correctly. After talking to an accounting professor, he decides he needs a standard cost system for his shop. Describe the process Stan should follow in setting his standards for materials and labor.

PA3. LO 8.1 What makes a variance favorable? Give an example of a favorable variance involving materials. What makes a variance unfavorable? Give an example of an unfavorable variance involving labor.

PA4. LO 8.2 April Industries employs a standard costing system in the manufacturing of its sole product, a park bench. They purchased 60,000 feet of raw material for $300,000, and it takes 5 feet of raw materials to produce one park bench. In August, the company produced 10,000 park benches. The standard cost for material output was $100,000, and there was an unfavorable direct materials quantity variance of $6,000.

A. What is April Industries' standard price for one unit of material?
B. What was the total number of units of material used to produce the August output?
C. What was the direct materials price variance for August?

PA5. LO 8.2 Ed Co. manufactures two types of O rings, large and small. Both rings use the same material but require different amounts. Standard materials for both are shown.

	Large	Small
Rubber	3 feet at $0.25 per foot	1.25 feet at $0.25 per foot
Connector	1 at $0.03	1 at $0.03

At the beginning of the month, Edve Co. bought 25,000 feet of rubber for $6,875. The company made 3,000 large O rings and 4,000 small O rings. The company used 14,500 feet of rubber.

A. What are the direct materials price variance, the direct materials quantity variance, and the total direct materials cost variance?
B. If they bought 10,000 connectors costing $310, what would the direct materials price variance be for the connectors?
C. If there was an unfavorable direct materials price variance of $125, how much did they pay per foot for the rubber?

PA6. LO 8.2 The Whizbang Company makes a special type of toy. Each top takes 6 ounces of a special material that costs $3 per ounce. Whizbang bought 4,000 ounces of the material at a cost of $11,300. They used 3,400 ounces to make 534 toys. Compute the direct materials price variance, the direct materials quantity variance, and the total direct materials cost variance.

PA7. LO 8.3 Ellis Company's labor information for September is as follows:

Direct labor hourly rate paid	$ 32.00
Total standard direct labor hours for units produced	11,000
Direct labor hours worked	10,850
Direct labor rate variance	$8,137.50 (favorable)

A. Compute the standard direct labor rate per hour.
B. Compute the direct labor time variance.
C. Compute the standard direct labor rate if the direct labor rate variance was $2,712.50 (unfavorable).

PA8. LO 8.3 Breakaway Company's labor information for May is as follows:

Actual direct labor hours worked	48,000
Standard direct labor hours allowed	47,400
Total payroll for direct labor	$1,128,000
Direct labor time variance	$ 13,800 (unfavorable)

A. What is the actual direct labor rate per hour?
B. What is the standard direct labor rate per hour?
C. What was the total standard direct labor cost for May?
D. What was the direct labor rate variance for May?

PA9. LO 8.3 Power Co.'s labor information for June is as follows:

Direct labor hours worked	67,200
Standard labor hours for units manufactured	70,000
Unfavorable direct labor rate variance	$ 23,520
Total payroll for labor	$823,200

A. What was the actual labor rate per hour?
B. What was the standard labor rate per hour?
C. What was the total standard labor cost for units produced in June?
D. What was the direct labor time variance for June?

PA10. LO 8.4 Prepare a flexible budget for overhead based on the following data:

Percent of capacity	90%	100%	110%
Direct labor hours	3,600	4,000	4,400
Units of output	900	1,000	1,100
Variable overhead	$3,600	$ 4,000	$ 4,400
Fixed overhead	$6,000	$ 6,000	$ 6,000
Total overhead	$9,600	$10,000	$10,400

Normal capacity = 100% and overhead is applied based on direct labor hours
Standard overhead rate = $10,000/4,000 = $2.50 per direct labor hour
Direct materials are $67.50 per unit.
Direct labor is $23.50 per hour.

PA11. LO 8.4 Reddy Corporation has collected the following data for the month of June:

Actual total factory overhead incurred	$61,250
Budgeted fixed factory overhead costs	$42,000
Activity level, in direct labor hours	15,000
Actual direct labor hours	18,000
Standard hours for output this period	17,000
Total factory overhead rate	$ 4.35

What is the variable overhead efficiency variance?

PA12. LO 8.4 ABC Inc. spent a total of $48,000 on factory overhead. Of this, $28,000 was fixed overhead. ABC Inc. had budgeted $27,000 for fixed overhead. Actual machine hours were 5,000. Standard hours for units made were 4,800. The standard variable overhead rate was $4.10. What is the variable overhead rate variance?

PA13. LO 8.5 Recompute the variances from the second Acme Inc. exercise using $0.0725 as the standard cost of the material and $14 as the standard labor cost per hour. How has your explanation of the variances changed?

Problem Set B

PB1. LO 8.1 Sameerah is trying to determine the standard hours to make one unit. She has studied the manufacturing process and is trying to determine what portion of the employees' time should be included in the standard time to make the product. She knows that the actual time the worker is assembling, cutting, and painting should be part of the standard hours. She is questioning whether setup, down time, rest periods, and cleanup should be part of the standard hours. Explain why you would or would not include these times.

PB2. LO 8.1 Carl cleans offices. He has the following buildings to clean every day: building A, which is 12,500 square feet; building B, which is 24,500 square feet; building C, which is 10,500 square feet; and building D, which is 6,700 square feet. He is allowed 5 seconds per square foot. Each employee is allowed one 30-minute lunch per shift. How many employees will he need to hire?

PB3. LO 8.1 Freidrich is working with the operations manager to determine what the standard material cost is for a spice chest. He has watched the process from start to finish and taken detailed notes on what material is used. The easiest material to measure is the wood. Each chest uses 5 board feet and produces 1.5 feet of scrap. He is not sure what to do with the scrap that is produced; the company cannot buy the boards in any other dimensions. What amount of materials should be included in the standard for material costs?

PB4. LO 8.2 A company bought 45,000 pounds of plastic pellets to make DVDs at a cost of $9,900. The standard cost per pound for the pellets is 20.5 cents. Some of these pellets were used in three jobs. The first job called for 7,500 pounds but used 7,250 pounds. The second job called for 8,800 pounds but used 9,000 pounds. The third job called for 2,300 pounds but used 2,250 pounds. Compute the direct materials price variance and the direct materials quantity variance for each job and in total. Why would you want to calculate the direct materials quantity variance for each job?

PB5. LO 8.2 Illinois Company is a medium-sized company that makes dresses. During the month of June, 8,575 dresses were made. All material purchases were used to make the dresses. The company had this information: standard per dress of 6 yards of material at $6.20 per yard. The actual quantity was 52,000 yards at a cost of $325,520. Compute the direct materials price variance, the direct materials quantity variance, and the total direct materials cost variance.

PB6. LO 8.2 Corolla Manufacturing has a standard cost for steel of $20 per pound for a product that uses 4 pounds of steel. During September, Corolla purchased and used 4,200 pounds of steel to make 1,040 units. They paid $20.75 per pound for the steel. Compute the direct materials price variance, the direct materials quantity variance, and the total direct materials cost variance for the month of September. What would change if Corolla had made 2,200 units?

PB7. LO 8.3 Marymount Company makes one product. In the month of April, it made 3,500 units. Workers were paid $32 per hour for labor, for a total of $718,848. The standard hours per unit are 6.4, and the standard labor wage rate is $38.40 per hour.

A. What are the actual hours worked?
B. What are the standard hours for the units made?
C. What is the direct labor rate variance for April?
D. What is the direct labor time variance for April?
E. What is the total direct labor variance for April?

PB8. LO 8.3 Adam Inc.'s records for May include the following information:

Actual payroll	$40,000
Actual hours worked	3,200
Labor rate variance	$ 8,000 (favorable)
Labor time variance	$ 4,800 (unfavorable)

A. What are Adam's standard labor hours for the units made?
B. What is Adam's total standard labor cost for the units made?

PB9. LO 8.3 Ribco's labor cost information for making its only product for March is as follows:

Standard hours per unit	1.25
Budgeted units for the period	12,000
Finished units for the period	10,000
Standard rate per hour	$ 40
Actual labor costs incurred	$414,000
Actual rate paid per hour	$ 36

A. What is the direct labor rate variance?
B. What is the direct labor time variance?
C. What is the total direct labor variance?

PB10. LO 8.5 Use the following standard cost card for 1 gallon of ice cream to answer the questions.

STANDARD COST CARD

Product: Gallon of Ice Cream

Manufacturing Cost Information	Standard Quantity	×	Standard Cost per Unit	=	Cost Summary
Direct Materials					
Cream	5 quarts		$1.15 per quart		$5.75
Sugar	16 ounces		$0.08 per ounce		$1.28
Direct Labor	3 minutes		$36.00 per hour		$1.80
Total Direct Costs					$8.83

Actual direct costs incurred to make 50 gallons of ice cream:

- 275 quarts of cream at $1.05 per quart
- 832 ounces of sugar at $0.075 per ounce
- 165 minutes of labor at $37 per hour

All material used was bought during the current period.

A. Compute the material and labor variances.
B. Comment on the results and possible causes of the variances.

PB11. LO 8.5 Use the following standard cost card for 1 gallon of ice cream to answer the questions.

STANDARD COST CARD Product: Gallon of Ice Cream				
Manufacturing Cost Information	**Standard Quantity**	×	**Standard Cost per Unit**	= **Cost Summary**
Direct Materials				
Cream	6 quarts		$1.00 per quart	$6.00
Sugar	15 ounces		$0.07 per ounce	$1.05
Direct Labor	3 minutes		$38.00 per hour	$1.90
Total Direct Costs				$8.95

Actual direct costs incurred to make 50 gallons of ice cream:

- 275 quarts of cream at $1.05 per quart
- 832 ounces of sugar at $0.075 per ounce
- 165 minutes of labor at $37 per hour

All materials used were bought during the current period.

A. Compute the material and labor variances.
B. Comment on the results and possible causes of the variances.

Thought Provokers

TP1. LO 8.1 How do you balance a firm's need to succeed and the need for not asking the workers for perfection?

TP2. LO 8.1 What type of firm would use standard costing? What type of firm would not use standard costing?

TP3. LO 8.2 You started your own construction business and need to determine the cost of materials used to build one house, and how many materials you will need to do so.

- Where would you begin to determine the standard price and quantity needs to build one house?
- What would produce a difference between the standard cost to build a house and the actual cost? What would cause a favorable outcome? What would cause an unfavorable outcome?
- What action might your company take if you had an unfavorable total direct materials cost variance?

TP4. LO 8.3 Is labor a true variable cost?

TP5. LO 8.4 Why would managers use a flexible budget? What information does it provide that a regular budget does not?

TP6. LO 8.4 Fill in the blanks in the following flexible budget:

Percent of Capacity		**100%**	
Direct labor hours	3,600		
Units of output	1,800	2,000	2,200
Variable overhead		$ 8,000	
Fixed overhead		$10,000	
Total overhead		$18,000	

TP7. LO 8.4 Before automation became more prevalent, overhead was often calculated and allocated as a function of direct labor costs or direct labor hours. Why was this the case, and has this pattern changed?

TP8. LO 8.5 In your opinion, is it important that an organization set standards and measure them monthly? Why or why not?

9

Responsibility Accounting and Decentralization

Figure 9.1 Food Trucks. Food trucks have grown significantly in popularity. They allow customers to try a variety of foods that are served quickly, and they often set up in locations that are convenient for customers. The mobility of food trucks adds another dimension that has broad appeal. (credit: modification of "Food Truck" by David Stanley/Wikimedia Commons, CC BY 2.0)

Chapter Outline

LO **9.1** Differentiate between Centralized and Decentralized Management

LO **9.2** Describe How Decision-Making Differs between Centralized and Decentralized Environments

LO **9.3** Describe the Types of Responsibility Centers

LO **9.4** Describe the Effects of Various Decisions on Performance Evaluation of Responsibility Centers

Why It Matters

Lauren is a good cook who can make delicious meals quickly, and she enjoys cooking tremendously. Several friends have suggested she consider opening a food truck. She is intrigued by this idea and decides to further explore the possibility.

After several years of research and planning, Lauren opens her food truck and finds instant success. She is so busy that she decides to recruit several others to join her in her food truck business. While this is an exciting next step, she has some questions about expanding the food truck concept. In particular, she wants to know if she can grow the business while maintaining the level of quality in her food that has led to her success.

Since the concept of multiple food trucks is similar to the franchising concept, Lauren reaches out to a good friend who is the founder of a franchise that now has 10 regional locations. Her friend shares with her the concepts of a decentralized business and responsibility accounting. Under this approach, her friend tells her, she will be able to allow the individual food truck owners to have autonomy over their food truck while achieving the broader goals of financial success and serving quality food.

9.1 Differentiate between Centralized and Decentralized Management

All businesses start with an idea. After putting the idea into action and forming the business, measuring the performance of the business is a crucial next step for the business owners. As the business begins operations, it is fairly easy for the entrepreneur to measure the performance because the owner is heavily involved in the daily activities and decisions of the business. As the business grows through increased sales volume, additional products and locations, and more employees, however, it becomes more complicated to measure the performance of the organization. Owners and managers must design organizational systems that allow for operational efficiency, performance measurement, and the achievement of organizational goals.

In this chapter, you will learn the difference between centralized and decentralized management and how that relates to decision-making. You will learn about responsibility accounting and the type of decision-making authority that may be granted through different responsibility centers. Finally, you will learn how certain types of decisions have differing effects, depending on the type of responsibility center.

Management Control System

It is important for those studying business (and accounting, in particular) to understand the concept of a management control system. A **management control system** is a structure within an organization that allows managers to establish, implement, and monitor progress toward the strategic goals of the organization.

Establishing strategic goals within any organization is important. Strategic goals relate to all facets of the business, including which markets to operate in, what products and services to offer to customers, and how to recruit and retain a talented workforce. It is the responsibility of the organization's management to establish strategic goals and to ensure that all activities of the business help meet goals.

Once an organization establishes its strategic goals, it must implement them. Implementing the strategic goals of the organization requires communication and providing plans that guide the work of those in the organization.

The final factor in creating a management control system is to design mechanisms to monitor the activities of the organization to assess how well they are meeting the strategic goals. This aspect of the management control system includes the accounting system (both financial and managerial). Monitoring the performance of the organization allows management to repeat the activities that lead to good performance and to adjust activities that are not supporting the strategic goals. In addition, monitoring the activities of the organization provides feedback to management as to whether adjustments to the organization's strategy are necessary.

Establishing a management control system is very important to an organization. Organizations must continually evaluate ways to improve and remain competitive in an ever-changing market. This requires the organization to be both forward-looking (via strategic planning) and backward-looking (by evaluating what has occurred), constantly monitoring performance and making necessary adjustments.

CONCEPTS IN PRACTICE

Double Loop Learning

In the fall of 1977, Harvard professor Chris Argyris wrote an article entitled "Double Loop Learning in

Organizations." The article describes how organizations "learn," defined by Argyris as "a process of detecting and correcting error."[1] Argyris suggests there are two types of learning—single loop and double loop.

Single loop learning is characterized as a system that evaluates the organization from the perspective of the organization's present policies. The result of single loop learning is binary: the organization is either meeting or not meeting the company's objectives. There is no further evaluation or additional information fed back into the management control system.

Double loop learning, on the other hand, allows for a more comprehensive evaluation. In addition to evaluating whether or not the organization is meeting the current goals, double loop learning takes into consideration whether or not the current goals of the organization are relevant or should be adjusted in any way. That is, double loop learning requires organizations to evaluate the underlying assumptions that serves as the basis for establishing the current goals.

Argyris's introduction of double loop learning has had a significant impact on the study of management and organizations. The concept of double loop learning also highlights how accounting systems, both financial and managerial, play a vital role in helping the organization attain its strategic goals.

Establishing effective management control systems is important for organizations of all sizes. It is important for businesses to determine how they should structure the organization to ease decision-making and subsequent evaluation. First, levels of management within an organization help the organization form a structure that establishes levels of authority and roles within the organization. **Lower-level management** provides basic supervision and oversight for the operations of the organization. **Mid-level management** supervises and provides direction to lower-level management. Mid-level management often directs the various departments or divisions within the organization. Mid-level managers receive direction and are responsible for achieving the goals established by upper management. **Upper management** consists of the board of directors and chief executives charged with providing strategic guidance for the organization. Upper management has the ultimate authority within the organization and is accountable to the owners of the organization.

Once a company establishes its management levels, it must determine whether the business is set up as centralized or decentralized—opposite ends of a spectrum. Many businesses fall somewhere between the two ends. Understanding the structures of both centralized and decentralized organizations provides a foundation for understanding the variations in management accounting the organizations use.

ETHICAL CONSIDERATIONS

The Ethical Bakery Accountant

Bakery accountant Keith Roberts worked at Archway & The Mother's Cookie Company as the director of finance. According to the *New York Times*, Roberts found himself perplexed by some numbers: "he knew

1 Chris Argyris "Double Loop Learning in Organizations." *Harvard Business Review* 55, no. 5 (1977): 115–116.

things had been bad—daily reports he had been monitoring for six months showed that cookie sales at the company had been dismal. But the financial data he was looking at showed much more robust sales." He could not figure out where the sales were coming from, and after researching the accounting records, he determined that the company was booking nonexistent sales.

Why? Roberts reasoned that sham transactions allowed Archway, which was owned by a private-equity firm, Catterton Partners, to maintain access to badly needed money from its lender, Wachovia. Roberts played a major role in alerting Archway's auditing firm of the possibility of accounting fraud. When challenged with the deceptive accounting, Roberts's supervisor invoked a crucial period in the business as a rationale for the unorthodox accounting for sales. Roberts finally quit his job and the accounting misstatements were brought to the attention of the bank and the auditors.

Centralized Organizations

Centralization is a business structure in which one individual makes the important decisions (such as resource allocation) and provides the primary strategic direction for the company. Most small businesses are centralized in that the owner makes all decisions regarding products, services, strategic direction, and most other significant areas. However, a business does not have to be small to be centralized. Apple is an example of a business with a centralized management structure. Within Apple, much of the decision-making responsibility lies with the Chief Executive Officer (CEO) Tim Cook, who assumed the leadership role within Apple following the death of Steve Jobs. Apple has long been viewed as an organization that maintains a high level of centralized control over the company's strategic initiatives such as new product development, markets to operate in, and company acquisitions. Many businesses in rapidly changing technological environments have a centralized form of management structure. The decisions made by the lower level management are limited in a centralized environment.

The advantages of centralized organizations include clarity in decision-making, streamlined implementation of policies and initiatives, and control over the strategic direction of the organization. The primary disadvantages of centralized organizations can include limited opportunities for employees to provide feedback and a higher risk of inflexibility.

Decentralized Organizations

Decentralization is a business structure in which the decision-making is made at various levels of the organization. Typically, decentralized businesses are divided into smaller segments or groups in order to make it easier to measure the performance of the company and the individuals within each of the sub-groups.

Advantages of Decentralized Management

Many businesses operate in markets and industries that are highly competitive. In order to be successful, a company must work hard to develop strategic competitive advantages that distinguish the company from its peers. To accomplish this, the organizational structure must allow the organization to quickly adapt and take advantage of opportunities. Therefore, many organizations adopt a decentralized management structure in

order to maintain a competitive advantage.

There are numerous advantages of a decentralized management, such as:

- Quick decision and response times—it is important for decisions to be made and implemented in a timely manner. In order to remain competitive, it is important for organizations to take advantage of opportunities that fit within the organization's strategy.
- Better ability to expand company—it is important for organizations to constantly explore new opportunities to provide goods and services to its customers.
- Skilled and/or specialized management—organizations must invest in developing highly skilled employees who are able to make sound decisions that help the organization achieve its goals.
- Increased morale of employees—the success of an organization depends on its ability to obtain, develop, and retain highly motivated employees. Empowering employees to make decisions is one way to help increase employee morale.
- Link between compensation and responsibility—promotional opportunities are often linked with a corresponding increase in compensation. In a decentralized organization, a compensation increase often corresponds to a commensurate increase in the responsibilities associated with learning new skills, increased decision-making authority, and supervision of other employees.
- Better use of lower and middle management—many tasks must be performed in order to achieve success in an organization. Decentralized organizations often rely on lower and middle management to perform many of these tasks. This allows managers to gain valuable experience and expertise in different areas.

Disadvantages of Decentralized Management

While a decentralized organizational structure can be an advantage for many organizations, there are also disadvantages to this type of structure, including:

- Coordination problems—it is important for an organization to be working toward a common goal. Because decision-making is delegated in a decentralized organization, it is often difficult to ensure that all segments of the company are working in a consistent manner to achieve the strategic goals of the organization.
- Increased administrative costs due to duplication of efforts—because similar decisions need to be made and activities undertaken across all divisions of an organization, decentralized organizations are susceptible to duplicating efforts, which results in inefficiency and increased costs.
- Incongruity in operations—when autonomy is dispersed throughout the organization, as is the case in decentralized organizations, division managers may be tempted to customize/alter the operations of the division in an effort to maximize efficiency and suit the best interest of the division. In this structure, it is important to ensure the shortcuts taken by one division of the organization do not conflict with or disrupt the operations of another division within the organization.
- Each department/division is often self-centered (its own fiefdom)—it is not uncommon for separate divisions within an organization to be measured on the performance of the division rather than of the entire company. In a decentralized organization, it is possible for division managers to prioritize divisional goal over organizational goals. Leaders of decentralized organizations should ensure the organization's goals remain the priority for all divisions to attain.
- Significant, if not almost total, reliance on the divisional or department managers—because divisions within decentralized organizations have a high level of autonomy, the division may become operationally isolated from other divisions within the organization, focusing solely on the priorities of the division. If

divisional or departmental managers do not have a wide breadth of experience or skills, the division may be at a disadvantage due to limited access to other expertise.

CONCEPTS IN PRACTICE

Johnson & Johnson

Johnson & Johnson was founded in 1886. The first factory had 14 employees: eight women and six men.[2] Today, Johnson & Johnson, employs over 125,000 associates and operates in over 60 countries. You may recognize some of Johnson & Johnson's products, which include Johnson's Baby Shampoo, Neutrogena, Band-Aid, Tylenol, Listerine, and Neosporin.

William Weldon was Chief Executive Officer (CEO) of Johnson & Johnson from 2002 to 2012. Under Weldon's leadership, Johnson & Johnson operated under a decentralized structure. This interview on successfully operating a decentralized organization (https://openstax.org/l/50decentralized) shows it is clear that the key is the people within the organization. Weldon notes that to be successful, a decentralized organization must empower employees to innovate, develop expertise, and collaborate to achieve organizational goals.

Daily and Strategic Decision-Making

An underlying assumption is that businesses possess a single structure (either centralized or decentralized) at any given point. That is not necessarily the case. For example, businesses often add employees who specialize in the various needs of the organization. Over the life of an organization, it is not uncommon for businesses to demonstrate aspects of both centralization and decentralization.

New businesses, for example, are often centralized. When a business first opens, it is common for the owner(s) to be highly involved in the day-to-day operations. In addition, the small size of a new business allows the owner to have a high level of involvement in both the daily and the strategic decisions of the business. Daily decisions are ongoing, immediate decisions that must be made in order to effectively and efficiently meet the needs of the organization's customers. Strategic decisions, on the other hand, are made fairly infrequently and involve long-term goals of the organization. Being actively involved in the business allows new business owners to gain experience in all aspects of the business so that they can get a sense of the patterns of the daily operations and the decisions that need to be made. For example, the owner can be involved in determining the number of workers needed to meet the day's production goal. Having too many workers would be inefficient and require the company to incur unnecessary expenses. Having too few workers, on the other hand, may result in inferior quality of products, missed shipments, or lost sales.

Additionally, an owner involved in daily operations has the opportunity to evaluate and, if necessary, alter any strategic goals that may impact the daily operations. Strategic goals relate to all facets of the business, including in which markets to operate, what products and services to offer to customers, how to recruit and retain a talented workforce, and many other aspects of the business.

If an owner is involved in daily operations, an example of a potential strategic goal could be tha he or she can

2 "Our Story." Johnson & Johnson. https://ourstory.jnj.com/timeline

determine whether to pursue a cost leadership perspective. When pursuing a cost leadership perspective, companies undertake activities to eliminate costs in order to produce a product or provide a service that has a cost advantage compared to competing products or services. While providing a high-quality goods or service is important to a company pursuing a cost leadership perspective, the competitive advantage of the company is eliminating wasteful activities that add unnecessary costs, entering into strategic partnerships with suppliers and other companies, and focusing on activities that allow the organization to offer the good or service at a lower price than its competitors. Being highly involved in both the daily and strategic decisions can be very beneficial as the business is established, but it is demanding on the business owner and, without adjustments, often cannot be sustained.

As the business grows, management of a centralized organization faces a choice. Remaining highly involved in the daily decisions of the business results in a low level of involvement in the strategic decisions of the organization. While this may be effective in the short-term, the risks associated with not establishing and adjusting long-term strategic goals increase. On the other hand, remaining highly involved in the strategic decisions of the business results in a low level of involvement in the daily decisions of the business. This, too, is risky because ineffectively managing daily business decisions may have long-term, negative consequences.

ETHICAL CONSIDERATIONS

Ethically Directed Strategic Management

Managers in some organizations follow legal and regulatory requirements to operate their business at the lowest level of acceptable behavior in their business environment in order to keep costs low; however, some stakeholders may expect more than the minimum level of ethics. Stakeholders of business organizations are now insisting on higher ethical standards from their organizations. Stakeholders are any group or individual who may be affected by the organization's business decisions. Organizations providing high-quality goods and services need to consider all of their stakeholders when developing a strategic decision-making process to direct the organization's strategic decisions.

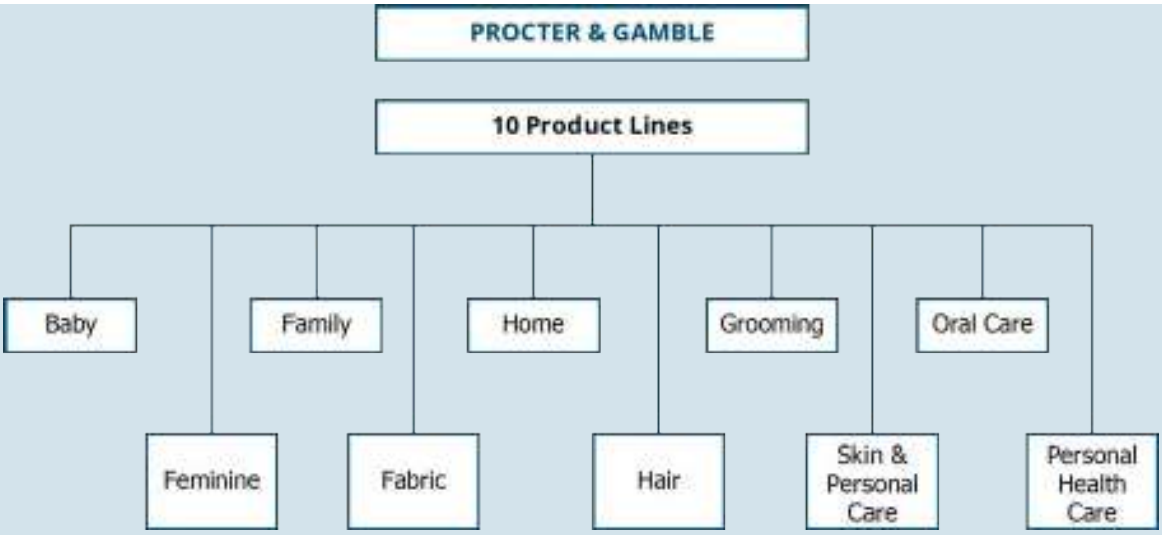
Another alternative for growing businesses is to move toward a decentralized operating structure. The management of growing businesses with a decentralized structure has a low level of involvement in the daily decisions of the business. Instead, management in these businesses focuses on strategic decisions that impact the long-term success of the organization. The daily decisions are delegated to others, thereby allowing management to focus on developing, implementing, and monitoring the firm's performance with respect to the strategic goals of the business.

THINK IT THROUGH

Centralized Structure at Procter & Gamble

The organizational chart shows the 10 product categories of Procter & Gamble.[3]

3 "Company Strategy." Procter & Gamble. http://www.pginvestor.com/Company-Strategy/Index?KeyGenPage=208821



Review the different types of products that Procter & Gamble produces. Think of 2–3 instances where Procter & Gamble would adopt a centralized perspective in its operations. Why would this perspective be beneficial for Procter & Gamble? Don't forget to consider the ingredients used to make these products and how these products are sold to consumers.

9.2 Describe How Decision-Making Differs between Centralized and Decentralized Environments

Businesses are organized with the intention of creating efficiency and effectiveness in achieving organizational goals. To aid in this, larger businesses use **segments**, uniquely identifiable components of the business. A company often creates them because of the specific activities undertaken within a particular portion of the business.[4] Segments are often categorized within the organization based on the services provided (i.e., departments), products produced, or even by geographic region. The purpose of identifying distinguishable segments within an organization is to provide efficiency in decision-making and effectiveness in operational performance.

Organizational Charts

Many organizations use an **organizational chart** to graphically represent the authority for decision-making and oversight. Organizational charts are similar in appearance to flowcharts. An organizational chart for a centralized organization is shown in Figure 9.2. The middle tier represents position held by individuals or departments within the company. The lowest tier represents geographic locations in which the company operates. The lines connecting the boxes indicate the relationship among the segments and branch from the ultimate and decision-making authority. Organizational charts are typically arranged with the highest-ranking person (or group) listed at the top.

4 In Building Blocks of Managerial Accounting, you learned that generally accepted accounting principles (GAAP)—also called accounting standards—provide official guidance to the accounting profession. Under the oversight of the Securities and Exchange Commission (SEC), GAAP are created by the Financial Accounting Standards Board (FASB). The official definition of segments as provided by FASB can be reviewed in ASC 280-10-50.

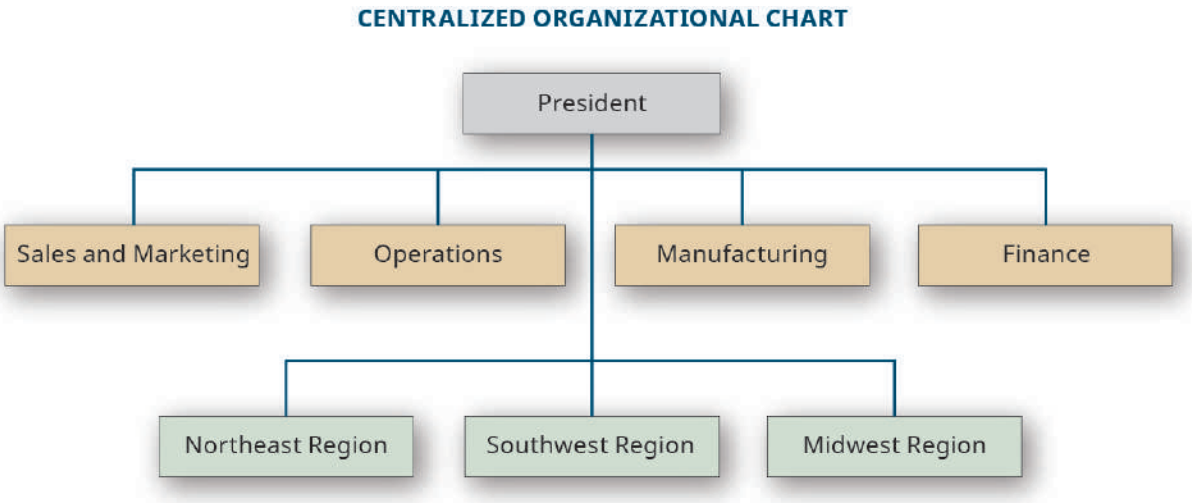


Figure 9.2 An Organizational Chart for a Centralized Organization. Centralized organizations have units that report directly to one person. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Notice the organization depicted in Figure 9.2 has segments based on departments as well as geographic regions. In addition, all lines connect directly to the president of the organization. This indicates that the president is responsible for the oversight and decision-making for the production and sales departments as well as the district (Northeast, Southwest, and Midwest) managers; essentially, the president has seven direct reports. In this centralized organizational structure, all decision-making responsibility resides with the president.

Figure 9.3 shows the same organization structured as a decentralized organization.

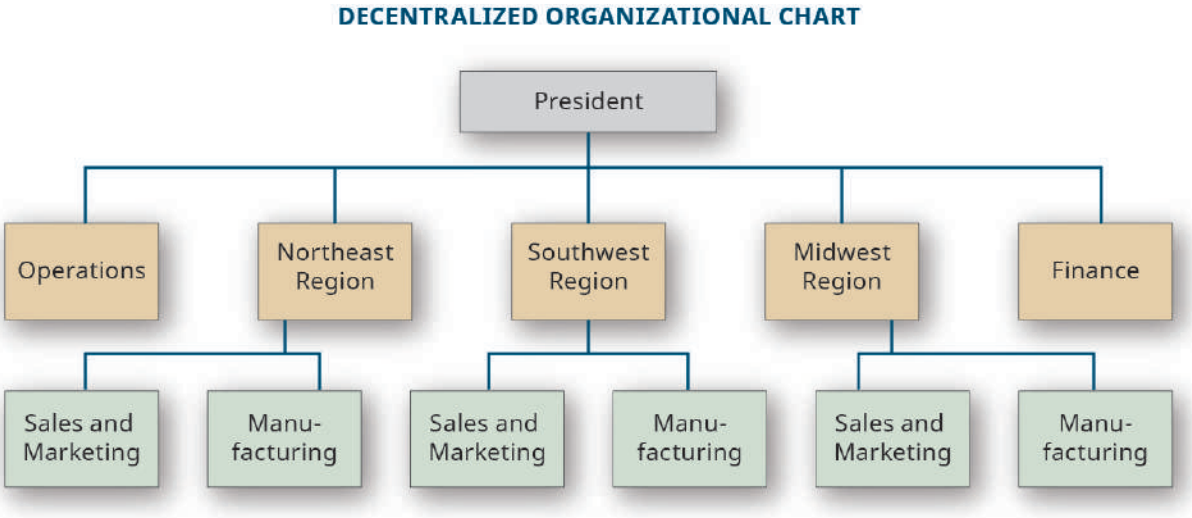


Figure 9.3 An Organizational Chart for a Decentralized Organization. Decentralized organizations have units that report through intermediate management layers. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Notice that the organization depicted in Figure 9.3 has the same segments, which represent departments and geographic regions. There are, however, noticeable differences between the centralized and decentralized

structure. Instead of seven direct reports, the president now oversees five direct reports, three of which are based on geography—the Western, Southern, and Eastern regional managers. Notice, too, each regional district manager is responsible for their respective production and sales departments. In this decentralized organization, all decision-making responsibility does not reside with the president; regional decisions are delegated to the three regional managers. Understand, however, that responsibility for achieving the organization's goals still ultimately resides with the company president.

In a centralized environment, the major decisions are made at the top by the CEO and then are carried out by everyone below the CEO. In a decentralized environment, the CEO sets the tone for the running of the organization and provides some decision-making guidelines, but the actual decisions for the day-to-day operations are made by the managers at the various levels of the organization. In other words, the essential difference between centralized and decentralized organizations involves decision-making. While no organization can be 100% centralized or 100% decentralized, organizations generally have a well-established structure that outlines the decision-making authority within the organization.

CONTINUING APPLICATION AT WORK

Centralized vs. Decentralized Management

Gearhead Outfitters was founded by Ted Herget in 1997 in a friend's living room in Jonesboro, AR. By 2003, the business moved to its downtown location. In 2006, a second Jonesboro location was opened. Over the next several years, the company's growth allowed for expansion to several different cities, miles and hours away. Eventually Little Rock, AR, Fayetteville, AR, Shreveport, LA, Springfield, MO, and Tulsa, OK became home to Gearhead branches.

With such growth, the company faced many management challenges. Would it be best for management to remain centralized with decision-making coming from a single location, or should the process be decentralized, allowing local management the flexibility and autonomy to run individual locations? If local management is given autonomy to make their own decisions, will those decisions be in line with company, or perhaps, individual goals? How will management be evaluated? Will inventory management be a uniform process, or will people and the process have to adapt to accommodate differences in demand at each location?

These are just some of the hurdles that Gearhead needed to address. What are some other issues which Gearhead might have considered? Think in terms of inventory management, personnel, efficiencies, and leadership development. How could Gearhead have use decentralized management to grow and thrive? Conversely, what would the benefits of keeping all or some of the company's management decisions more centralized be?

How Does Decision-Making Differ in a Centralized versus a Decentralized Environment?

The CEO of a centralized organization will determine the direction of the company and determine how to get the company to its goals. The steps necessary to reach these goals are then passed along to the lower-level managers who carry out these steps and report back to the CEO. The CEO would then evaluate the results and

incorporate any necessary operational changes. On the other hand, the CEO of a decentralized organization will determine the goals of the company and either pass along the goals to the divisional managers for them to determine how to reach these goals or work with the managers to determine the strategic plans and how to meet the goals laid out by those plans. The divisional managers will then meet with the managers below them to determine the best way to reach these goals. The lower-level managers are responsible for carrying out the plan and reporting their results to the manager above them. The higher-level managers will combine the results of several managers and evaluate those results before sending them to the divisional manager.

THINK IT THROUGH

Determining the Best Structure

Here are some examples of decisions that every business must make:

- Facility and equipment purchases and upgrades
- Personnel decisions such as hiring and compensation
- Products and services to offer, prices to charge customers, markets in which to operate

For each decision listed, identify and explain the best structure (centralized, decentralized, or both) for each of the following types of businesses:

- Auto manufacturer with multiple production departments
- Florist shop (with three part-time employees) owned by a local couple
- Law firm with four attorneys

9.3 Describe the Types of Responsibility Centers

You've learned how segments are established within a business to increase decision-making and operational effectiveness and efficiency. In other words, segments allow management to establish a structure of operational accountability.

The terminology changes slightly when we think about accountability relating to the financial performance of the segment. In a decentralized organization, the system of financial accountability for the various segments is administered through what is called responsibility accounting.

Responsibility accounting is a basic component of accounting systems for many companies as their performance measurement process becomes more complex. The process involves assigning the responsibility of accounting for particular segments of the company to a specific individual or group. These segments are often structured as **responsibility centers** in which designated supervisors or managers will have both the responsibility for the performance of the center and the authority to make decisions that affect the center.

Often, businesses will use the segment structure to establish the responsibility accounting framework. You might think of segments and responsibility centers as two sides of the same coin: segments establish the structure for operational accountability whereas responsibility centers establish the structure for financial accountability. Both segments and responsibility centers (which will likely be the same) attempt to accomplish the same goal: ensure all sectors of the business achieve the organization's strategic goals.

Before learning about the five types of responsibility centers in detail, it is important to understand the

essence of responsibility accounting and responsibility centers.

Fundamentals of Responsibility Accounting and Responsibility Centers

Recall the discussion of management control systems. These systems allow management to establish, implement, monitor, and adjust the activities of the organization toward attainment of strategic goals. Responsibility accounting and the responsibility centers framework focuses on monitoring and adjusting activities, based on financial performance. This framework allows management to gain valuable feedback relating to the financial performance of the organization and to identify any segment activity where adjustments are necessary.

Types of Responsibility Centers

Organizations must exercise care when establishing responsibility centers. In a responsibility accounting framework, decision-making authority is delegated to a specific manager or director of each segment. The manager or director will, in turn, be evaluated based on the financial performance of that segment or responsibility center. It is important, therefore, to establish a responsibility accounting framework that allows for an adequate and equitable evaluation of the financial performance of the responsibility center (and, by default, the manager of the responsibility center) as well as the attainment of the organization's strategic goals.

This is not an easy task. There are several factors that organizations must consider when developing and using a responsibility accounting framework. Before discussing those factors, let's explore the five types of responsibility centers: cost centers, discretionary cost centers, revenue centers, profit centers, and investment centers.

Cost Centers

A **cost center** is an organizational segment in which a manager is held responsible only for costs. In these types of responsibility centers, there is a direct link between the costs incurred and the product or services produced. This link must be recognized by managers and properly structured within the responsibility accounting framework.

An example of a cost center is the custodial department of a department store called Apparel World. On one hand, since the custodial department is structured as a cost center, the goal of the custodial department manager is to keep costs as low as possible, since this is the basis by which the manager will be evaluated by upper-level management. On the other hand, the custodial department manager, who is responsible for cleaning the store entrances, also wants to keep the store as clean as possible for the store's customers. If the store appears unclean and disorganized, customers will not continue to shop at the store. Therefore, the custodial department manager and upper-level management must work together to establish goals of the cost center (the custodial department, in this example) that satisfy the strategic goals of the business—maintaining a clean and organized store while minimizing the costs of managing the custodial department.

Figure 9.4 shows an example of what the cost center report might look like for the Apparel World custodial department.

APPAREL WORLD DEPARTMENT STORE
Custodial Department Cost Center
For the Month of December 2018

Account Title	Actual Expense	Budgeted Expense	Difference ($)	Difference (%)
Custodian wages	$15,500	$15,000	$500	3.3%
Department manager wages	3,500	3,500	0	0.0%
Cleaning equipment	450	125	325	260.0%
Cleaning supplies	275	120	155	129.2%
Total costs	$19,725	$18,745	$980	5.2%

Figure 9.4 Cost Center Report for the Custodial Department. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Let's use this report to explore how the department manager and upper-level management might review and use this information. In total, in December, the custodial department incurred $980 more of actual expenses than budgeted (or expected) expenses. This represents a 5.2% increase in expenses than was expected.

Notice the terminology used to describe the financial information of the custodial department: the department "*incurred* $980 more of actual expenses," rather than the department "*spent* $980 more of actual expenses." Recall from Introduction to Financial Statements (http://cnx.org/content/m67837/latest/) that financial statements are typically prepared using *accrual* accounting rather than *cash* accounting. Under accrual accounting, certain transactions are recorded regardless of when the cash is exchanged. Therefore, to say the custodial department "*spent* $19,725" or "*spent* $980 more for expenses" would technically be incorrect, since the cash may not have been spent.

The managers would then review each line item to determine what caused the $980 increase in expenses over what was expected. Keep in mind, the $980 represents the *total* overage from the budget, so it is possible that some expense accounts could have actually been *below* expectations. Unfortunately, that is not the case in the month of December because every line item, with the exception of department manager wages, exceeded the budgeted amount. It was no surprise to management that the department manager's wages were exactly as expected. Even though the custodial department manager worked more hours in the month of December, the manager is a salaried employee, so the wages are the same regardless of the number of hours worked.

Upon further investigation, it was determined that in December, the town where the Apparel World store is located received an unusually high amount of snow. This had an impact on each of the expense amounts in the custodial department. Because of the need to shovel snow more often, some of the custodial staff had to work overtime to ensure customers could easily and safely enter the store. This led to an increase in custodial wages of $500 compared to the budgeted or expected amount, which was established based on the previous year, when snowfall in the area was closer to average.

The research conducted by management also identified that additional cleaning equipment (mop buckets, mops, and "wet floor" signs) were purchased. The increased snowfall also led to the purchase of more salt than usual for the sidewalks outside the store. Because it was important to promptly clean the snow as well as the salt that was brought into the store on customers' shoes, additional equipment was purchased so that each entrance would have a mop and bucket. The custodial department manager decided this was the best course of action. Normally, the store uses a single mop and bucket to clean all entrances. This would have taken more time and increased the risk of an accident.

The increased application of salt partially explains the 129.2% (or $155) overage in the cleaning supplies expense account. Management has learned that the overage in this account was also caused by an increase in purchases of mop head replacements, floor cleaner, and paper towels.

After reviewing the December information and learning the causes of the increased expenses, the company determined that no corrective action was necessary going forward. The area received an unusually high level of snowfall that year, which was not something the custodial department manager could control. In fact, the upper-level managers praised the custodial department manager for taking action that was in the best interest of the store and its customers. The managers commented that they had received numerous compliments from customers regarding how easy and safe it was to enter the store compared to other local stores. The manager noted that, despite the increased snowfall, store sales were higher than expected and attributed much of the success to the work of the custodial department.

Discretionary Cost Centers

A discretionary cost center is similar to a cost center, with one distinguishing factor. A **discretionary cost center** is an organizational segment in which a manager is held responsible for controllable costs when there is not a well-defined relationship between the center's costs and its services or products. Examples include human resources and accounting departments. Human resources departments often establish policies that affect the entire organization. For instance, while a policy requiring all workers to have annual safety training for fires, injuries, and tornadoes is beneficial to the entire company, it is difficult to evaluate the human resources department manager's performance in relation to impacting the products or services the company provides. As you might expect, reviewing the financial performance of a discretionary cost center is similar to that of the review of a cost center.

Revenue Centers

A **revenue center** is an organizational segment in which a manager is held accountable only for revenues. As the name implies, the goal of a revenue center is to generate revenues for the business. In order to accomplish the goal of increasing revenues, the manager of a revenue center would focus on developing specific skillsets of the revenue center's employees. The reservations group of Southwest Airlines is an example of a segment that may be structured as a revenue center. The employees should be well-trained in providing excellent customer service, handling customer complaints, and converting customer interactions into actual sales. As the financial performance of cost centers and discretionary cost centers is similar, so is the financial performance of a revenue center and a cost center.

Profit Centers

A **profit center** is an organizational segment in which a manager is responsible for both revenues and costs (such as a Starbucks store location). Of the responsibility centers explored so far, a profit center structure is the most complex because a manager must be well-versed in techniques to increase revenues, decrease expenses, and thereby increase profits while also meeting the strategic goals of the organization.

Let's return to the Apparel World department store. Figure 9.5 shows an example of what the profit center report might look like for the Apparel World children's clothing department.

APPAREL WORLD DEPARTMENT STORE
Children's Clothing Department Profit Center
For the Month of December 2018

Revenues	Actual	Budgeted	Difference ($)	Difference (%)
Clothing revenue	$175,000	$145,000	$30,000	20.7%
Clothing accessories revenue	1,400	2,200	(800)	−36.4%
Total revenue	$176,400	$147,200	$29,200	19.8%
Expenses				
Associates wages	$ 22,500	$ 21,750	$ 750	3.4%
Department manager wages	7,200	7,200	0	0.0%
Cost of clothing sold	111,125	87,000	24,125	27.7%
Cost of accessories sold	1,008	1,584	(576)	−36.4%
Equipment/fixture repairs	1,025	290	735	253.4%
Utilities	895	620	275	44.4%
Total expenses	$143,753	$118,444	$25,309	21.4%
Department profit (loss)	$ 32,647	$ 28,756	$ 3,891	13.5%

Figure 9.5 Profit Center Report for the Children's Clothing Department. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Just as with the cost center, let's walk through an analysis of the December children's clothing department profit center report. Overall, the department's actual profit exceeded budgeted profit by $3,891, or 13.5%, compared to budgeted (or expected) profit. This increase was driven by a total revenue increase over budget by $29,200 or 19.8%. Recall from Building Blocks of Managerial Accounting that variable costs, unlike fixed costs, change in proportion to the level of activity in a business. Therefore, it should be no surprise that the expenses in the children's clothing department also increased. In fact, the expenses increased $25,309 (or 21.4%) versus the budgeted amount. The revenues of the department increased $29,200, while expenses increased $25,309, yielding an increase in profit of $3,891 over expectations.

The increase in revenue could be further analyzed. Because the store also sells accessories such as belts and socks, the children's clothing department tracks two revenue sources (also called *streams*)—clothing and accessories. Management was pleased to learn that clothing revenue exceeded expectations by $30,000, or 20.7%. Given the higher-than-usual level of snowfall in the area, this is an impressive increase, and the company can attribute a portion of the successful month to the employees of the custodial department, who worked extra hard to ensure customers could easily and safely enter the store.

The overall revenue of the department increased by $29,200. Since the clothing department revenue increased by $30,000, the clothing accessories revenue stream must have experienced a decline in revenue. In fact, the accessories revenue dropped by 36.4%. While this is a large percentage, consider the fact that the actual value of revenue decline was relatively minor—only $800 lower (as indicated by the negative amount) than expected. This indicates the employees may not have encouraged customers to also get belts or socks with their clothing purchase. This is an opportunity for the department manager to remind employees to encourage customers to purchase accessories to complement the clothing purchases. Overall, the increase in revenue attained by the children's clothing department is a highlight for the store.

A review of the department's expenses shows increases in all expenses, except department manager wages and cost of accessories sold. When reviewing the profit center report, pay special attention to how the differences between the actual and budgeted expenses are calculated in this analysis. In the revenue section, a

positive number indicates the revenue exceeded the budgeted amount, which means a favorable financial performance. In the expense section, a positive number indicates the expense exceeded the budgeted amount, which means an unfavorable financial performance.

As with the custodial department manager, the manager of the children's clothing department is also a salaried employee, so the wages do not change each month—the wages are a fixed cost for the department. Since the clothing accessories revenue declined, the cost of accessories also declined. The accessories expenses were $576 lower than expected. While this appears to be good news for the department, recall that clothing accessories revenue dropped by $800. Therefore, the department profit margin decreased by a net amount of $224 versus expectations ($800 revenue decline and a corresponding expense decrease of $576).

All other actual expenses were over budget, as indicated by the positive numbers. Remember, these are expenses, and in this analysis, they indicate unfavorable financial performance. It probably comes as no surprise that all of the expense overages are a result of the increased sales. Because of the increased sales, more associates were needed to cover each shift, and they worked more hours to cover the longer store hours, which caused wages to go over budget. The substantial increase in clothing revenue also caused the cost of clothing sold to increase proportionately. Similarly, the increased sales drove an increase in equipment/fixture repairs of $735 (or 253.4%) over budget due to repairs to cash registers and clothing racks. Because the store was open longer hours during the holiday season, the utilities expenses also exceeded budget by $275, or 44.4%.

Overall, the Apparel World department store management was pleased with the December financial performance of the children's clothing department. The department exceeded budgeted sales, which resulted in an increase in department profitability. The review also highlighted an area for improvement in the department—increasing accessory sales—which is easily corrected through additional training.

Notice that the review of the children's clothing department profit center report discussed differences measured in both dollars and percentages. When analyzing financial information, looking only at dollar values can be misleading. Displaying information as percentages—percentage of an entire amount or percentage change—standardizes the information and facilitates an easier and more accurate comparison, especially when dealing with segments (or companies) with vastly different sizes.

Let's look at another scenario using Apparel World. The example so far has explored the financial performance review processes for a cost center and a profit center. Now assume that store management wants to compare two different profit centers—children's clothing and women's clothing. Figure 9.6 shows the December financial information for the children's clothing department, and Figure 9.7 shows the financial information for the women's clothing department.

APPAREL WORLD DEPARTMENT STORE
Children's Clothing Department Profit Center
For the Month of December 2018

Revenues	Actual	Budgeted	Difference ($)	Difference (%)
Clothing revenue	$175,000	$145,000	$30,000	20.7%
Clothing accessories revenue	1,400	2,200	(800)	-36.4%
Total revenue	$176,400	$147,200	$29,200	19.8%
Expenses				
Associates wages	$ 22,500	$ 21,750	$ 750	3.4%
Department manager wages	7,200	7,200	0	0.0%
Cost of clothing sold	111,125	87,000	24,125	27.7%
Cost of accessories sold	1,008	1,584	(576)	-36.4%
Equipment/fixture repairs	1,025	290	735	253.4%
Utilities	895	620	275	44.4%
Total expenses	$143,753	$118,444	$25,309	21.4%
Department profit (loss)	$ 32,647	$ 28,756	$ 3,891	13.5%

Figure 9.6 Profit Center Report for the Children's Clothing Department, without Percentages. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

APPAREL WORLD DEPARTMENT STORE
Women's Clothing Department Profit Center
For the Month of December 2018

Revenues	Actual	Budgeted	Difference ($)
Clothing revenue	$400,000	$308,000	$92,000
Clothing accessories revenue	17,280	14,300	2,980
Total revenue	$417,280	$322,300	$94,980
Expenses			
Associates wages	$ 42,000	$ 38,500	$ 3,500
Department manager wages	12,400	12,400	0
Cost of clothing sold	288,000	201,124	86,876
Cost of accessories sold	12,442	10,296	2,146
Equipment/fixture repairs	275	400	(125)
Utilities	1,050	1,000	50
Total expenses	$356,167	$263,720	$92,447
Department profit (loss)	$ 61,113	$ 58,580	$ 2,533

Figure 9.7 Profit Center Report for the Women's Clothing Department, without Percentages. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Comparing the dollar differences in the two departments, notice that the children's clothing department is a smaller department, as measured by total revenue, than the women's clothing department.

Now, let's compare the differences in the two departments by looking at the percentages. The children's clothing department financial information is shown in Figure 9.8, and the women's clothing department financial information is shown in Figure 9.9.

APPAREL WORLD DEPARTMENT STORE
Children's Clothing Department Profit Center
For the Month of December 2018

Revenues	Actual	Budgeted	Difference ($)	Difference (%)
Clothing revenue	$175,000	$145,000	$30,000	20.7%
Clothing accessories revenue	1,400	2,200	(800)	-36.4%
Total revenue	$176,400	$147,200	$29,200	19.8%
Expenses				
Associates wages	$ 22,500	$ 21,750	$ 750	3.4%
Department manager wages	7,200	7,200	0	0.0%
Cost of clothing sold	111,125	87,000	24,125	27.7%
Cost of accessories sold	1,008	1,584	(576)	-36.4%
Equipment/fixture repairs	1,025	290	735	253.4%
Utilities	895	620	275	44.4%
Total expenses	$143,753	$118,444	$25,309	21.4%
Department profit/(loss)	$ 32,647	$ 28,756	$ 3,891	13.5%

Figure 9.8 Profit Center Report for the Children's Clothing Department. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

APPAREL WORLD DEPARTMENT STORE
Women's Clothing Department Profit Center
For the Month of December 2018

Revenues	Actual	Budgeted	Difference ($)	Difference (%)
Clothing revenue	$400,000	$308,000	$92,000	29.9%
Clothing accessories revenue	$17,280	$14,300	$2,980	20.8%
Total revenue	$417,280	$322,300	$94,980	29.5%
Expenses				
Associates wages	$42,000	$38,500	$3,500	9.1%
Department manager wages	$12,400	$12,400	$0	0.0%
Cost of clothing sold	$288,000	$201,124	$86,876	43.2%
Cost of accessories sold	$12,442	$10,296	$2,146	20.8%
Equipment/fixture repairs	$275	$400	($125)	-31.3%
Utilities	$1,050	$1,000	$50	5.0%
Total expenses	$356,167	$263,720	$92,447	35.1%
Department profit (loss)	$61,113	$58,580	$2,533	4.3%

Figure 9.9 Profit Center Report for the Women's Clothing Department. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Does the comparison change when the dollar differences are shown as percentages? Which department was more effective at strengthening the store's financial position? Which department was more efficient with the December revenue? What other factors might the Apparel World management consider?

Adding the percentages to the financial analysis allows managers to more directly make comparisons, to separate departments in this case. Simply reviewing the dollar differences can be misleading because of size differences between the departments being compared. The Women's Department added more value ($61,113)

to the store's financial position, while the Children's Department was more efficient, converting 13.5% (or $0.135) of every dollar of revenue to profit.

Investment Centers

It is important for managers to continually invest in the business. Managers must choose investments that improve the value of the business by improving the customer experience, increasing customer loyalty, and, ultimately, increasing the value of the organization. A limitation of the centers explored so far—cost center, discretionary cost center, revenue center, and profit center—is that these structures do not account for the investments made by the various responsibility center managers. The final responsibility center—investment centers—takes into account and evaluates the investments made by the responsibility center managers. The goal of the investment center structure is to ensure that segment managers choose investments that add value and help the organization achieve its strategic goals.

An **investment center** is an organizational segment (such as the northern region of Best Buy or the food trucks used in the Why It Matters opening case) in which a manager is accountable for profits (revenues minus expenses) *and* the invested capital used by the segment.

CONCEPTS IN PRACTICE

Research and Development at Hershey's

As you know by now, financial statements tell users what has occurred in the past—the statements provide feedback value. Responsibility accounting is no exception—it is a system that measures the financial performance of what has already occurred and provides management with a measure of past events.

Have you ever considered how companies measure the outcome of activities that have not yet occurred? As you've learned, many companies invest in research and development activities to determine how to improve existing products and to create entirely new products or processes.

The Hershey Chocolate Company is one company that invests heavily in research and development. Hershey's has created an Advanced Technology & Foresight Lab, which looks for innovative ways to bring chocolate to the market.

Here are some of the innovative things that Hershey's has developed:

- Sourcemap—an interactive, web-based tool to show consumers where the ingredients in their favorite Hershey's snack, such as Hershey's Milk Chocolate with Almonds Bar (https://openstax.org/l/50HersheyMap) comes from. There is also a video and short story for each point on the interactive map (https://openstax.org/l/50HersheyVideo) for more information.
- SmartLabel—a scanable label on each Hershey's product that gives the user up-to-date ingredient, allergen, and other information.
- Chocolate made inside the package—Hershey's developed this process to form a piece of chocolate (https://openstax.org/l/50HersheyChoco) inside the package.
- 3D Chocolate Printing—using a 3D printer, Hershey's has developed an innovative way to create customized chocolate candies.[5]

Measuring the financial success of innovations such as these is nearly impossible in the short-run. However, in the long-run, investments in product development help companies like Hershey's increase sales, reduce costs, gain market share, and remain competitive in the marketplace.

There are numerous methods used to evaluate the financial performance of investment centers. When discussing profit centers, we used the segment's profit/loss stated in dollars. Another method to evaluate segment financial performance involves using the profit margin percentage.

The profit margin percentage is calculated by taking the net profit (or loss) divided by the net sales. This is a useful calculation to measure the organization's (or segment's) efficiency at converting revenue into profit (net income). While the dollar value of a segment's profit/loss is important, the advantage of using a percentage is that percentages allow for more direct comparisons of different-sized segments.

Let's return to the Apparel World example and look at the profit margin percentage for the children's and women's clothing departments. Figure 9.10 shows the December financial information for the children's clothing department, including the profit margin percentage.

APPAREL WORLD DEPARTMENT STORE
Children's Clothing Department Profit Center
For the Month of December 2018

Revenues	**Actual**	**Budgeted**
Clothing revenue	$175,000	$145,000
Clothing accessories revenue	1,400	2,200
Total revenue	$176,400	$147,200
Expenses		
Associates wages	$ 22,500	$ 21,750
Department manager wages	7,200	7,200
Cost of clothing sold	111,125	87,000
Cost of accessories sold	1,008	1,584
Equipment/fixture repairs	1,025	290
Utilities	895	620
Total expenses	$143,753	$118,444
Department profit (loss)	$ 32,647	$ 28,756
Profit margin %	18.5%	19.5%

Figure 9.10 Profit Center Report for the Children's Clothing Department, Including Profit Margin Percentage. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The actual profit margin percentage achieved by the children's clothing department was 18.5%, calculated by taking the department profit of $32,647 divided by the total revenue of $176,400 ($32,647 / $176,400). The actual profit margin percentage was slightly lower than the expected percentage of 19.5% ($28,756 / $147,200). To determine why the profit margin percentage slipped slightly compared to expectations, management could compare the actual revenue and expenses with the budgeted revenue and expenses using a vertical analysis, as shown in Financial Statement Analysis. Doing so would highlight the fact that the cost of clothing sold as a

5 Sue Gleiter. "Hershey Company Goes Futuristic with 3-D Printed Chocolates." PennLive. https://www.pennlive.com/food/index.ssf/2014/12/hersheys_3-d_chocolate.html

percentage of clothing revenue increased significantly compared to what was expected. Management would want to explore this further, looking at factors influencing both clothing revenue (sales prices and quantity) and the cost of the clothing (which may have increased).

Figure 9.11 shows the December financial information for the women's clothing department, including the profit margin percentage.

APPAREL WORLD DEPARTMENT STORE
Women's Clothing Department Profit Center
For the Month of December 2018

Revenues	**Actual**	**Budgeted**
Clothing revenue	$400,000	$308,000
Clothing accessories revenue	17,280	14,300
Total revenue	$417,280	$322,300
Expenses		
Associates wages	$ 42,000	$ 38,500
Department manager wages	12,400	12,400
Cost of clothing sold	288,000	201,124
Cost of accessories sold	12,442	10,296
Equipment/fixture repairs	275	400
Utilities	1,050	1,000
Total expenses	$356,167	$263,720
Department profit (loss)	$ 61,113	$ 58,580
Profit margin %	14.6%	18.2%

Figure 9.11 Profit Center Report for the Women's Clothing Department, Including Profit Margin Percentage. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The actual profit margin percentage of the women's clothing department was 14.6%, calculated by taking the department profit of $61,113 divided by the total revenue of $417,280 ($61,113 / $417,280). The actual profit margin percentage was significantly lower than the expected percentage of 18.2% ($58,580 / $322,300). As with the children's clothing department, a vertical analysis indicates the significant decrease from budgeted profit margin percentage was a result of the cost of clothing sold. This would lead management to investigate possible causes that would have influenced the clothing revenue (sales prices and quantity), the cost of the clothing, or both.

Another method used to evaluate investment centers is called return on investment. **Return on investment** (ROI) is the department or segment's profit (or loss) divided by the investment base (Net Income / Base). It is a measure of how effective the segment was at generating profit with a given level of investment. Another way to think about ROI is its use as a measure of leverage. That is, the return on investment calculation measures how much profit the segment can realize per dollar invested.

Several points are in order regarding the definition of return on investment. In practice, the numerator (segment profit or loss) may have different names, depending upon the terms used by the organization. Some organizations may call this value *net income* (or loss) or *operating income* (or loss). These terms relate to the financial performance of the segment, and each organization decides how best to identify and quantify financial performance.

Another significant point in the definition of return on investment relates to the denominator (investment base). There is no uniform definition of "investment base" within the accounting/finance profession. Some organizations define investment base as operating assets, while others define the investment base as average operating assets. Other organizations use the book value of assets, and still others use the historical or even replacement cost of assets. There are valid arguments for all of these definitions for investment base. It is important not to be confused by these variations but instead to know the definition in a particular context and to use it consistently. For our purposes, the denominator in the return on investment formula will be "investment base," and the value will be provided.

Finally, you may recall from Long-Term Assets (http://cnx.org/content/m67894/latest/) that accountants carefully consider where to place certain costs (either on the balance sheet as assets or on the income statement as expenses). While ROI typically deals with long-lived assets such as buildings and equipment that are charged to the balance sheet, the ROI approach also applies to certain "investments" that are expensed. For instance, advertising costs are expensed. If a segment is considering an advertising campaign, management would assess the effectiveness of the advertising campaign in a similar manner as the traditional ROI analysis using large, capitalized investments. That is, management would want to assess the additional revenue (or profit) derived from the advertising campaign (which would be the numerator in the ROI calculation) compared to the investment or cost of the advertising campaign (which would be the denominator in the ROI calculation). To illustrate, let's say management was able to identify that an advertising campaign costing $2,500 brought in an additional $500 of profit. This would be a 20% return on investment ($500 / $2,500).

A return on investment analysis of an investment center begins with the same information as an analysis of a profit center. To explore return on investment, let's return to the December Apparel World profit center information analyzing the children's and women's clothing departments. Assume that a smaller store in another location had the following profit for December:

- Children's clothing department: $3,891
- Women's clothing department: $2,533

Now assume that each department had an investment base of the following amounts:

- Children's clothing department: $15,000
- Women's clothing department: $65,000

To calculate the return on investment (ROI) for each department, divide the segment profit by the segment investment base. The ROI for each department is:

- Children's clothing department: 25.9% ($3,891 / $15,000)
- Women's clothing department: 3.9% ($2,533 / $65,000)

The children's clothing department contributed the most to the financial position of this Apparel World location ($3,891 vs. $2,533). In addition, the children's clothing department was able to better leverage every dollar invested into profit. Stated differently, for every dollar invested, the children's clothing department was able to realize $0.259 of profit while the women's clothing department realized only $0.039 of profit for every dollar invested.

It is also significant that the children's clothing department requires a smaller dollar value of investment. This conserves store resources (financial capital) and helps store management prioritize and efficiently allocate future resources. By investing in the children's clothing department, store management is able to invest a smaller dollar amount while achieving a higher rate of return (profitability) on that investment.

One of the criticisms of the ROI approach is that each segment evaluates potential investments *only* in relation to the individual segment's ROI. This may cause the individual segment manager to select only projects or activities that improve the individual segment's ROI and decline projects that improve the financial position of the overall company. Most often, segment managers are primarily evaluated based on the performance of the segment they manage with only a small portion, if any, of their evaluation based on overall corporate performance. This means that the bonuses of a segment manager are largely dependent on how the segment performs, or in other words, based on the decisions made by that segment manager. A manager may choose to forgo a project or activity because it will lower the segment's ROI even though the project would benefit the entire company. ROI and the many implications of its use are explained further and demonstrated in Balanced Scorecard and Other Performance Measures.

The final investment center evaluation method, residual income (RI), structures the investment selection process to incentivize segment managers to select projects that benefit the entire company, rather than only the specific segment.

YOUR TURN

Analyzing Historical Success

Companies want to be sure the investments they make are generating an acceptable return. Additonally, individual investors want to ensure they are receiving the highest financial return for the money they are investing.

This article published in the New York Times on best investments (https://openstax.org/l/50Microsoft) listed Microsoft as having one of the best investments since 1926 (based on a study by Hendrik Bessembinder). Based on stock market returns to investors, Microsoft ranked third, behind ExxonMobil and Apple. According to the article, "since 1986, it has had an annualized return of 25 percent."

Other companies in the ranking included familiar company names such as General Electric (ranked #4), Walmart (ranked #10), McDonald's (#31), and Coca-Cola (#15).

But does historical success ensure future success? General Electric is listed in the article as the 4th highest-ranking company for creating wealth for investors. Conduct internet research to find out the condition of General Electric today. What do you think the future holds for General Electric?

As the world-wide economy changes, General Electric seems to be struggling to evolve, and this issue potentially leaves them with an uncertain future.

Residual income (RI) establishes a minimum level that *all* investments must attain in order to be accepted by management. This minimum acceptable level is defined as a dollar value and is applicable to all departments or segments of the business. Residual income is calculated by taking the segment income less the product of the investment value and cost of capital percentage. The formula is:

$$\textbf{Residual Income} = \textbf{Income} - (\textbf{Investment} \times \textbf{Cost of Capital Percentage})$$

As with the return on investment calculation, income can be defined as segment operating income (or loss) or segment profit (or loss). Some organizations may use different terms. In RI scenarios, the investment refers to

a *specific* project the segment is considering. Investment, in RI calculations, should not be confused with the *total* investment base, which was used in the ROI calculation. Finally, the cost of capital, which is covered in Short-Term Decision-Making, refers to the rate at which the company raises (or earns) capital. Essentially, the cost of capital can be considered the same as the interest rate at which the company can borrow funds through a bank loan. By establishing a standard cost of capital rate used by all segments of the company, the company is establishing a minimum investment level that all investment opportunities must achieve. For example, assume a company can borrow funds from a local bank at an interest rate of 10%. The company, then, does not want a segment accepting an investment opportunity that earns anything less than 10%. Therefore, the company will establish a threshold—the cost of capital percentage—that will be used to screen potential investments. At the same time, under the residual income structure, managers of the individual segments (also called responsibility centers) will be incentivized to undertake investments that benefit not only the segment but also the entire company. Recall that the ROI of the children's clothing department was 25.9% ($3,891 profit / $15,000 investment). Under an ROI analysis, the manager of the children's clothing department would not accept an investment that earns less than 25.9% because the rate of return would be negatively impacted, even though the company may benefit. Under a residual income structure, managers would accept all investments with a positive value because the investment would exceeded the investment threshold established by the company.

Let's look at an example. Recall that the children's clothing department of Apparel World had an investment base of $15,000. Assuming the cost of capital (understood as the rate of a bank loan) to Apparel World is 10%. This is the rate that Apparel World will also set as the rate it expects all responsibility centers to earn. Therefore, in the example, the expected amount of residual value—the profit goal, in a sense—for the children's clothing department is $1,500 ($15,000 investment base × 10% cost of capital). Management is pleased with the December performance of the children's clothing department because it earned a profit of $3,891, well in excess of the $1,500 goal.

Now let's examine how the manager of the children's clothing department would evaluate a potential investment opportunity. Assume in December the manager had an opportunity to invest to upgrade the store by adding a supervised children's play area for children to use while parents shopped. The manager believes this enhancement might increase sales because parents could take their time shopping, while knowing their children are safe and having fun. The upgrade would make the customer shopping experience more enjoyable for everyone.

The children's play area requires an investment of $50,000 and the expected increase in income as a result of the children's play area is $5,001. Because the Apparel World store has a cost of capital requirement of 10%, the manager would invest in the children's play area because the residual income on this investment would be positive. To be precise, the residual income is $1. Using the residual income formula, the residual income is $5,001 – ($50,000 × 10%) = $1.

While this is an exaggerated and oversimplified example, it is intended to highlight the fact that, as long as resources (funds) are available to invest, a responsibility manager will (or should) accept projects that have a positive residual value. In this example, the children's clothing department would be in a better financial position by undertaking this project than if they rejected this project. The department earned $3,891 of profit in December but would have earned, based on the estimates, $3,892 if the department added the children's play area.

The benefit of a residual income approach is that all investments in all segments of the organization are evaluated using the same approach. Instead of having each segment select only investments that benefit only

the segment, the residual income approach guides managers to select investments that benefit the entire organization.

9.4 Describe the Effects of Various Decisions on Performance Evaluation of Responsibility Centers

Organizations incur various types of costs using decentralization and responsibility accounting, and they need to determine how the costs relate to particular segments of the organization within the responsibility accounting framework. One way to categorize costs is based on the level of autonomy the organization (or responsibility center manager) has over the costs. **Controllable costs** are costs that a company or manager can influence. Examples of controllable costs include the wages paid to employees of the company, the cost of training provided to employees, and the cost of maintaining buildings and equipment. As it relates to controllable costs, managers have a fair amount of discretion. While managers may choose to reduce controllable costs like the examples listed, the long-term implications of reducing certain controllable costs must be considered. For example, suppose a manager chooses to reduce the costs of maintaining buildings and equipment. While the manager would achieve the short-term goal of reducing expenses, it is important to also consider the long-term implications of those decisions. Often, deferring routine maintenance costs leads to a greater expense in the long-term because once the building or equipment ultimately needs repairs, the repairs will likely be more extensive, expensive, and time-consuming compared to investments in routine maintenance.

THINK IT THROUGH

The Frequency of Maintenance

If you own your own vehicle, you may have been advised (maybe all too often) to have your vehicle maintained through routine oil changes, inspections, and other safety-related checks. With advancements in technology in both car manufacturing and motor oil technology, the recommended mileage intervals between oil changes has increased significantly. If you ask some of your family members how often to change the oil in your vehicle, you might get a wide range of answers—including both time-based and mileage-based recommendations. It is not uncommon to hear that oil should be changed every three months or 3,000 miles. An article from the Edmunds.com website devoted to automobiles (https://openstax.org/l/50YourOil) suggests automobile manufacturers are extending the recommended intervals between oil changes to up to 15,000 miles.

Do you know what the recommendation is for changing the oil in the vehicle you drive? Why do you think the recommendations have increased from the traditonal 3,000 miles to longer intervals? How might a business apply these concepts to the concept of maintaining and upgrading equipment? If you were the accountant for a business, what factors would you recommend management consider when making the decisions on how frequently to maintain equipment and how big of a priority should equipment maintenace be?

The goal of responsibility center accounting is to evaluate managers only on the decisions over which they have control. While many of the costs that managers will encounter are controllable, other costs are

uncontrollable and originate from within the organization. **Uncontrollable costs** are those costs that the organization or manager has little or no ability to influence (in the short-term, at least) and therefore should not be incorporated into the analysis of either the manager or the segment's performance. Examples of uncontrollable costs include the cost of electricity the company uses, the cost per gallon of fuel for a company's delivery trucks, and the amount of real estate taxes charged by the municipalities in which the company operates. While there are some long-term ways that companies can influence these costs, the examples listed are generally considered uncontrollable.

One category of uncontrollable costs is **allocated costs**. These are costs that are often allocated (or charged) to the segments within the organization based on some allocation formula or process, such as the costs of receiving support from corporate headquarters. These costs cannot be controlled by the responsibility center manager and thus should not be considered when that manager is being evaluated. Costs relevant to decision-making and financial performance evaluation will be further explored in Short-Term Decision-Making.

Effects of Decisions on Performance Evaluation of Responsibility Centers

Suppose, as the manager of the maintenance department of a major airline, you become aware of a training session that is available to your mechanics. The disadvantages are that the training will require the mechanics to miss an entire week of work and the associated costs (travel, lodging, training session) are high. The advantage is that, as a result of the training, the time during which the planes are grounded for repairs will significantly decrease. What factors would influence your decision regarding whether or not to send mechanics to school? Considering the fact that each mechanic would miss an entire week of work, what factors would you consider in determining how many mechanics to send? Do these factors align with or conflict with what is best for the company or you as the department manager? Is there a way to quantify the investment in the training compared to the benefit of quicker repairs for the airplanes?

Scenarios such as this are common for managers of the various responsibility centers—cost, discretionary cost, revenue, profit, and investment centers. Managers must be well-versed at using both financial and nonfinancial information to make decisions such as these in order to do what is best for the organization.

ETHICAL CONSIDERATIONS

Pro-Stakeholder Culture Opens Business Opportunities

The use of pro-stakeholder decision-making by managers in their responsibility centers allows managers to determine alternatives that are both profitable and follow stakeholders' ethics-related demands. In an essay in *Business Horizons*, Michael Hitt and Jamie Collins explain that companies with a pro-stakeholder culture should better understand the multiple ethical demands of those stakeholders. They also argue that this understanding should "provide these firms with an advantage in recognizing economic opportunities associated with such concerns."[6] The identification of these opportunities can make a manager's decisions more profitable in the long run.

Hitt and Collins go on to argue that "as products and services may be developed in response to consumers' desires, stakeholders' ethical expectations can, in fact, represent latent signals on emerging economic opportunities."[7] Providing managers the ability to identify alternatives based upon

stakeholders' desires and demands gives them a broader decision-making platform that allows for decisions that are in the best interest of the organization.

Often one of the most challenging decisions a manager must make relates to **transfer pricing**, which is the pricing process put into place when one segment of a business "sells" goods to another segment of the same business. In order to understand the significance of transfer pricing, recall that the primary goal of a responsibility center manager is to manage costs and make decisions that contribute to the success of the company. In addition, often the financial performance of the segment impacts the manager's compensation, through bonuses and raises, which are likely tied to the financial performance of the segment. Therefore, the decisions made by the manager will affect both the manager and the company.

Application of Transfer Pricing

Transfer pricing can affect **goal congruence**—alignment between the goals of the segment or responsibility center, or even an individual manager, with the strategic goals of the organization. Recall what you've learned regarding segments of the business. Often, segments will be arranged by the type of product produced or service offered. Segments often sell products to external customers. For example, assume a soft drink company has a segment—called the blending department—dedicated to producing various types of soft drinks. The company may have an external customer to which it sells unique soft drink flavors that the customer will bottle under a different brand name (perhaps a store brand like Kroger or Meijer). The segment may also produce soft drinks for another segment within its own company—the bottling department, for example—for further processing and ultimate sale to external customers. When the internal transfer occurs between the blending segment and the bottling segment, the transaction will be structured as a sale for the blending segment and as a purchase for the bottling department. To facilitate the transaction, the company will establish a transfer price, even though the transaction is internal because each segment is responsible for its own profits and costs.

Figure 9.12 shows a graphical representation of the transfer pricing structure for the soft drink company used in the example.

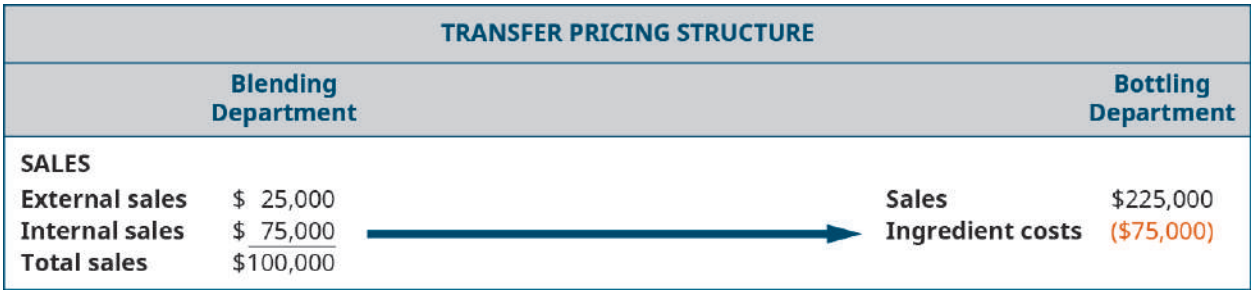


Figure 9.12 Transfer Pricing. The sale for the Blending Department is the purchase for the Bottling Department. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

6 Michael Hitt and Jamie Collins "Business Ethics, Strategic Decision Making, and Firm Performance." *Business Horizons* 50, no. 5 (February 2007): 353–357.

7 Michael Hitt and Jamie Collins "Business Ethics, Strategic Decision Making, and Firm Performance." *Business Horizons* 50, no. 5 (February 2007): 353–357.

Notice that the blending department has two categories of customers—external and internal. External customers purchase the soft drink mixtures and bottle the drinks under a different label, such as a store brand. Internally, the blending department "sells" the soft drink mixtures to the bottling department. Notice the "sale" by the blending department (a positive amount) and the "purchase" by the bottling department (a negative amount) net out to zero. This transaction does not impact the overall financial performance of the organization and allows the responsibility center managers to analyze the financial performance of the segment just as if these were transactions involving outside entities.

What issues might this scenario cause as it relates to goal congruence—that is, meeting the goals of the corporation as a whole as well as meeting the goals of the individual managers?

In situations where the selling division, in this case the blending division, has excess capacity—meaning they can produce more than they currently sell—and ignoring goal congruence issues, the selling division would sell its products internally for variable cost. If there is no excess capacity, though, the opportunity cost of the contribution margin given up by taking internal sales instead of external sales would need to be considered. Let's look at each of these general situations individually.

In the case of excess capacity, the selling division has the ability to produce the goods to sell internally with only variable costs increasing. Thus, it seems logical to make transfer price the same as the variable costs—but is it? Reflecting back on the concept of responsibility centers, the idea is to allow management to have decision-making authority and to evaluate and reward management based on how well they make decisions that lead to increased profitability for their segment. These managers are often rewarded with bonuses or other forms of compensation based on how well they reach certain profitability measures. Does selling goods at variable cost increase the profitability for the selling division? The answer, of course, is no. Thus, why would a manager, who is rewarded based on profitability, sell goods at variable cost? Obviously, the manager would prefer not to sell at variable cost and would rather sell the goods at some amount above variable cost and thus contribute to the segment's profitability. What should the transfer price be? There are various options for choosing a transfer price.

CONCEPTS IN PRACTICE

Transfer Pricing with Overseas Segments

An inherent assumption in transfer pricing is that the divisions of a company are located in the same country. While implementing a transfer pricing framework can be complex for a business located entirely in the United States, transfer pricing becomes even more complex when any of the divisions are located outside of the United States.

Companies with overseas transactions involving transfer pricing must pay particular attention to ensure compliance with the tax, foreign currency exchange rate fluctuations, and other regulations in the countries in which they operate.

This can be expensive and difficult for companies to manage. While many firms use their own employees to manage the process, the Big Four accounting firms, for example, offer expertise in transfer pricing setup and regulatory compliance. This short video from Deloitte on transfer pricing (https://openstax.org/l/50TranferPrice) provides more information about this valuable service that accountants provide.

Available Transfer Pricing Approaches

There are three primary transfer pricing approaches: market-based prices, cost-based prices, or negotiated prices.

Market Price Approach

With the **market price approach**, the transfer price paid by the purchaser is the price the seller would use for an outside customer. Market-based prices are consistent with the responsibility accounting concepts of profit and investment centers, as managers of these units are evaluated based on purchasing and selling goods and services at market prices. Market-based transfer pricing is very common in a situation in which the seller is operating at full capacity.

The benefit of using a market price approach is that the company will need to stay familiar with market prices. This will likely occur naturally because the company will also have outside sales. A potential disadvantage of this approach is that conflicts might arise when there are discrepancies between the current market price and the market price the company sets for transfer prices. Firms should decide at what point and how frequently to update the transfer prices used in a market approach.

For example, assume a company adopts a market approach for transfer prices. As time goes by, the market price will likely change—it will either increase or decrease. When this occurs, the firm must decide if and when to update transfer prices. If current market prices are higher than the market price the company uses, the selling division will be happy because the price earned for intersegment (transfer) sales will increase while inputs (costs) to provide the goods or services remain the same. An increase in the transfer price will, in turn, increase the profit margins of the selling division. The opposite is true for the purchasing division. If the market transfer price increases to match the current market price, the costs (cost of goods sold, in particular) will increase. Without a corresponding increase in the prices charged to its customers or an offset through cost reductions, the profit margins of the purchasing division will decrease. This situation could cause conflict between divisions within same company, an unenviable situation for management as one manager is pleased with the transfer price situation and the other is not. Both managers desire to improve the profits of their respective divisions, but in this situation, the purchasing division may feel they are giving up profits that are then being realized by the selling division due the increase in the market price of the goods and the use of a market-based transfer price.

Cost Approach

When the transfer price uses a **cost approach**, the price may be based on either total variable cost, full cost, or a cost-plus scenario. In the variable cost scenario, as mentioned previously, the transfer of the goods would take place at the total of all variable costs incurred to produce the product. In a full-cost scenario, the goods would be transferred at the variable cost plus the fixed cost per unit associated with making that product. With a cost-plus transfer price, the goods would be transferred at either the variable cost or the full-cost plus a predetermined markup percentage. For example, assume the variable cost to produce a product is $10 and the full cost is $12. If the company uses a cost-plus methodology to calculate the transfer price with a 30% mark-up, the transfer price would be $13 ($10 × 130%) based on just the variable cost or $15.60 ($12 × 130%) based on the full cost. When using the full cost as a basis for applying markup, it is important to understand that the cost structure may include costs that are irrelevant to establishing a transfer price (for example, costs unrelated to producing the actual product to be transferred, such as the fixed cost of the plant supervisor’s salary, which will exist whether the product is transferred internally or externally), which may unnecessarily

influence decisions.

The benefit of using a cost approach is that the company will invest effort into determining the actual costs involved in making a product or providing another service. The selling division should be able to justify to the purchasing division the cost that will be charged, which likely includes a profit margin, based on what the division would earn on a sale to an outside customer. At the same time, a deeper understanding of what drives the costs within a division provides an opportunity to identify activities that add unnecessary costs. Companies can, in turn, work to increase efficiency and eliminate unnecessary activity and bring down the cost. In essence, the selling division has to justify the costs it is charging the purchasing division.

Negotiated Price Approach

Somewhere in between a transfer price based on cost and one based on market is a **negotiated price approach** in which the company allows the buying segment and the selling segment to negotiate the transfer price. This is common in situations in which there is no external market. When an external price exists and is used as a starting point for establishing the transfer price, the organization must be aware of differences in specific costs between the source of the external price and its own organization. For example, a price from an external source may include a higher profit margin than the profit margin targeted by a company pursuing a cost leadership strategy. In this case, the external price should be reduced to account for such differences.

However, one disadvantage of using a negotiated price system is the possibility of creating a situation in which competition exists between a department and an outside vendor (as occurs when it is cheaper for a department to purchase from an outside vendor rather than another department in the organization) or, worse yet, between departments of the same organization. It is paramount that, when selecting a transfer pricing methodology, the goals of the particular departments involved align with the overall strategic goals of the organization. A transfer pricing structure is not intended to facilitate competition between departments within the same company. Rather, a transfer pricing system should be viewed as a tool to help the company remain competitive in the marketplace and improve a company's overall profit margin.

Other Transfer Pricing Issues

The three approaches to transfer pricing assume that the selling department has excess capacity to produce additional products to sell internally. What happens if the selling department does not have excess capacity—in other words, if the selling department can sell all that it produces to external customers? If an internal department wants to purchase goods from the selling department, what would be an appropriate selling price? In this case, the transfer price must take into consideration the opportunity cost of the contribution margin that would be lost from having to forego external sales in order to meet internal sales.

Suppose in the previous example that the blending department is at full capacity but the bottling department wants to purchase some of its soft drink blends internally. Assume the variable cost to produce one unit of soft drink is $10, the fixed cost per unit is $2, and the market price for selling one unit is $18. What would be an appropriate transfer price in this situation? Since the blending department does not have the capacity to meet external sales plus internal sales, in order to accept the internal sales order, the blending department would have to lose sales to external customers. The contribution margin per unit is $8 ($18 − $10). Thus, $8 per unit would be given up for each external unit that is sold internally.

Looking only at costs, the blending department would be indifferent between an external sale of $18 and an internal sale of $18 ($10 variable cost + $8 contribution margin). Obviously, there are other issues that need to

be considered in these situations, such as the effect on external customers if demand cannot be met. Overall, if there is no excess capacity, the transfer price should take into consideration the opportunity cost lost from taking internal sales over external sales.

In addition to the possibility of losing opportunity costs, there are additional transfer pricing issues. Recall that decentralized organizations delegate decision-making authority throughout the organization. A well-designed transfer pricing policy can contribute not only to the segment manager's profits but to overall corporate profits in situations where the transfer price is lower than the external price. However, when a transfer pricing system is used to facilitate transactions between departments, an ill-designed policy is likely to lead to disputes between departments. It is possible the departments view each other as competition rather than strategic partners. When this occurs, it is important for upper-level management to establish a process that allows managers to resolve disagreements in a way that aligns with organizational, rather than departmental, goals.

Transfer pricing systems become even more complicated when departments are located in different countries. The transfer price in an international setting must also account for differences in currencies and fluctuating exchange rate as well as differences in regulations such as tariffs and duties, taxes, and other regulations.

Transfer Pricing Example

Regal Paper has two divisions. The Paper Division produces copy paper, wrapping paper, and paper used on the outside of cardboard displays placed in grocery, office, and department stores. The Box Division produces cardboard boxes sold at Christmas, cardboard boxes purchased by manufacturers for packaging their goods, and cardboard displays for stores, particularly seasonal displays. Both divisions are profit centers, and each manager is evaluated and rewarded based on his division's profitability. The Box Division has approached the Paper Division to buy paper needed to cover cardboard displays that have been ordered by several major snack food manufacturers for the upcoming Superbowl game. The Box Division has been buying the display coverings from an external seller for $12.50 per unit. Currently, the Paper Division has excess capacity and can fill the order for the 500,000 display coverings that the Box Division is requesting.

The cost to the Paper Division to produce one display covering is as follows:

Variable cost per unit	$ 8.00
Fixed cost per unit	1.00
Selling price to external customers	12.00
Price at which Box Division can buy externally	12.50

What would be the transfer price per unit under each of the following scenarios?

1. Market-based transfer price. This transfer price is the same as the selling price to external customers, which is $12.
2. Cost-based transfer price. This transfer price is the same as the variable costs per unit, which is $8.
3. Full-cost–based transfer price. This transfer price is the same as the variable costs plus the fixed cost per unit, which is $9.
4. Cost plus assuming 20% mark-up. This marks up the cost-based transfer price by 20%, which is $8 × 120%, or $9.60.
5. Full-cost plus assuming 20% mark-up. This marks up the full-cost–based transfer price by 20%, which is $9 × 120%, or $10.80.
6. Range of negotiated transfer price. The negotiated transfer price should be between the lowest and highest possible prices: $8–12

7. What if Paper had no excess capacity? If the Paper Division had no excess capacity, the transfer price would be the cost plus the contribution margin, which is $8 + $4, or $12.
8. Which transfer price is best? If there is excess capacity, then typically a negotiated transfer price is best, as it allows the managers who are evaluated on that decision to have input into the decision and does not take away their autonomy. Table 9.1 shows the per-unit effect on income of each of the transfer pricing options on each division. Remember, the effects provided here cannot necessarily be generalized, as there are two critical factors: whether or not the selling department is at capacity and the price at which the purchasing department could buy the goods externally, which in this case is $0.50 more per unit than the market price of the paper being sold by the Paper Division.

Per-Unit Effect on Division Income of Various Transfer Pricing Methodologies

Transfer Pricing Method	Paper Division	Box Division
Market	$4 per unit increase in income ($12 SP – $8 VC)	$0.50 per unit increase in income ($12.50 – $12 SP)
Cost	$0 per unit increase in income ($8 SP – $8 VC)	$4.50 per unit increase in income ($12.50 – $8)
Full-cost	$1 per unit increase in income ($9 SP – $8 VC)	$3.50 per unit increase in income ($12.50 – $9)
Cost-Plus (20%)	$1.60 per unit increase in income ($9.60 SP – $8 VC)	$2.90 per unit increase in income ($12.50 – $9.60)
Full-cost Plus (20%)	$2.80 per unit increase in income ($10.80 SP – $8VC)	$1.70 per unit increase in income ($12.50 – $10.80)
Negotiated ($0 – $12)	Increase to income between $0 and $4 per unit	Increase to income between $0.50 and $4.50
No Excess Capacity	$4 per unit increase in income ($12 SP – $8 VC)	$0.50 per unit increase in income ($12.50 – $12 SP)
SP = selling price; VC = variable cost		

Table 9.1

As you can see, the transfer price can significantly affect the profitability of the division. It is easy to see which transfer prices most benefit the seller and which most benefit the buyer. Thus, as previously mentioned, a negotiated transfer price is often the best resolution to determining a transfer price.

THINK IT THROUGH

Comparing Transfer Pricing and Outsourcing

Assume you are the President of a manufacturing firm that has a division that transfers products to other divisions within the company. The other divisions have recently complained that the transfer price charged to the departments has increased significantly over the past several quarters. They are frustrated because performance evaluations and bonuses are linked to the profitability of their respective departments.

During a recent management meeting, a cost accountant suggests the company can solve this issue by transferring production to another supplier that has a lower cost of production due to lower labor costs. In addition to solving the conflict between departments, the company's overall profitability will increase because of the substantial cost savings.

Evaluate this scenario and explain how you would respond as the company's President. Consider the perspectives of various stakeholders in this situation.

Key Terms

allocated costs costs that are generated by non–revenue generating portions of the business, such as corporate headquarters, that are assigned based on some formula to the revenue generating portions of the business

centralization business structure in which one individual makes the important decisions and provides the primary strategic direction for the company

controllable costs those that a company or manager can influence

cost approach transfer pricing structure in which the transfer price may be based on total variable cost, full cost, or a cost-plus scenario, calculated by adding a markup to either variable cost or full cost

cost center organizational segment in which a manager is held responsible only for costs

decentralization business structure in which the decision-making is made at various levels of the organization

discretionary cost center organizational segment in which a manager is held responsible only for controllable costs when there is not a well-defined relationship between the center's costs and its services or products

goal congruence integration of multiple goals, either within an organization or across multiple components or entities; congruence is achieved by aligning goals to achieve an anticipated mission

investment center organizational segment in which a manager is accountable for profits (revenues minus expenses) and the invested capital used by the segment

lower-level management level of management that provides basic supervision and oversight for the operations of the organization

management control system structure within an organization that allows managers to establish, implement, and monitor progress toward the strategic goals of the organization

market price approach transfer pricing structure in which the transfer price is based on the price the seller would use for an outside customer

mid-level management level of management that receives direction from upper management and supervises and provides direction to lower-level management

negotiated price approach transfer pricing structure in which the transfer price is based on negotiations between the buying segment and the selling segment

organizational chart graphical representations illustrating the authority for decision-making and oversight throughout an organization

profit center organizational segment in which a manager is responsible for and evaluted on both revenues and costs

residual income (RI) amount of income a given division (or project) is expected to earn in excess of a firm's minimum return goal

responsibility accounting method of encouraging goal congruence by setting and communicating the financial performance measures by which managers will be evaluated

responsibility centers segments in which supervisors or managers have responsibility for the performance of the center and the authority to make decisions that affect the center

return on investment (ROI) measure of the percentage of income generated by profits that were invested in capital assets

revenue center part of an organization in which management is evaluated based on the ability to generate revenues; the manager's primary control is only revenues

segment portion of the business that management believes has sufficient similarities in product lines,

geographic locations, or customers to warrant reporting that portion of the company as a distinct part of the entire company

transfer pricing pricing structure used when one segment of a business "sells" goods to another segment of the same business

uncontrollable costs those that an organization or manager has little or no ability to influence

upper management level of management that consists of the board of directors and chief executives charged with providing strategic guidance for the organization

Summary

9.1 Differentiate between Centralized and Decentralized Management

- Management control systems allow managers to develop a reporting structure to help the organization meet its strategic goals.
- In centralized organizations, primary decisions are made by the person or persons at the top of the organization.
- Decentralized organizations delegate decision-making authority throughout the organization.
- Daily decision-making involves frequent and immediate decisions.
- Strategic decision-making involves infrequent and long-term decisions.

9.2 Describe How Decision-Making Differs between Centralized and Decentralized Environments

- Segments are uniquely identifiable components of the business that facilitate the effective and efficient operation of the business.
- Organizational charts are used to graphically represent the authority structure of an organization.
- The CEO of a centralized organization will establish the strategy and make decisions that will be implemented throughout the organization.
- The CEO of a decentralized organization will establish strategic goals and empower managers to achieve the goals.

9.3 Describe the Types of Responsibility Centers

- A responsibility accounting structure helps management evaluate the financial performance of the segments in the organization.
- Responsibility centers are segments within a responsibility accounting structure.
- Five types of responsibility centers include cost centers, discretionary cost centers, revenue centers, profit centers, and investment centers.
- Cost centers are responsibility centers that focus only on expenses.
- Discretionary cost centers are responsibility centers that focus only on controllable expenses.
- Revenue centers are responsibility centers that focus on revenues.
- Profit centers are responsibility centers that focus on revenues and expenses.
- Investment centers are responsibility centers that consider the investments made by the responsibility center.
- Return on investment is a particular type of investment center structure that calculates a responsibility center's profit percentage relative to the center's investment.
- Residual income is a particular type of investment center structure that evaluates investments using a common cost of capital rate amongst all responsibility centers.

9.4 Describe the Effects of Various Decisions on Performance Evaluation of Responsibility Centers

- Uncontrollable costs are costs that management or an organization has little or no ability to influence.

- Controllable costs are costs that managers or an organization can influence.
- Managers in a responsibility accounting structure should only be evaluated based on controllable costs.
- Businesses with segments that provide goods to other segments within the business often use a transfer pricing structure to record the transaction.
- The general transfer pricing model considers the opportunity costs involved in selling to internal rather than external customers. This method is difficult to implement and businesses often choose other methods.
- The market price model uses market prices that would be used for external customers as the basis for internal transfers.
- The cost approach uses the company's cost to make the product as the basis for establishing the transfer price.
- The negotiated model allows the selling and buying segments within the business to determine the transfer price.
- Transfer price arrangements are more difficult in international businesses because of complexities related to taxes, duties, and currency fluctuations.

Multiple Choice

1. LO 9.1 Which of the following is *not* a common goal of an organization?
   A. operational efficiency
   B. being acquired by another business
   C. achieving strategic goals
   D. measuring financial performance

2. LO 9.1 Which of the following does *not* describe a management control system?
   A. establishes a company's strategic goals
   B. implements a company's strategic goals
   C. monitors a company's strategic goals
   D. a system that only measures profitability

3. LO 9.1 In centralized organizations, primary decisions are made by _____.
   A. an individual at the top of the organization
   B. various managers throughout the organization
   C. outside consultants
   D. low-level management

4. LO 9.1 A key advantage of a decentralized organization is _____.
   A. increased administrative costs
   B. quicker decisions and response time
   C. the ease of aligning segment and company goals
   D. duplication of efforts

5. LO 9.1 Strategic decisions occur _____.
   A. frequently and involve immediate decisions
   B. frequently and involve long-term decisions
   C. infrequently and involve long-term decisions
   D. infrequently and involve immediate decisions

6. LO 9.2 Segments are uniquely identifiable components of the business and can be categorized by all of the following *except* _____.

A. products produced
B. services provided
C. geographical location
D. number of employees

7. LO 9.2 Organizational charts _____.

A. list the salaries of all employees
B. outline the strategic goals of the organization
C. show the structure of an organization
D. help management measure financial performance

8. LO 9.2 In a centralized organization, where are goals established?

A. at the lower level of the organization and promoted upward
B. outside the organization based on best practices in the industry
C. by each segment of the organization
D. at the highest level of the organization and promoted downward

9. LO 9.2 Managers in decentralized organizations make decisions relating to all of the following *except* _____.

A. the company's stock price
B. equipment purchases
C. personnel
D. prices to charge customers

10. LO 9.3 Which of the following is *not* a type of responsibility center?

A. concentrated cost center
B. investment center
C. profit center
D. cost center

11. LO 9.3 A system that establishes financial accountability for operating segments within an organization is called _____.

A. a financial statement
B. an internal control system
C. responsibility accounting
D. centralization

12. LO 9.3 A responsibility center in which managers are held accountable for both revenues and expenses is called a _____.

A. discretionary cost center
B. revenue center
C. cost center
D. profit center

13. LO 9.3 A responsibility center structure that considers investments made by the operating segments by using a common cost of capital percentage is called _____.

A. return on investment
B. residual income
C. a profit center
D. a discretionary cost center

14. LO 9.3 An important goal of a responsibility accounting framework is to help ensure which of the following?

A. decision-making is made by the top executives.
B. investments made by each segment are minimized.
C. identification of operating segments that should be closed.
D. segment and company financial goals are congruent.

15. LO 9.4 Costs that a company or manager can influence are called _____.

A. discretionary costs
B. fixed costs
C. variable costs
D. controllable costs

16. LO 9.4 An example of an uncontrollable cost would include all of the following *except* _____.

A. real estate taxes charged by the county in which the business operates
B. per-gallon cost of fuel for the company's delivery trucks
C. hourly rate of pay for the company's purchasing manager
D. federal income tax rate paid by the company

17. LO 9.4 Internal costs that are charged to the segments of a business are called _____.

A. controllable costs
B. variable costs
C. fixed costs
D. allocated costs

18. LO 9.4 A transfer pricing arrangement that uses the price that would be charged to an external customer is a _____.

A. market-based approach
B. negotiated approach
C. cost approach
D. decentralized approach

19. LO 9.4 A transfer pricing structure that considers the opportunity costs of selling to internal rather than external customers uses _____.

A. the cost approach
B. the general transfer pricing approach
C. the market-based approach
D. the opportunity cost approach

Questions

1. LO 9.1 What is a management control system? What are its components and how does the system help the business?

2. LO 9.1 Identify and describe the levels of management, including the various types of decisions managers at each level make.

3. LO 9.1 Discuss the difference between centralized and decentralized organizations. Does the size of the organization influence whether the organization has a centralized or decentralized structure? Explain.

4. LO 9.1 Identify a company where you recently shopped. Assume the company operates with a decentralized structure. Describe how customers might benefit from the decentralized structure.

5. LO 9.1 Discuss the difference between daily and strategic decisions. Think of a business and provide an example of a daily and strategic decision.

6. LO 9.1 Access PepsiCo's 2017 annual report (https://openstax.org/l/50Pepsi2017) . Starting at the top of the document, use the find (Ctrl + F) or search feature in the browser to search the annual report for the word "segments" to determine how many operating segments PepsiCo has. What are the segments? How are the segments categorized?

7. LO 9.1 Another search of PepsiCo's 2017 annual report (https://openstax.org/l/50 Pepsi2017) reveals the company maintains a centralized management perspective on aspects of these items:

- Commodities (items such as sugar and high fructose corn syrup that go into many of the beverages)
- Research and development
- Insurance and benefit program
- Foreign currency transactions
- Debt, investments, and other financing activities

Explain why these activities would be centralized functions within PepsiCo as opposed to decentralized like many other activities.

8. LO 9.2 Define segments and describe how identifying segments within a business might help manage the business.

9. LO 9.2 Choose a company and describe how a specific issue, policy, or procedure (for example, granting merchandise returns, establishing sales prices) might look if the business is structured as a centralized business.

10. LO 9.2 Choose a company and explain how a specific issue, policy, or procedure (for example, granting merchandise returns, establishing sales prices) might look if the business is structured as a decentralized business.

11. LO 9.2 Assume you are the manager of a local Starbucks. What factors do you feel would be relevant to hiring workers (including pay), assuming Starbucks is a decentralized organization?

12. LO 9.2 Assume you are the manager of a local Starbucks. What factors do you feel would be relevant to hiring workers (including pay), assuming Starbucks is a centralized organization?

13. LO 9.2 Use Netflix's 2017 annual report (https://openstax.org/l/50Netflix2017) to answer the following questions. How many segments does Netflix have? What are the segments? The annual report also shows selected nonfinancial and financial information for each segment. Prepare a brief presentation listing the "Paid memberships at end of period," "Revenues," and "Contribution profit" (also called *operating profit*) for the three most recent years (2017, 2016, and 2015). In the presentation, include any observations you notice about the trends of each segment.

14. LO 9.2 Reference the Kellogg Company's 2017 annual report (https://openstax.org/l/50Kellogg2017) to answer the following question. In "Note 18: Reportable Segments," you will find selected financial information for segments within Kellogg Company. Prepare a brief presentation listing each segment, along with the "Net Sales," "Operating Profit," and "Total Assets." For Total Assets, you should ignore Corporate and Elimination entries, and you will need to combine the U.S. divisions into a North American total. Report this information for the three most recent years (2017, 2016, and 2015). In the presentation, include any observations you notice about the trends of each segment. You may want to use Microsoft Excel or another spreadsheet application for the numerical data. This information will be used in a subsequent question.

15. LO 9.2 Lavell started out mowing lawns in the neighborhood when he was 13 years old. He did such good work that, without advertising, his business grew steadily each year. After college, Lavell decided to continue the business as a full-time career. One of his concerns, however, is the number of hours he is putting in. Once school lets out, he finds himself working long hours nearly every day of the week. Although he has added workers, his business now handles mowing, trimming, and landscaping for residential, corporate, and nonprofit clients. He is considering adding managers but is not quite sure how to structure the organization. Lavell wants to focus on building the business rather than doing the daily work, so he knows a decentralized structure will be best. He has asked you to develop a potential organizational chart to help him envision the best way to organize the business. Describe the advantages to this approach as well as any concerns he should have.

16. LO 9.3 Describe the concept of responsibility accounting.

17. LO 9.3 Describe the concept of a cost center and, using a specific organization, give an example of how this might be used to achieve the strategic goals of the organization.

18. LO 9.3 Describe the concept of a profit center and, using a specific organization, give an example of how this might be used to achieve the strategic goals of the organization.

19. LO 9.3 Explain the benefits of a return on investment structure within an investment center framework. It may help to think of an example using an existing company.

20. LO 9.3 Explain the benefits of a residual income structure within an investment center framework. It may help to think of an example using an existing company.

21. LO 9.4 Discuss the concept of controllable and uncontrollable costs and how they affect the evaluation of the responsibility center's financial performance.

22. LO 9.4 Discuss the concept of transfer pricing.

23. LO 9.4 Discuss the advantages and disadvantages of a market-based transfer pricing approach.

24. LO 9.4 Discuss the advantages and disadvantages of a cost-based transfer pricing approach.

25. LO 9.4 Discuss the advantages and disadvantages of a negotiated transfer pricing approach.

Exercise Set A

EA1. LO 9.3 Assume you have been hired by Hilton Hotels and Resorts. As part of your new role in the accounting department, you have been tasked to set up a responsibility accounting structure for the company. As your first task, your supervisor has asked you to give an example of a cost center, profit center, and an investment center within the Hilton organization. Your supervisor is a little unsure of the difference between a profit center and investment center and would like you to explain the difference.

EA2. LO 9.3 Consider the national nonprofit organization the American Red Cross. Assume you are the regional director of the organization, and you just received the quarterly financial reports. Even though the organization is a nonprofit, assume it is set up as a profit center because it is helpful for the financial reports to show both donations and expenses by each region/location. One particular report shows there is one location in your region that is extremely over budget on nearly every expense item. From a management perspective, can you think of a reason(s) when going over budget might actually be a good thing? As the regional manager, how might you respond to the overages to help the particular location in the future?

EA3. LO 9.3 The following information is from Bluff Run Golf Courses. The company runs three courses and the July income statement for each course is shown.

BLUFF RUN GOLF COURSES
Income Statement
Month Ending July 31, 2018

Revenues	**Blue Course**	**Black Course**	**Gold Course**
Greens fees revenue	$62,500	$89,000	$ 42,800
Outings revenue	?	6,000	28,000
Total revenue	$73,500	$95,000	$ 70,800
Expenses			
Landscaping	$ 7,800	$14,200	$ 6,400
Wages	43,900	?	32,600
Repairs and maintenance	5,600	2,600	4,400
Fuel	3,100	3,000	1,980
Utilities	1,800	3,000	1,650
Total expenses	$62,200	$79,100	$ 47,030
Operating income	$11,300	$15,900	?

A. Find the missing value for outings revenue, wages, and operating income.
B. Comment on the financial performance of each course.
C. Identify a limitation of analyzing the information provided.

You may want to consider using Microsoft Excel or another spreadsheet application for the numerical data. This information will be used in a subsequent question.

EA4. LO 9.3 The following information is from Dave's Sporting Goods. Dave's is a Midwest sporting goods store with three regional stores. The August income statement for all stores is shown.

DAVE'S SPORTING GOODS Income Statement Month Ending August 31, 2018			
	Nebraska	**Iowa**	**Illinois**
Sales	$22,000	$51,000	$36,000
Cost of goods sold	10,000	25,000	19,000
Gross profit	$12,000	$26,000	$17,000
Expenses			
Selling expenses	1,000	3,200	2,100
Wages expense	6,000	9,000	8,000
Costs allocated from corporate	3,000	15,000	5,500
Total expenses	$10,000	$27,200	$15,600
Operating income (loss)	$ 2,000	($ 1,200)	$ 1,400

A. Comment on the operating income results for each store.
B. Now assume the costs allocated from corporate is an uncontrollable cost for each store. How does this change your assessment of each store?

EA5. LO 9.4 Assume you are the department B manager for Marley's Manufacturing. Marley's operates under a cost-based transfer structure. Assume you receive the majority of your raw materials from department A, which sells only to department B (they have no outside sales). After calculating the operating income in dollars and operating income in percentage, analyze the following financial information to determine costs that may need further investigation. (Hint: It may be helpful to perform a vertical analysis.)

MARLEY'S MANUFACTURING Income Statement Month Ending August 31, 2018		
	Dept A	**Dept B**
Sales	$22,000	$51,000
Cost of goods sold	10,560	26,520
Gross profit	$11,440	$24,480
Utility expenses	1,000	3,200
Wages expense	5,500	10,200
Costs allocated from corporate	2,200	15,000
Total expenses	$ 8,700	$28,400
Operating income/(loss) $	?	?
Operating income/(loss) %	?	?

EA6. LO 9.4 As manager of department B in Marley's Manufacturing, based on the costs you identified in the previous exercise for further research, how does this impact the financial performance of your department, and what might be some questions you want to ask or solutions you might propose to Marley's management?

EA7. LO 9.4 Based on your research of the market in the previous exercises, you have determined the market price for the items your department purchase is 15% below what you are being charged by department A of Marley's Manufacturing. How would you view this as a manager? What steps could you take to solve this discrepancy? What alternatives would you consider, assuming you had control over purchasing decisions?

EA8. LO 9.4 Using the information in the previous exercises about Marley's Manufacturing, determine the operating income for department B, assuming department A "sold" department B 1,000 units during the month and department A reduces the selling price to the market price.

Exercise Set B

EB1. LO 9.3 Assume you have been hired by Cabela's Sporting Goods. As part of your new role in the accounting department, you have been tasked to set up a responsibility accounting structure for the company. As your first task, your supervisor has asked you to give an example of a cost center, profit center, and an investment center within the Cabela's organization. Your supervisor is a little unsure of the difference between a profit center and investment center and would like you to explain the difference.

EB2. LO 9.3 Assume you are the regional manager for a hotel chain. You receive the quarterly financial reports and notice one particular hotel had drastically lower revenue and a corresponding high occupancy rate. Upon further investigation, you discover the manager for the hotel provided lodging for a neighboring town that was hit by a tornado. As the manager, how do you respond to this?

EB3. LO 9.3 The following information is from Dessert Dynasty. The company runs three stores and the December Income Statement for all stores is shown.

DESSERT DYNASTY
Income Statement
Month Ending December 31, 2018

	Store X	Store Y	Store Z
Retail revenue	$17,976	?	$37,380
Events revenue	11,760	4,620	2,520
Total revenue	$29,736	$30,870	$39,900
Ingredients	3 ,528	3,276	?
Wages	15,792	18,438	$23,646
Baking supplies	1,848	2,352	1,092
Fuel	832	1,302	1,260
Utilities	693	756	1,260
Total expenses	$22,693	$26,124	$33,222
Operating income	?	$ 4,746	$ 6,678

A. Find the missing values for retail revenue, ingredients, and operating income.
B. Comment on the financial performance of each store.
C. Identify a limitation of analyzing the information provided.

You may want to consider using Microsoft Excel or another spreadsheet application for the numerical data. This information will be used in a subsequent question.

EB4. LO 9.3 The following information is from Good Read Books. Good Read is a regional book store with three regional stores. The May income statement for all stores is shown.

GOOD READS BOOKS Income Statement Month Ending May 31, 2018			
	Store 1	**Store 2**	**Store 3**
Sales	$52,920	$32,340	$74,970
Cost of goods sold	27,930	14,700	36,750
Gross profit	$24,990	$17,640	$38,220
Expenses			
Selling expenses	3,087	1,470	4,704
Wages expense	11,760	8,820	13,230
Costs allocated from corporate	8,085	4,410	22,050
Total expenses	$22,932	$14,700	$39,984
Operating income (loss)	$ 2,058	$ 2,940	($ 1,764)

A. Comment on the operating income results for each store.
B. Now assume the costs allocated from corporate is an uncontrollable cost for each store. How does this change your assessment of each store?

EB5. LO 9.4 Assume you are the warehouse manager for Vinnie's Vinyls, a multi-location business specializing in vinyl records. Vinnies's operates under a cost-based transfer structure and the warehouse supplies all stores with the records. The stores can purchase records only from the warehouse, and the warehouse can only sell to Vinnie's stores. The manager of the West store has some concerns relating to the store's financial performance and has asked for your help analyzing transfer costs. After calculating the operating income in dollars and the operating income percent, analyze the following financial information to determine costs that may need further investigation. (Hint: it may be helpful to perform a vertical analysis.)

VINNIE'S VINYLS Income Statement Month Ending March 31, 2018		
	Warehouse	**West Store**
Sales	$18,920	$43,860
Cost of goods sold	9,082	21,053
Gross profit	$ 9,838	$22,807
Selling expenses	860	2,752
Wages expense	4,730	15,351
Costs allocated from corporate	2,838	4,386
Total expenses	$ 8,428	$22,489
Operating income/(loss) $	?	?
Operating income/(loss) %	?	?

EB6. LO 9.4 As manager of the warehouse for Vinnie's Vinyls, based on this analysis and the items you identified for further research, what is your advice to the manager of the West store? What might be some questions you want to ask or solutions you might propose to Vinnie's management?

EB7. LO 9.4 Discuss how, as warehouse manager for Vinnie's Vinyls, you view the different rate of allocated costs the warehouse is being charged compared to the West store. Describe the implications of this. What steps could you take to solve this discrepancy? What alternatives would you consider, assuming management is willing to consider making changes in the rate?

EB8. LO 9.4 Determine the operating income for Vinnie's Vinyls' West store, assuming the warehouse allocation is reduced to 10% of sales for the warehouse and the difference will be charged to the West store. Management has determined that the warehouse takes fewer corporate resources and the allocation to the West store was lower than it should have been.

Problem Set A

PA1. LO 9.3 Use the following information to answer the questions that follow.

BLUFF RUN GOLF COURSES
Income Statement
Month Ending July 31, 2018

	Course A	Course B	Course C
Greens fees revenue	$62,500	$89,000	$42,800
Outings revenue	?	6,000	28,000
Total revenue	$73,500	$95,000	$70,800
Landscaping	$ 7,800	$14,200	$ 6,400
Wages	43,900	?	32,600
Repairs and maintenance	5,600	2,600	4,400
Fuel	3,100	3,000	1,980
Utilities	1,800	3,000	1,650
Total expenses	$62,200	$79,100	$47,030
Operating income	$11,300	$15,900	?
Operating income %	?	?	?

A. Calculate the operating income percentage for each of the courses. Comment on how your analysis has changed for each course.
B. Perform a vertical analysis for each course. Based on your analysis, what accounts would you want to investigate further? How might management utilize this information?
C. Which method of analysis (using a dollar value or percentage) is most relevant and/or useful? Explain.

PA2. LO 9.3 Use Netflix's 2017 annual report (https://openstax.org/l/50Netflix2017) to answer the following questions.

A. Using the revenue and contribution profit information, calculate the contribution profit (loss) percentage for each of the divisions. Comment on how your analysis has changed compared to your analysis of the dollar amounts for each division.

B. Since companies typically do not publicly provide more than macro levels of asset values, let's assume the following level of assets (investment):

Assets (fictitious)	2017	2016	2015
Domestic streaming	$15,000,000	$14,000,000	$10,000,000
International streaming	6,000,000	4,000,000	2,000,000
Domestic DVD	1,500,000	2,000,000	3,000,000

Calculate the return on investment (ROI) for each division. Comment on the results.

C. Assume that Netflix uses a cost of capital of 7%. Calculate the residual income (RI) for each of the divisions. Comment on the results.

PA3. LO 9.3 The income statement comparison for Forklift Material Handling shows the income statement for the current and prior year.

FORKLIFT MATERIAL HANDLING Income Statement Comparison		
	Current Year	**Prior Year**
(Amounts in thousands)		
Sales	$33,750	$24,750
Cost of goods sold	21,938	16,830
Gross profit	$11,812	$ 7,920
Wages	$ 8,775	$ 6,188
Utilities	675	250
Repairs	169	325
Selling	506	200
Total expenses	$10,125	$ 6,963
Operating income	?	?
Operating income %	?	?
Total assets (investment base)	$ 4,500	$ 1,500
Return on investment	?	?
Residual income (8% cost of capital)	?	?

A. Determine the operating income (loss) (dollars) for each year.

B. Determine the operating income (percentage) for each year.

C. The company made a strategic decision to invest in additional assets in the current year. These amounts are provided. Using the total assets amounts as the investment base, calculate the return on investment. Was the decision to invest additional assets in the company successful? Explain.

D. Assuming an 8% cost of capital, calculate the residual income for each year. Explain how this compares to your findings in part C.

PA4. LO 9.3 Assume you are the leather department manager at the Famous Football Factory. The leather department is a cost center and you are reviewing the scrap costs for the previous year, shown here:

FAMOUS FOOTBALL FACTORY
Cost Center Data-Leather Division

	Jan.	Feb.	Mar.	Apr.	May	June
Leather Scrap Expense	$10,000	$10,100	$10,302	$10,405	$11,029	$11,801
	July	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
Leather Scrap Expense	$13,100	$14,278	$15,135	$11,351	$11,351	$11,465

A. Using Microsoft Excel or another spreadsheet application, create a line chart with markers showing the leather scrap expense. Describe your observations.

B. Knowing that leather is susceptible to indoor temperature, you decide to talk with the maintenance manager and obtain the following information:

	Jan.	Feb.	Mar.	Apr.	May	June
Average indoor temperature (°F)	70	71	70	70	71	73
Air conditioning spare parts inventory	$3,500	$3,150	$2,898	$2,695	$2,426	$2,207
Number of air conditioning breakdowns	0	0	0	1	2	4
	July	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
Average indoor temperature (°F)	74	76	74	72	71	70
Air conditioning spare parts inventory	$2,031	$2,010	$2,010	$2,010	$2,010	$1,990
Number of air conditioning breakdowns	4	6	5	1	0	0

Using Microsoft Excel or another spreadsheet application, create individual line charts with markers showing the indoor temperature, spare parts inventory, and breakdowns. Describe your observations and actions you might consider.

PA5. LO 9.4 Financial information for BDS Enterprises for the year-ended December 31, 20xx, was gathered from an accounting intern, who has asked for your guidance on how to prepare an income statement format that will be distributed to management. Subtotals and totals are included in the information, but you will need to calculate the values.

A. In the correct format, prepare the income statement using the following information:
B. Calculate the profit margin, return on investment, and residual income. Assume an investment base of $100,000 and 6% cost of capital.
C. Prepare a short response to accompany the income statement that explains why uncontrollable costs are included in the income statement.

Pretax income	?
Gross profit	?
Allocated costs (uncontrollable)	$2,035
Labor expense	41,580
Sales	189,000
Research and development (uncontrollable)	315
Depreciation expense	17,000
Net income/(loss)	?
Cost of goods sold	119,070
Selling expense	1,250
Total expenses	?
Marketing costs (uncontrollable)	790
Administrative expense	690
Income tax expense (21% of pretax income)	?
Other expenses	320

PA6. LO 9.4 Using the information from BDS Enterprises, prepare the income statement to include all costs, but separate out uncontrollable costs. Insert subtotals where appropriate (include one for operating income) before the uncontrollable costs. Income tax expense should be based on all expenses (that is, it will be the same amount as in question 1). Calculate net income, profit margin, ROI, and RI, excluding uncontrollable expenses. Prepare a short response to accompany the income statement that explains why uncontrollable costs are separated in the income statement.

PA7. LO 9.4 Management of Great Springs Bottled Water Company has asked you, the controller, to develop a transfer pricing system for the company. The Transportation Department of the company sells all of its product to the Bottling Department of the company. Thus the Transportation Department's sales become the Bottling Department's cost of goods sold. In order to determine an optimal transfer pricing system, management would like you to demonstrate what an income statement would look like under a cost, market, and negotiated transfer pricing structure. These various transfer prices are listed as follows. Prepare an income statement for each of the transfer prices by filling in the missing numbers in the provided income statement based on each transfer price (thus four different income statements) and calculate the operating income/loss percentage. Prepare a brief summary of the results.

Cost-based	$ 0.62
Market-based	$ 0.74
Negotiated	$ 0.70
Gallons transferred	278,000

GREAT SPRINGS BOTTLED WATER
Income Statement
Month Ending August 31, 2018

	Transportation	Bottling
Sales	?	$286,000
Cost of goods sold	$89,627	?
Gross profit	?	?
Fuel/utility expense	$15,000	$3,200
Wages expense	43,090	57,200
Costs allocated from corporate	17,236	15,000
Total expenses	$75,326	$75,400
Operating income/(loss) $	?	?
Operating income/(loss) %	?	?

PA8. LO 9.4 The following revenue data were taken from the December 31, 2017, Coca-Cola annual report (10-K):

2017 (in millions)	Europe, Middle East, Africa	Latin America	North America	Asia Pacific	Bottle Investments
Outside sales	$7,332	$3,956	$ 8,651	$4,767	$10,524
Intersegment sales	42	73	1,986	409	81
Total sales	$7,374	$4,029	$10,637	$5,176	$10,605

2016 (in millions)	Europe, Middle East, Africa	Latin America	North America	Asia Pacific	Bottle Investments
Outside sales	$7,014	$3,746	$ 6,437	$4,788	$19,751
Intersegment sales	264	73	3,773	506	134
Total sales	$7,278	$3,819	$10,210	$5,294	$19,885

For each segment and each year, calculate intersegment sales (another name for transfer sales) as a percentage of total sales. Using Microsoft Excel or another spreadsheet application, create a clustered column graph to show the 2016 and 2017 percentages for each division. Comment on your observations of this data. How might a division sales manager use this data?

Problem Set B

PB1. LO 9.3 Use the following information to answer the questions that follow.

DESSERT DYNASTY Income Statement Month Ending December 31, 2018			
	Store X	**Store Y**	**Store Z**
Retail revenue	$17,976	?	$37,380
Events revenue	11,760	4,620	2,520
Total revenue	$29,736	$30,870	$39,900
Ingredients	$3,528	$3,276	?
Wages	15,792	18,438	23,646
Baking supplies	1,848	2,352	1,092
Fuel	832	1,302	1,260
Utilities	693	756	1,260
Total expenses	$22,693	$26,124	$33,222
Operating income	?	$4,746	$6,678
Operating income %	?	?	?

A. Calculate the operating income percentage for each of the stores. Comment on how your analysis has changed for each store.
B. Perform a vertical analysis for each store. Based on your analysis, what accounts would you want to investigate further? How might management utilize this information?
C. Which method of analysis (using a dollar value or percentage) is most relevant and/or useful? Explain.

PB2. LO 9.3 Use Kellogg's 2017 annual report (https://openstax.org/l/50Kellogg2017) to answer the following questions.

A. Using the information for Kellogg, calculate the operating profit percentage for each of the divisions. Comment on how your analysis has changed compared to your analysis of the dollar amounts for each division.
B. Using total assets as the investment, calculate the ROI for each division. In the total assets information you compile, you should ignore corporate and elimination entries amounts and you will also need to combine the U.S. divisions into a North American total. Comment on the results.
C. Assume that Kellogg uses a cost of capital of 10%. Calculate the RI for each of the divisions (you will need to condense the U.S. divisions into a North American total). Comment on the results.

PB3. LO 9.3 The income statement comparison for Rush Delivery Company shows the income statement for the current and prior year.

RUSH DELIVERY COMPANY Income Statement Comparison		
(Amounts in thousands)	**Current Year**	**Prior Year**
Sales	$15,000	$11,000
Cost of goods sold	9,750	7,480
Gross profit	$5,250	$3,520
Wages	$3,900	$3,080
Utilities	300	250
Repairs	75	325
Selling	225	200
Total expenses	$4,500	$3,855
Operating income/(loss)	?	?
Operating income/(loss) %	?	?
Total assets (investment base)	$4,500	$1,500
Return on investment	?	?
Residual income (8% cost of capital)	?	?

A. Determine the operating income (loss) (dollars) for each year.
B. Determine the operating income (percentage) for each year.
C. The company made a strategic decision to invest in additional assets in the current year. These amounts are provided. Using the total assets amounts as the investment base, calculate the ROI. Was the decision to invest additional assets in the company successful? Explain.
D. Assuming an 8% cost of capital, calculate the RI for each year. Explain how this compares to your findings in part C.

PB4. LO 9.3 Assume you are the manager for the semi-trucks division at the Speedy Delivery Company. The semi-truck division is a cost center and you are reviewing the driver overtime costs for the previous year, shown here:

SPEEDY DELIVERY COMPANY
Cost Center Data-Semi-Truck Division

	Jan.	Feb.	Mar.	Apr.	May	June
Driver overtime	$150,000	$172,500	$103,500	$104,535	$106,626	$95,963

	July	Aug.	Sep.	Oct.	Nov.	Dec.
Driver overtime	$91,165	$82,048	$69,741	$87,177	$135,124	$243,222

A. Microsoft Excel or another spreadsheet application, create a line chart with markers showing the driver overtime expense. Describe your observations.

B. Knowing that safety is important in your industry and weather plays a significant role in the safety of drivers, you decide to talk with the safety manager and obtained the following information:

	Jan.	Feb.	Mar.	Apr.	May	June
Average snowfall (inches)	15	12	2	0	0	0
Non-company highway accidents	128	70	42	38	35	56

	July	Aug.	Sep.	Oct.	Nov.	Dec.
Average snowfall (inches)	0	0	0	2	35	62
Non-company highway accidents	78	83	53	35	208	423

Using Microsoft Excel or another spreadsheet application, create individual line charts with markers showing the average snowfall and non-company highway accidents. Describe your observations and actions you might consider.

PB5. LO 9.4 Financial information for Lighthizer Trading Company for the fiscal year-ended September 30, 20xx, was collected. As part of a management training session, you have been asked to prepare an income statement format that will be used to distribute to management. Subtotals and totals are included in the information, but you will need to calculate the values.

A. In the correct format, prepare the income statement using this information:

B. Calculate the profit margin, return on investment, and residual income. Assume an investment base of $42,000 and 8% cost of capital.

C. Prepare a short response to accompany the income statement that explains why uncontrollable costs are included in the income statement.

Pretax income	?
Gross profit	?
Allocated costs (uncontrollable)	$ 855
Labor expense	$17,464
Sales	$79,380
Research and development (uncontrollable)	$ 132
Depreciation expense	$ 7,140
Net income/(loss)	?
Cost of goods sold	$50,009
Selling expense	$ 525
Total expenses	?
Marketing costs (uncontrollable)	$ 332
Administrative expense	$ 290
Income tax expense (21% of pretax income)	?
Other expenses	$ 134

PB6. LO 9.4 Using the information for Lighthizer Trading Company, prepare the income statement to include all costs, but separate out uncontrollable costs. Insert subtotals where appropriate (include one for operating income) before the uncontrollable costs. Income tax expense should be based on all expenses (that is, it will be the same amount as in the previous exercise). Calculate net income, profit margin, ROI, and RI excluding uncontrollable expenses. Prepare a short response to accompany the income statement that explains why uncontrollable costs are separated in the income statement.

PB7. LO 9.4 Management of Green Peak Tea Company has asked you, the controller, to develop a transfer pricing system for the company. The Brewing Department of the company sells all of its product to the Bottling Department of the company. Thus the Brewing Department's sales become the Bottling Department's cost of goods sold. In order to determine an optimal transfer pricing system, management would like you to demonstrate what an income statement would look like under a cost, market, and negotiated transfer pricing structure. These various transfer prices are listed as follows. Prepare an income statement for each of the transfer prices by filling in the missing numbers in the provided income statement based on each transfer price (thus four different income statements) and calculate the operating income/loss percentage. Prepare a brief summary of the results.

Cost-based	$ 1.32
Market-based	$ 1.15
Negotiated	$ 1.24
Gallons transferred	89,000

GREEN PEAK TEA COMPANY
Income Statement
Month Ended November 31, 2018

	Brewing	Bottling
Sales	?	$207,000
Cost of goods sold	$61,090	?
Gross profit	?	?
Fuel/utilities expense	6,000	$ 5,400
Wages expense	22,180	41,400
Costs allocated from corporate	$39,938	28,000
Total expenses	$39,928	$ 74,800
Operating income/(loss) $	?	?
Operating income/(loss) %	?	?

PB8. LO 9.4 The following revenue data were taken from the December 31, 2017, General Electric annual report (10-K):

2017 (in millions)	Power	Renewable Energy	Oil & Gas	Aviation	Health-care	Transport-ation	Lighting
Outside sales	$34,598	$10,211	$16,584	$26,790	$19,098	$4,168	$1,956
Intersegment sales	1,392	69	646	585	18	10	31
Total sales	$35,990	$10,280	$17,230	$27,375	$19,116	$4,178	$1,987

2016 (in millions)	Power	Renewable Energy	Oil & Gas	Aviation	Health-care	Transport-ation	Lighting
Outside sales	$35,465	$9,022	$12,515	$25,530	$18,276	$4,713	$4,795
Intersegment sales	1,330	11	383	730	15	1	28
Total sales	$36,795	$9,033	$12,898	$26,260	$18,291	$4,714	$4,823

For each segment and each year, calculate intersegment sales (another name for transfer sales) as a percentage of total sales. Using Microsoft Excel or another spreadsheet application, create a clustered column graph to show the 2016 and 2017 percentages for each division. Comment on your observations of this data. How might a division sales manager use this data?

Thought Provokers

TP1. LO 9.1 You have just been elected president of a brand-new service club on campus. The club is part of a national organization, but the organization charter gives the local organization a fair amount of flexibility in setting up the management of the club. As president, you can choose to make most of the decisions for the club and pass along your direction to the officers and members below you, or you can create specific committees, such as membership or academic, and allow each of the committees to make its own decisions and rules within the overall guidelines set out by the national charter. Consider the need to manage and evaluate the club and describe which form of organization would you set up for your club and why.

TP2. LO 9.3 Consider these two companies: Apple and ExxonMobil. Write a summary of your perception of each company's financial position. Consider the levels of revenue, profitability, and any other financial measures you feel are relevant. After completing your summary, download Apple's September 30, 2017 annual report (10-K) (https://openstax.org/l/50Apple2017) and download Exxon Mobil's December 31, 2016 annual report (10-K) (https://openstax.org/l/50Exxon2017) for more information.

Gather the following information for each company:

Apple Data

Apple	9/30/2017	9/24/2016	9/26/2015
Net sales			
Income before provision for income taxes			
Net income			

Table 9.2

Exxon Mobile Data

Exxon	2017	2016	2015
Total revenues and other income			
Income before income taxes			
Net income attributable to ExxonMobil			

Table 9.3

What observations do you have about the financial performance of each company? Calculate the net income % (also called profit margin %) of each company. What observations do you have? How do these results compare to your perception of these companies before reviewing the annual reports?

10

Short-Term Decision Making

Figure 10.1 Value Add. Used coffee grounds can add value to a business. (credit left: modification of "Old coffee grounds to sprinkle on your garden" by Tristan Ferne/Flickr; credit right: modification of "Reusing coffee grounds" by Montgomery Cty Division of Solid Waste Services's photostream/Flickr)

Chapter Outline

Why It Matters

One day, at your part-time job in a local coffee shop, you realize that the employees throw many pounds of used coffee grounds in the trash each day. From an environmental perspective, you are concerned because of the volume of trash being transferred to the landfill. From a business perspective, you wonder if discarding the used grounds is the only option. Could those coffee grounds be used in a profitable manner? After a bit of research, you discover that, if prepared in certain ways, used coffee grounds are good as fertilizer, can kill insects on some plants, can be used as a body scrub, among other options. A recent radio talk show discussed the possibility that coffee grounds could be used as an alternative fuel source, and you learned that coffee grounds are actually being used to help fuel buses in London.

You consider the options for the used coffee grounds and come up with three possibilities for your coffee shop: (1) throw away the used grounds; (2) sell the used grounds to a company that will process them into

fertilizer, bio-fuel, or some other product; or (3) process and package the used grounds for resale in the coffee shop as fertilizer and bug repellant. What information would you need for your analysis? Which decision would you choose and why? Are the revenue and cost components the only components of the decision that you should consider? These and similar issues are the types of questions that the accounting analysis process can help management address when evaluating short-term decisions.

10.1 Identify Relevant Information for Decision-Making

Almost everything we do in life results from choosing between alternatives, and the choices we make result in different consequences. For example, when choosing whether or not to eat breakfast before going to class, you face two alternatives and two sets of consequences. Eating breakfast means you must get up a little earlier, have food available, and be willing to prepare the food. Not eating means sleeping in longer, not having to plan food, and being hungry during class. Just as our lives are fraught with decisions large and small, the same is true for businesses. Almost every aspect of being in business involves choosing between alternatives, and each alternative typically has one or more consequences. Understanding how businesses make decisions paves the way not only to better decision-making processes but potentially to better outcomes.

Decisions made by businesses can have short-term effects or long-term impacts, or in some situations, both. Short-term decisions often address a temporary circumstance or an immediate need while long-term decisions align more with permanent problem solving and meeting strategic goals. Because these two types of decisions require different types of analyses, we will consider short-term decision-making here and long-term decision-making in Capital Budgeting Decision. Accounting distinguishes between short-term and long-term decisions not only because of the difference in the general nature of these decisions but also because the types of analyses differ significantly between short-term and long-term decision categories. As the time horizon over which the decision will have an impact expands, more costs become relevant to the decision-making process. In addition, when a time element is considered, there will be additional factors such as interest (paid or received) that will have a greater influence on decisions. Table 10.1 provides examples of short-term and long-term business decisions.

Examples of Short-Term and Long-Term Business Decisions

Short-Term Business Decisions	Long-Term Business Decisions
• Accepting a special production order • Determining the best product mix from current products • Outsourcing a part or service • Further processing or refining a current product	• Buying new equipment versus remodeling old equipment • Choosing which products to manufacture • Expanding into a new area or country • Diversifying by buying another business

Table 10.1 Short-term and long-term business decisions should be analyzed using different frameworks.

CONTINUING APPLICATION AT WORK

Short-Term Decision-Making

Considering the business challenges facing Gearhead Outfitters, what short-term decisions might the company encounter? Remember that the retailer sells men's, women's and children's outdoor clothing, footwear, and accessories. Gearhead must carry a certain level and variety of inventory to meet the demands of its customers. The company will have to maintain appropriate accounting records to make proper business decisions to promote sustainability and growth.

How might Gearhead be able to compete with larger chains and remain profitable? Will every sale result in the anticipated profit to the company? Consider what specialized short-term decision-making processes the company may use to meet its goals. Should more of an item than normal be purchased for resale to receive a larger discount from the supplier? What information about cost, volume, and profit is needed to make a sound business decision in this case? Some items may be sold at a loss (or lesser profit) to attract customers to the store. What type of information and accounting system is needed to help in this situation? The company requires relevant, consistent, and reliable data to determine the proper course of action.

Short-term decision-making is vital in any business. Consider this concept in relation to Centralized vs. Decentralized Management and how a company's approach may affect the decision-making process. Discuss possible short-term issues and decisions, management focuses, and whether or not the centralized versus decentralized style will aid in company flexibility and success. Also, think in terms of how the decision-making process will be evaluated.

Relevant Information for Short-Term Decision-Making

Business decision-making can be outlined as a process that is applied by management with each decision that is made. The process of decision-making in a managerial business environment can be summed up in these steps.

1. Identify the objective or goal. For a business, typically the goal is to maximize revenues or minimize costs.
2. Identify alternative courses of action that can achieve the goal or address an obstacle that is hindering goal achievement.
3. Perform a comprehensive analysis of potential solutions. This includes identifying revenues, costs, benefits, and other financial and qualitative variables.
4. Decide, based upon the analysis, the best course of action.
5. Review, analyze, and evaluate the results of the decision.

The first step of the decision-making process is to identify the goal. In the decisions discussed in this course, the quantitative goal will either be to maximize revenues or to minimize costs. The second step is to identify the alternative courses of action to achieve the goal. (In the real world, steps one and two may require more thought and research that you will learn about in advanced cost accounting and management courses.). This chapter focuses on steps three and four, which involve **short-term decision analysis**: determining the appropriate information necessary for making a decision that will impact the company in the short term, usually 12 months or fewer, and using that information in a proper analysis in order to reach an informed decision among alternatives. Step five, which involves reviewing and evaluating the decision, is briefly

addressed with each type of decision analyzed.

Though these same general steps could be used in long-term decision analyses, the nature of long-term decisions is different. Short-term decisions are typically operational in nature: making versus buying a component of a product, using scarce resources, selling a product as-is or processing it further into a different product. It is relatively easy to change a short-term decision with minimal impact on the company. Long-term decisions are strategic in nature and typically involve large sums of money. The effects of a long-term decision can have significant financial impact on a company for years. Examples of long-term decisions include replacing manufacturing equipment, building a new factory, or deciding to eliminate a product line. While you've learned how managerial accounting classifies, tracks, monitors, and controls costs, managerial accountants also closely analyze revenues, which are less controllable than costs, but are important in these decisions. As stated in the first step of the decision-making process, maximizing revenues is usually one of the goals of an organization. Therefore, making some short-term decisions requires analysis of both costs and revenues.

In carrying out step three of the managerial decision-making process, a differential analysis compares the relevant costs and revenues of potential solutions. What does this involve? First, it is important to understand that there are many types of short-term decisions that a business may face, but these decisions always involve choosing between alternatives. Examples of these types of decisions include determining whether to accept a special order; making a product or component versus buying the product or component; performing additional processing on a product; keeping versus eliminating a product or segment; or determining whether to take on a new project. In each of these situations, the business should compare the relevant costs and the relevant revenues of one alternative to the relevant costs and relevant revenues of the other alternative(s). Therefore, an important step in the differential analysis of potential solutions is to identify the relevant costs and relevant revenues of the decision.

What does it mean for something to be relevant? In the context of decision-making, something is relevant if it will influence the decision being made. For example, suppose you have two options for a summer job—either flagging traffic for a road crew or working for a landscaping company doing lawn care. For either job, you will be required to have industrial grade sound protectors (plugs or headphones) for your ears. This cost would not be relevant because it is the same under either alternative, so it will not influence your decision between the two jobs; it would be considered an **irrelevant cost**. You also believe your transportation costs will be the same for either job; thus this would also be an irrelevant cost.

However, if you are required to have steel-toed boots for the road work job but can wear any type of work boot for the landscaping job, you would need to consider the difference between the costs, or the **differential cost**, of these two types of boots. This difference in cost between the two pairs of boots would be designated as a **relevant cost** because it influences your decision.

The two jobs also may have differences in revenues, called a **differential revenue**. Because the differential revenue influences the decision, it is also a **relevant revenue**. If both jobs pay the same hourly wage, it would have an **irrelevant revenue**, but if the road crew job offers overtime for any time worked over 40 hours, then this overtime wage has the potential to be a relevant revenue if overtime is a likely occurrence. Looking only at these differences—of both costs and revenues—between the alternatives, is known as **differential analysis**.

In conducting these types of analyses between alternatives, the initial focus will be on each **quantitative factor** of the analysis—in other words, the component that can be measured numerically. Examples of quantitative factors in business include sales growth, number of defective parts produced, or number of labor hours worked. However, in decision-making, it is important also to consider each **qualitative factor**, which is one that cannot be measured numerically. For example, using the same summer job scenario, qualitative

factors may include the environment in which you would be working (road dust and tar odors versus pollen and mower exhaust fumes), the amount of time exposed to the sun, the people with whom you will be working (working with friends versus making new friends), and weather-related issues (both jobs are outdoors, but could one job send you home for the day due to weather?). Examples of qualitative factors in business include employee morale, customer satisfaction, and company or brand image. In making short-term decisions, a business will want to analyze both qualitative and quantitative factors.

In short-term decision-making, revenues are often easier to evaluate than costs. In addition, each alternative typically only has one possible one revenue outcome even though there are many costs to consider for each alternative. How do we know if a cost will have an impact on the decision? The starting point is to understand the various labels that are attached to costs in these decision-making environments.

Avoidable versus Unavoidable Costs

Management must determine if a cost is avoidable or unavoidable because in the short run, only avoidable costs are relevant for decision-making purposes. An **avoidable cost** is one that can be eliminated (in whole or in part) by choosing one alternative over another. For example, assume that a bike shop offers their customers custom paint jobs for bikes that the customers already own. If they eliminate the service, the cost of the bike paint could be eliminated. Also assume that they had been employing a part-time painter to do the work. The painter's compensation would also be an avoidable cost.

An **unavoidable cost** is one that does not change or go away in the short-run by choosing one alternative over another. For example, a company might sign a long-term lease on equipment or a production facility. These types of leases typically don't allow for cancellation, so if this one does not, then their required payments are unavoidable costs for the duration of the lease.

Variable costs are avoidable costs, since variable costs do not exist if the product is no longer made, or if the portion of the business (such as a segment or division) that generated the variable costs ceases to operate. Fixed costs, on the other hand, may be unavoidable, partially unavoidable, or avoidable only in certain circumstances. Remember that fixed costs tend to remain constant for a period of time and within a relevant range of production and are not easily eliminated in the short-run. Therefore, most fixed costs also are unavoidable. If a fixed cost is specific only to one of the alternatives, then that fixed cost also may be avoidable. Avoidable costs are future costs that are relevant to decision-making. Past costs are never an avoidable cost.

Recall that we are using a short-term viewpoint to determine whether or not costs are avoidable. In the long run, virtually all costs are avoidable. For example, assume that a company has a long-term, ten-year lease on a production facility that cannot be cancelled. For the first ten years it would be noncancelable and thus unavoidable. But after ten years it would become avoidable.

YOUR TURN

AlexCo's Wagons

AlexCo produces collapsible wagons that are popular with beachgoers, shoppers, gardeners, parents, and tailgaters. Annual sales have been 100,000 wagons per year. The retail selling price of each wagon is

$67.00. To date, AlexCo has produced each of the components used in making the wagons but has been approached by DAL, Inc. with an offer to provide the axle and wheel assembly for $18.75 per assembly. AlexCo's costs to produce the axle and wheel assembly are $9.00 in direct materials, $6.50 in direct labor, $3.57 in variable overhead, and $2.50 in fixed overhead. Twenty-five percent of the fixed overhead is avoidable if the assembly is produced by DAL. Should AlexCo continue to make the axle and wheel assembly or should it buy the assembly from DAL, Inc.?

Solution

	Relevant Costs	
	Make Internally	Buy from DAL, Inc.
Direct materials	$ 9.00	
Direct labor	6.50	
Variable overhead	3.57	
Avoidable fixed costs	0.63	
Total unit relevant cost	19.70	$ 18.75
Units required	100,000	100,000
Total relevant costs	$1,970,000	$1,875,000

Ignoring qualitative factors, it would be more cost effective for AlexCo to buy the axle and wheel assembly from DAL, Inc. However, AlexCo should be certain of any qualitative issues and not solely base their decision on the quantitative analysis.

Sunk Costs

A **sunk cost** is one that cannot be avoided because it has already occurred. A sunk cost will not change regardless of the alternative that management chooses; therefore, sunk costs have no bearing on future events and are not relevant in decision-making. The basic premise sounds simple enough, but sunk costs are difficult to ignore due to human nature and are sometimes incorrectly included in the decision-making process. For example, suppose you have an old car, a hand-me-down from your grandmother, and last year you spent $1,600 on repairs and new tires and were just told by your mechanic that the car needs $1,200 in repairs to operate safely. Your goal is to have a safe and reliable car. Your alternatives are to get the repairs completed or trade in the car for a newer used car.

From a quantitative perspective, you have gathered the following information to help with your decision. The trade-in value of your old car will be the minimum given by the dealer, or $200. The newer used car will require you to make monthly payments of $150 for two years. In analyzing your two alternatives, what costs do you consider? Remember, the $1,600 you have already spent (note the past tense) is a sunk cost; it is a consequence of a past decision. In this example, the relevant costs for each alternative are the following: $1,200 in current repair costs to keep your current car or $3,400 (from the 24 payments of $150 minus $200 for the trade in) to buy a newer used car. Obviously, you also would consider qualitative factors, such as the sentimental value of your grandmother's car or the excitement of having a newer car.

Sunk costs are most problematic for business decisions when they pertain to existing equipment. The book value of an asset (historical cost – accumulated depreciation) is a sunk cost regardless of whether a business

keeps the asset or disposes of it in some manner. The cost of the asset occurred in the past and therefore is sunk and irrelevant to the decision at hand. Mangers may be reluctant to ignore sunk costs when making decisions, especially if the prior decision to purchase the asset was an unwise one. Often, when management takes a path of action that is not achieving the desired results, managers may continue the same path in the hope that the effect of prior decisions will improve the results. The use of the word *prior* is a key indicator that information is nonrelevant to a current decision. Holding on to old decisions or old commitments is common because letting them go forces management to admit they made a bad decision.

Future Costs That Do Not Differ

Any future cost that does not differ between the alternatives is not a relevant cost for the decision. For example, if a company is considering baking either bagels or doughnuts and both baked goods require $0.30 worth of flour, then the cost of flour would not be a relevant cost in determining which of the two had the highest production cost. As relevant information for short-term decision-making, the cost of sound protectors for your summer job would not be relevant to your decision because that cost exists in both scenarios. Another irrelevant cost would be your transportation cost, since that cost is also the same regardless of the job you choose. In another example, if a company is planning to produce either red widgets or blue wingdings and will need to hire 10 additional employees to produce either of the goods, the cost of those 10 employees is irrelevant because it does not differ between the alternatives.

ETHICAL CONSIDERATIONS

Johnson & Johnson's 1982 Recall and Replacement of All Tylenol in the World

In 1982, Johnson & Johnson was faced with a large-scale business and ethical dilemma. During the course of several days beginning on September 29, 1982, seven deaths occurred in the Chicago area that were attributed to consuming capsules of Extra-Strength Tylenol. The painkiller was, at the time, Johnson & Johnson's best-selling product. The company had to decide if the short-term cost of replacing the Tylenol was worth the future cost to their reputation and their customer's health and safety. At tremendous expense, Johnson & Johnson "placed consumers first by recalling 31 million bottles of Tylenol capsules from store shelves and offering replacement product in the safer tablet form free of charge."[1]

As it was later discovered, someone was lacing Tylenol capsules with cyanide and returning the pills in the original packages to store shelves. However, Johnson & Johnson's decision to incur short-term costs by recalling all of their pills ultimately paid off, as in the long run, the company's stock value increased and Tylenol sales recovered. One could look at the decision as an opportunity cost: Johnson & Johnson had to choose between two alternatives. The company could have chosen a short-term solution with reduced short-term losses, but by making an ethical business decision, the long-term rewards were greater than the short-term savings.

Opportunity Costs

When choosing between two alternatives, usually only one of the two choices can be selected. When this is the

1 Judith Rehak. "Tylenol Made a Hero of Johnson & Johnson: The Recall That Started Them All." *New York Times*. Mar. 23, 2002. https://www.nytimes.com/2002/03/23/your-money/IHT-tylenol-made-a-hero-of-johnson-johnson-the-recall-that-started.html

case, you may be faced with **opportunity costs**, which are the costs associated with not choosing the other alternative. For example, if you are trying to choose between going to work immediately after completing your undergraduate degree or continuing to graduate school, you will have an opportunity cost. If you choose to go to work immediately, your opportunity cost is forgoing a graduate degree and any potential job limitations or advancements that result from that decision. If you choose instead to go directly into graduate school, your opportunity cost is the income that you could have been earning by going to work immediately upon graduation.

YOUR TURN

Costs and Revenue at Carolina Clusters

Carolina Clusters, Inc., a candy manufacturer in a resort town, just bought a new taffy pulling machine for $27,000 and is planning to increase the production of salt-water taffy. Due to the increased production, Carolina is deciding between hiring two part-time college students or one full-time employee. Each college student would work half days totaling 20 hours per week, and would earn $12 per hour. The full-time employee would work full days 40 hours per week and would earn $12 per hour plus the equivalent of $2 per hour in benefits. Each employee is given two t-shirts to wear as their uniform. The t-shirts cost Carolina $8 each. In addition, Carolina provides disposable hair coverings and gloves for the employees. Each employee uses, on average, six sets of gloves per eight-hour shift or four sets per four-hour shift. One hair covering per shift per person is typical. The cost of the hair covering is $0.05 per covering and the cost of a pair of gloves is $0.02 per pair. Identify any relevant costs, relevant revenues, sunk costs, and opportunity costs that Carolina Clusters needs to consider in making the decision whether to hire two part-time employees or one full-time employee.

Solution

Relevant costs:

- $2 per hour for benefits
- $16 for two t-shirts: Hiring one full-time person will result in a $16 expenditure for t-shirts. Hiring two college students would result in $32 in t-shirt expenditures, thus the relevant t-shirts costs is the $16 difference.
- $0.05 for a hair covering: Hiring one full-time person will result in $0.05 per day in hair covering costs but hiring two college students would result in $0.10 per day in hair covering costs thus the relevant hair covering cost is the $0.05 difference.
- $0.04 for a pair of gloves: Hiring one full-time person will result in $0.12 (6 × $0.02) per day in glove costs, but hiring two college students would result in $0.16 (8 × $0.02) per day in glove costs. Thus, the relevant glove cost is the $0.04 difference.

Relevant revenues: None

Sunk costs: $27,000 for the taffy machine

Opportunity costs: None

10.2 Evaluate and Determine Whether to Accept or Reject a Special Order

Both manufacturing and service companies often receive requests to fill special orders. These **special orders** are typically for goods or services at a reduced price and are usually a one-time order that, in the short-run, does not affect normal sales. When deciding whether to accept a special order, management must consider several factors:

- The capacity required to fulfill the special order
- Whether the price offered by the buyer will cover the cost of producing the products
- The role of fixed costs in the analysis
- Qualitative factors
- Whether the order will violate the Robinson-Patman Act and other fair pricing legislation

Fundamentals of the Decision to Accept or Reject a Special Order

The starting point for making this decision is to assess the company's normal production capacity. The **normal capacity** is the production level a company can achieve without adding additional production resources, such as additional equipment or labor. For example, if the company can produce 10,000 towels a month based on its current production capacity, and it is currently contracted to produce 9,000 a month, it could not take on a special one-time order for 3,000 towels without adding additional equipment or workers. Most companies do not work at maximum capacity; rather, they function at normal capacity, which is a concept related to a company's relevant range. The **relevant range** is the quantitative range of units that can be produced based on the company's current productive assets. These assets can include equipment capacity or its labor capacity. Labor capacity is typically easier to increase on a short-term basis than equipment capacity. The following example assumes that labor capacity is available, so only equipment capacity is considered in the example.

Assume that based on a company's present equipment, it can produce 20,000 units a month. Its relevant range of production would be zero to 20,000 units a month. As long as the units of production fall within this range, it does not need additional equipment. However, if it wanted to increase production from 20,000 units to 24,000 units, it would need to buy or lease additional equipment. If production is fewer than 20,000 units, the company would have unused capacity that could be used to produce additional units for its current customers or for new clients.

If the company does not have the capacity to produce a special order, it will have to reduce production of another good or service in order to fulfill the special order or provide another means of producing the goods, such as hiring temporary workers, running an additional shift, or securing additional equipment. As you will learn, not having the capacity to fill the special order will create a different analysis than it would if there is sufficient capacity.

Next, management must determine if the price offered by the buyer will result in enough revenue to cover the differential costs of producing the items. For example, if price does not meet the variable costs of production, then accepting the special order would be an unprofitable decision.

Additionally, fixed costs may be relevant if the company is already operating at capacity, as there may be additional fixed costs, such as the need to run an extra shift, hire an additional supervisor, or buy or lease additional equipment. If the company is not operating at capacity—in other words, the company has *unused* capacity—then the fixed costs are irrelevant to the decision if the special order can be met with this unused capacity.

Special orders create several qualitative issues. A logical issue is the concern for how existing customers will

feel if they discover a lower price was offered to the special-order customer. A special order that might be profitable could be rejected if the company determined that accepting the special order could damage relations with current customers. If the goods in the special order are modified so that they are cheaper to manufacture, current customers may prefer the modified, cheaper version of the product. Would this hurt the profitability of the company? Would it affect the reputation?

In addition to these considerations, sometimes companies will take on a special order that will not cover costs based on qualitative assessments. For example, the business requesting the special order might be a potential client with whom the manufacturer has been trying to establish a business relationship and the producer is willing to take a one-time loss. However, our coverage of special orders concentrates on decisions based on quantitative factors.

Companies considering special orders must also be aware of the anti–price discrimination rules established in the Robinson-Patman Act. The Robinson-Patman Act is a federal law that was passed in 1936. Its primary intent is to prevent some forms of price discrimination in sales transactions between smaller and larger businesses.

LINK TO LEARNING

The Robinson-Patman Act prevents large retailers from purchasing goods in bulk at a greater discount than smaller retailers are able to obtain them. It helps keep competition fair between large and small businesses and is sometimes called the "Anti-Chain Store Act." Read the LegalDictionary.net full definition and example of the Robinson-Patman Act (https://openstax.org/l/50RobPatAct) to learn more.

Sample Data

Franco, Inc., produces dental office examination chairs. Franco has the capacity to produce 5,000 chairs per year and currently is producing 4,000. Each chair retails for $2,800, and the costs to produce a single chair consist of direct materials of $750, direct labor of $600, and variable overhead of $300. Fixed overhead costs of $1,350,000 are met by selling the first 3,000 chairs. Franco has received a special order from Ghanem, Inc., to buy 800 chairs for $1,800. Should Franco accept the special order?

Calculations Using Sample Data

Franco is not operating at capacity and the special order does not take them over capacity. Additionally, all the fixed costs have already been met. Therefore, when evaluating the special order, Franco must determine if the special offer price will meet and exceed the costs to produce the chairs. Figure 10.2 details the analysis.

	Current Cost to Produce	Special Order Price Offer	Difference in Favor of Accepting Special Order
Direct materials	$ 750		
Direct labor	600		
Variable overhead	300		
Variable costs to produce	1,650		
Special offer price		$1,800	$150 per chair

Figure 10.2 Special Order: Supplier Has Excess Capacity. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Since Franco has already met his fixed costs with current production and since he has the capacity to produce the additional 800 units, Franco only needs to consider his variable costs for this order. Franco's variable cost to produce one chair is $1,650. Ghanem is offering to buy the chairs for $1,800 apiece. By accepting the special order, Franco would meet his variable costs and make $150 per chair. Considering only quantitative factors, Franco should accept the special offer.

How would Franco's decision change if the factory was already producing at capacity at the time of the special offer? In other words, assume the corporation is already producing the most it can produce without working more hours or adding more equipment. Accepting the order would likely mean that Franco would incur additional fixed costs. Assume that, to fill the order from Ghanem, Franco would have to run an extra shift, and this would require him to hire a temporary production manager at a cost of $90,000. Assume no other fixed costs would be incurred. Also assume Franco will incur additional costs related to maintenance and utilities for this extra shift and estimates those costs will be $70,000. As shown in Figure 10.3, in this scenario, Franco would have to charge Ghanem at least $1,850 in order to meet his cost.

	Current Production	Special Order Current Offer
Selling price	$2,800	$1,800
Variable cost to produce	1,650	1,650
Additional costs to recover*		200
Contribution margin	$1,150	$ (50)
*$90,000 supervisor salary + $70,000 additional costs = $160,000 in costs to recover ÷ 800 chairs in special order = $200 per chair additional costs due to capacity issue.		

Figure 10.3 Special Order: Supplier Does Not Have Excess Capacity. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Final Analysis of the Decision

The analysis of Franco's options did not consider any qualitative factors, such as the impact on morale if the company is already at capacity and opts to implement overtime or hire temporary workers to fill the special order. The analysis also does not consider the effect on regular customers if management elects to meet the special order by not fulfilling some of the regular orders. Another consideration is the impact on existing customers if the price offered for the special order is lower than the regular price. These effects may create a bad dynamic between the company and its customers, or they may cause customers to seek products from competitors. As in the example, Franco would need to consider the impact of displacing other customers and

the risk of losing business from regular customers, such as dental supply companies, if he is unable to meet their orders. The next step is to do an overall cost/benefit analysis in which Franco would consider not only the quantitative but the qualitative factors before making his final decision on whether or not to accept the special order.

THINK IT THROUGH

Athletic Jersey Special Orders

Jake's Jerseys has been asked to produce athletic jerseys for a local school district. The special order is for 1,000 jerseys of varying sizes, and the price offered by the school district is $10 less per jersey than the normal $50 market price. The school district interested in the jerseys is one of the largest in the area. What quantitative and qualitative factors should Jake consider in making the decision to accept or reject the special order?

10.3 Evaluate and Determine Whether to Make or Buy a Component

One of the most common outsourcing scenarios is one in which a company must decide whether it is going to make a component that it needs in manufacturing a product or buy that component already made. For example, all of the components of the iPhone are made by companies other than Apple. Ford buys truck and automobile seats, as well as many other components and individual parts, from various suppliers and then assembles them at Ford factories. With each component, Ford must decide if it is more cost effective to make that component internally or to buy that component from an external supplier.

This type of analysis is also relevant to the service industry; for example, ADP provides payroll and data processing services to over 650,000 companies worldwide. Or a law firm may decide to hire certain research activities to be completed by outside experts rather than hire the necessary staff to keep that function in-house. These are all examples of outsourcing. **Outsourcing** is the act of using another company to provide goods or services that your company requires.

Many companies outsource some of their work, but why? Consider this scenario: Today, while driving home from class, one of your car's engine warning lights goes on. You will most likely take your car to an auto repair specialist to have it analyzed and repaired, whereas your grandfather might have popped the hood, grabbed his toolbox, and attempted to diagnose and fix the problem himself. Why? It is often a matter of expertise and sometimes simply a matter of cost benefit. In your grandfather's time, car engines were more mechanical and less electronic, which made learning to repair cars a simpler process that required less expertise and only basic tools. Today, your car has many electronic components and often requires sophisticated monitors to assess the problem and may involve the replacement of computer chips or electronic sensors. Thus, you opt to outsource the repair of your car to someone who has the knowledge and facilities to provide the repair more cost effectively than you could if you did it yourself. Your grandfather likely could have made the repair to his car several decades ago as cheaply as the mechanic with only a sacrifice of his time. To your grandfather, the cost of his time was worth the benefit of completing the repair himself.

Companies outsource for the same reasons. Many companies have found that it is more cost effective to outsource certain activities, such as payroll, data storage, and web design and hosting. It is more efficient to

pay an outside expert than to hire the appropriate staff to keep a particular task inside the company.

Fundamentals of the Decision to Make or to Buy

As with other decisions, the make-versus-buy decision involves both quantitative and qualitative analysis. The quantitative component requires cost analysis to determine which alternative is more cost effective. This cost analysis can be performed by looking at the cost to buy the component versus the cost to produce the component, which allows us to make a decision based on an analysis of unavoidable costs. For example, the costs to produce will include direct materials, direct labor, variable overhead, and fixed overhead. If the business chooses to buy the component instead, the avoidable costs will go away but unavoidable costs will remain and would need to be considered as part of the cost to buy the component.

Sample Data

Thermal Mugs, Inc., manufactures various types of leak-proof personal drink carriers. Thermal's T6 container, its most insulated carrier, maintains the temperature of the liquid inside for 6 hours. Thermal has designed a new lid for the T6 carrier that allows for easier drinking and pouring. The cost to produce the new lid is $2.19:

Direct materials	$0.87
Direct labor	0.45
Fixed overhead	0.51
Variable overhead	0.36
Total unit cost	$2.19

Plato Plastics has approached Thermal and offered to produce the 120,000 lids Thermal will require for current production levels of the T6 carrier, at a unit price of $1.75 each. Is this a good deal? Should Thermal buy the lids from Plato rather than produce them themselves? Initially, the $1.75 presented by Plato seems like a much better price than the $2.19 that it would cost Thermal to produce the lids. However, more information about the relevant costs is necessary to determine whether the offer by Plato is the better offer. Remember that all the variable costs of producing the lid will only exist if the lid is produced by Thermal, thus the variable costs (direct materials, direct labor, and variable overhead) are all relevant costs that will differ between the alternatives.

What about the fixed costs? Assume all the fixed costs are not tied directly to the production of the lid and therefore will still exist even if the lid is purchased externally from Plato. This means the fixed costs of $0.51 per unit are unavoidable and therefore are not relevant.

Calculations Using Sample Data

Calculations show that when the relevant costs are compared between the two alternatives, it is more cost effective for Thermal to produce the 120,000 units of the T6 lid internally than to purchase it from Plato.

	Relevant Costs	
	Make Internally	Buy from Plato
Direct materials	$ 0.87	
Direct labor	0.45	
Variable overhead	0.36	
Total unit relevant cost	1.68	$ 1.75
Units required	120,000	120,000
Total relevant costs	$201,600	$210,000

By producing the T6 lid internally, Thermal can save $8,400 ($210,000 − $201,600). How would the analysis change if a portion of the fixed costs were avoidable? Suppose that, of the $0.51 in fixed costs per unit of the T6 lid, $0.12 of those fixed costs are associated with interest costs and insurance expenses and thus would be avoidable if the T6 lid is purchased externally rather than produced internally. How does that change the analysis?

	Relevant Costs	
	Make Internally	Buy from Plato
Direct materials	$ 0.87	
Direct labor	0.45	
Variable overhead	0.36	
Avoidable fixed costs	0.12	
Total unit relevant cost	1.80	$ 1.75
Units required	120,000	120,000
Total relevant costs	$216,000	$210,000

In this scenario, it is more cost effective for Thermal to buy the T6 lid from Plato, as Thermal would save $6,000 ($216,000 − $210,000).

Final Analysis of the Decision

The difference in these two presentations of the data emphasizes the importance of defining which costs are relevant, as improper cost identification can lead to bad decisions.

These analyses only considered the quantitative factors in a make-versus-buy decision, but there are qualitative factors to consider as well, including:

- Will the T6 lid made by Plato meet the quality requirements of Thermal?
- Will Plato continue to produce the T6 lid at the $1.75 price, or is this a teaser rate to obtain the business, with the plan for the rate to go up in the future?
- Can Plato continue to produce the quantity of the lids desired? If more or fewer are needed from Plato, is the adjusted production level obtainable, and does it affect the cost?
- Does using Plato to produce the lids displace Thermal workers or hamper morale?
- Does using Plato to produce the lids affect the reputation of Thermal?

In addition, if the decision is to buy the lid, Thermal is dependent on Plato for quality, timely delivery, and cost control. If Plato fails to deliver the lids on time, this can negatively affect Thermal's production and sales. If the lids are of poor quality, returns, replacements, and the damage to Thermal's reputation can be significant. Without long-term agreements on price increases, Plato can increase the price they charge Thermal, thus making the entire drink container more expensive and less profitable. However, buying the lid likely means that Thermal has excess production capacity that can now be applied to making other products. If Thermal

chooses to make the lid, this consumes some of the productive capacity and may affect the relationship Thermal has with the outside supplier if that supplier is already working with Thermal on other products.

Make versus buy, one of many outsourcing decisions, should involve assessing all relevant costs in conjunction with the qualitative issues that affect the decision or arise because of the choice. Although it may appear that these types of outsourcing decisions are difficult to resolve, companies throughout the world make these decisions daily as part of the company's strategic plan, and therefore, each company must weigh the advantages and disadvantages of outsourcing production of goods and services. Some examples are shown in Table 10.2.

Advantages and Disadvantages of Outsourcing

Advantages of Outsourcing	Disadvantages of Outsourcing
• Utilizes external expertise, removes the need for in-house expertise • Frees up capacity for other uses • Frees up capital for other uses • Allows management to focus on competitive strengths • Transfers some production and technological risks to supplier	• Takes away control over quality and timing of production • May limit ability to upsize or downsize production • May have hidden costs and/or a lack of stability of price • May diminish innovation • Often makes it difficult to bring the production back in-house once it has been removed

Table 10.2

In an outsourcing decision, the relevant costs and qualitative issues should be analyzed thoroughly. If there are no qualitative issues that affect the decision and the leasing or purchasing price is less than the relevant (avoidable) costs of producing the good or service in house, the company should outsource the product or service. The following example demonstrates this issue for a service entity.

Lake Law has ten lawyers on staff who handle workers' compensation and workplace discrimination lawsuits. Lake has an excellent success rate and frequently wins large settlements for their clients. Because of the size of their settlements, many clients are interested in establishing trusts to manage the investing and distribution of the funds. Lake Law does not have a trust or estate lawyer on staff and is debating between hiring one or using an attorney at a nearby law firm that specializes in wills, trusts, and estates to handle the trusts of Lake's clients. Hiring a new attorney would require $120,000 in salary for the attorney, an additional 20% in benefits, a legal assistant for the new attorney for 20 hours per week at a cost of $20 per hour, and conversion of a storage room into an office. Lake spent $100,000 on redecorating the offices last year and has sufficient furniture for a new office. The attorney at the nearby firm would charge a retainer of $50,000 plus $200 per hour worked on each trust. The retainer is in addition to the $200 per hour charge for work on trusts. The average trust takes 10 hours to complete and Lake estimates approximately 50 trusts per year. In addition, an external attorney would charge $500 for each trust to cover office expenses and filing fees. Which option should Lake choose?

To determine the solution, first, find the relevant costs for hiring internally and for using an external attorney.

	Hire Internally	Use External Attorney
Salary	$120,000	
Benefits (20%)	24,000	
Legal assistant (20 hrs x $20 x 52 weeks)	20,800	
Retainer		$ 50,000
Cost per trust × number of trusts ($200 × 10 × 50)		$100,000
Additional fees		25,000
Total relevant costs	$164,800	$175,000

Based on the quantitative analysis, Lake should hire an estate attorney to have on staff. For the year, the firm would save $10,200 ($164,800 for internal versus $175,000 with the external attorney) by going with the internal hire. Other potential advantages would be that an in-house attorney could complete more than the estimated 50 trusts without incurring additional costs, and by keeping the work in-house, it helps to build the relationship between the firm and the clients. A disadvantage would be if there is not sufficient work to keep the in-house attorney busy, the company would still have to pay the $120,000 salary plus the additional costs of $44,800 for benefits and the legal assistant's salary, even if the attorney is working at less than full capacity.

LINK TO LEARNING

The iPhone is the ultimate example of outsourcing. Though created in the United States, it is produced all around the globe, with thousands of parts supplied by over 200 suppliers—none of which is Apple. Read this article from The New York Times on where parts for the iPhone are made (https://openstax.org/l/50iPhoneParts) to learn how an iPhone gets from the design phase in the United States to production of components around the world, to assembly in China, and then back to the United States for sale in a retail store.

10.4 Evaluate and Determine Whether to Keep or Discontinue a Segment or Product

Companies tend to divide their organization along product lines, geographic locations, or other management needs for decision-making and reporting. A **segment** is a portion of the business that management believes has sufficient similarities in product lines, geographic locations, or customers to warrant reporting that portion of the company as a distinct part of the entire company. For example, General Electric, Inc., has eight segments and the Walt Disney Company has four segments. Table 10.3 shows these segments.

Examples of Company Segments

General Electric Segments	Disney Segments
• Additive • Aviation • Capital • Digital • Healthcare • Lighting • Power • Renewable Energy • Transportation	• Media Networks • Parks, Experiences, and Consumer Products • Studio Entertainment • Direct to Consumer and International

Table 10.3 Examples of Company Segments[2]

As part of the normal operations of a business, managers make decisions such as whether to keep producing a product, whether to continue operating in certain areas, or whether to close entire segments of their operations. These are historically some of the most difficult decisions that managers make. Examples of these types of decisions include Macy's decision to close 100 stores in 2016 due to increased competition from online retailers such as Amazon.com[3] and Delta Airline's decision to eliminate 16 routes to save costs.[4] What information does management use in making these types of decisions?

As with other decisions, management must consider both the quantitative and qualitative aspects. In choosing between alternatives—that is, in choosing between keeping and eliminating the product, segment, or service—the relevant revenues and costs should be analyzed. Remember that relevant revenues and costs are those that differ between alternatives. Often, the keep-versus-eliminate decision arises because the product or segment appears to be generating less of a profit than in prior periods or is unprofitable. In these situations, the product or segment may produce a positive contribution margin but may appear to have a lower or negative profit because of the allocation of common fixed costs.

Fundamentals of the Decision to Keep or Discontinue a Segment or Product

Two basic approaches can be used to analyze data in this type of decision. One approach is to compare contribution margins and fixed costs. In this method, the contribution margins with and without the segment (or division or product line) are determined. The two contribution margins are compared and the alternative with the greatest contribution margin would be the chosen alternative because it provides the biggest contribution toward meeting fixed costs.

The second approach involves calculating the total net income for retaining the segment and comparing it to the total net income for dropping the segment. The company would then proceed with the alternative that has the highest net income. In order to perform these net income calculations, the company would need more information than they would need in order to follow the contribution margin approach, which does not

2 GE Businesses. n.d. https://www.ge.com/; Disney. "Our Businesses." n.d. https://www.thewaltdisneycompany.com/about/#our-businesses

3 Hayley Peterson. "Macy's May Shut Down Even More Stores." *Business Insider*. May 12, 2017. http://www.businessinsider.com/macys-might-shut-down-more-stores-2017-5

4 Jason Williams. "Delta Downsizing Flights to 14 More Cities." Cincinnati.com. Mar. 11, 2015. http://www.cincinnati.com/story/news/2015/03/10/delta-cincinnati-airline-cuts-kentucky/24701445/

consider the costs and revenues that are the same between the alternatives.

THINK IT THROUGH

Allocating Common Fixed Costs

Acme, Co., has three retail divisions: Small, Medium, and Large. Sales, variable costs, and fixed costs for each of the divisions are:

	Sales	Variable Costs	Fixed Costs
Small	$ 5,000,000	$ 2,875,000	$2,450,000
Medium	10,000,000	7,235,000	5,125,000
Large	25,000,000	18,960,000	8,230,000

Included in the fixed costs are $5,400,000 in allocated common costs, which are split evenly among the three divisions. Is an even split the best way to allocate those costs? Why or why not? What other ways might Acme consider using to allocate the common fixed costs?

Sample Data

Suppose SnowBucks, Inc., has three product lines: snow boots, snow sporting equipment, and a clothing line for winter sports. It has been brought to senior management's attention that the snow boot product line is unprofitable. Figure 10.4 shows the data presented to senior management:

	Snow Boots	Snow Sporting Equipment	Clothing Line	Total
Sales	$1,150,000	$1,540,000	$1,354,000	$4,044,000
Cost of goods sold				
Variable manufacturing expenses	423,000	507,000	378,000	1,308,000
Fixed manufacturing expenses	392,000	413,000	353,000	1,158,000
Gross margin	335,000	620,000	623,000	1,578,000
Selling and administrative expenses				
Variable selling and administrative expenses	195,000	130,000	147,000	472,000
Fixed selling and administrative expenses	216,000	216,000	216,000	648,000
Operating income	$ (76,000)	$ 274,000	$ 260,000	$ 458,000

Figure 10.4 Operating Income Report for SnowBucks, by Segment. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Upon initial review, it appears that the snow boot product line is unprofitable. Should this product line be eliminated? To adequately analyze this situation, a proper analysis of the relevant revenues and costs must be made. The functional income statement in Figure 10.4 does not separate relevant from non-relevant costs.

In conducting the analysis, the accounting team discovers that each product line is allocated certain costs over which the product line managers have no control. These **allocated costs** are typically associated with areas of the company that do not generate revenue but are necessary for the running of the organization, such as

salaries for executives, human resources, and accounting at headquarters.

The cost of these parts of the organization must somehow be shared with the revenue-generating portions of the business. Companies often allocate these costs to other parts of the organization based on some formula, such as dividing the total costs by the number of divisions or segments, as percentage of total revenue, or as percentage of total square footage.

SnowBucks currently allocates these costs equally to the three product lines, and all the fixed selling and administrative expenses are considered allocated costs. In addition, the fixed manufacturing expenses represent factory rent, depreciation, and insurance, and all these costs will continue to exist regardless of whether the snow boot division continues. However, included in the fixed manufacturing expenses is the $75,000 salary of a sales supervisor for each division. This is an avoidable fixed cost as this cost would no longer exist if any division ceased operating.

Calculations Using Sample Data

Based on the new information, a new analysis using a product line margin indicates the following:

	Snow Boots	Snow Sporting Equipment	Clothing Line	Total
Sales	$1,150,000	$1,540,000	$1,354,000	$4,044,000
Variable expenses				
Variable manufacturing expenses	423,000	507,000	378,000	1,308,000
Variable selling and administrative expenses	195,000	130,000	147,000	472,000
Contribution margin	532,000	903,000	829,000	2,264,000
Direct fixed manufacturing expenses	75,000	75,000	75,000	225,000
Product margin	457,000	828,000	754,000	2,039,000
Allocated fixed expenses				
Fixed selling and administrative expenses				648,000
Fixed manufacturing expenses				933,000
Operating income				$ 458,000

Final Analysis of the Decision

This new analysis shows that when the relevant costs and revenues are considered, it is apparent the snow boot product line is contributing toward meeting the fixed costs of the organization and therefore to overall corporate profitability. The reason the snow boot product line was showing an operating loss was due to the allocation of common costs. Consideration should be given to the way allocated costs are assigned to the various products to determine if the allocation is logical or if another allocation method, such as one based on each product line's percentage of the total corporate sales, would provide a better matching of costs and services provided by corporate headquarters. Management should also consider qualitative factors, such as the impact of removing one product line on the overall sales of the other products. If customers commonly buy snow boots and skis together, then discontinuing the snow boot line could impact the sales of snow skis.

YOUR TURN

View Walt Disney Company's 2018 full year earnings report (https://openstax.org/l/50DisneyEarn) on their website. Scroll to the section on Segment Results and answer these questions:

A. How many segments does Disney have?
B. Which segment had the highest revenue in 2018?
C. Which segment had the highest operating income in 2018?
D. Which segment has shown the most revenue growth between 2017 and 2018?
E. How many segments showed growth in operating income between 2017 and 2018 and how many segments showed a decline in operating income between 2017 and 2018?
F. Which segment has shown the least operating income growth between 2017 and 2018?

Solution

A. Four: Media Networks, Parks & Resorts, Studio Entertainment, and Consumer Products & Interactive Media
B. Media Networks
C. Media Networks
D. Studio Entertainment
E. Two segments (Parks & Resorts and Studio Entertainment) showed operating income growth, while two segments (Media Networks and Consumer Products & Interactive Media) showed a decline in operating income between 2017 and 2018.
F. Consumer Products & Interactive Media

10.5 Evaluate and Determine Whether to Sell or Process Further

One major decision a company has to make is to determine the point at which to sell their product—in other words, when it is no longer cost effective to continue processing the product before sale. For example, in refining oil, the refined oil can be sold at various stages of the refining process. The point at which some products are removed from production and sold while others receive additional processing is known as the **split-off point**. As you have learned, the relevant revenues and costs must be evaluated in order to make the best decision for the company.

In making the decision, a company must consider the **joint costs**, or those costs that have been shared by products up to the split-off point. In some manufacturing processes, several end products are produced from a single raw material input. For example, once milk has been processed it can be sold as milk or it can be processed further into cheese, yogurt, cream, or ice cream. The costs of processing the milk to the stage at which it can be sold or processed further are the joint costs. These costs are allocated among all the products that are sold at the split off point as well as those products that are processed further. Ice cream has the basic costs of the milk plus the costs of processing it further into ice cream.

As another example, suppose a company that makes leather jackets realizes it has a reasonable amount of unused leather from the cutting of the patterns for the jackets. Typically, this scrap leather is sold, but the company is beginning to consider using the scrap to make leather belts. How would the company allocate the costs incurred from processing and preparing the leather before cutting it if they decide to make both the

jackets and the belts? Would it be financially beneficial to process the scrap leather further into belts?

Fundamentals of the Decision to Sell or Process Further

When facing the choice of selling or processing further, the company must determine the revenues that would be received if the product is sold at the split-off point versus the net revenues that would be received if the product is processed further. This requires knowing the additional costs of further processing. In general, if the differential revenue from further processing is greater than the differential costs, then it will be profitable to process a joint product after the split-off point. Any costs incurred prior to the split-off point are irrelevant to the decision to process further as those are sunk costs; only future costs are relevant costs.

Even though joint product costs are common costs, they are routinely allocated to the joint products. A potential reason for this treatment is the GAAP (generally accepted accounting principles) requirement that all production costs must be inventoried.

Be aware that some complexities can arise when allocating joint product costs. The first issue is that joint production costs can be allocated based on varying production and sales characteristics or assumptions. For example, a physical measurement method, a relative sales value method at the point of split-off, and a net realizable value method based on additional processing after the split-off point can all be used to allocate joint production costs.

A second complexity is that eliminating the production of one or more joint products will not always enable the company to reduce joint production costs. Because of the mechanics of the common cost allocation process, such an action will only work if reductions are made in all of the joint products collectively. If only some of the joint products are eliminated, the remaining joint product or products would absorb all of the joint product costs.

An example of this last issue might help clarify the point. Assume that you have a lumber production company that cuts trees, prepares board lumber for housing and furniture, and also prepares sawdust and wood scraps that is used in the production of particle board. Assume that in a given year the company experienced $1,100,000 in joint costs. Using one of the three previously mentioned cost allocation methods, the company allocated $1,000,000 in joint costs to the production of board lumber and $100,000 to the production of wood scraps and sawdust.

Assume that in the next year it also experienced $1,100,000 in joint costs. However, in that year, the company lost its buyer of wood scraps and sawdust, so it had to give both of them away, without generating any revenue. In this case, the company would still realize $1,100,000 in joint costs. However, the entire amount would be allocated to the production of the board lumber. The only way to reduce the joint costs is to realize joint costs of less than $1,000,000.

YOUR TURN

Luxury Leathers

Luxury Leathers, Inc., produces various leather accessories, such as belts and wallets. In the process of cutting out the leather pieces for each product, 400,000 pounds of scrap leather is produced. Luxury has been selling this leather scrap to Sammy's Scrap Procurement for $2.25 per pound. Luxury has an

employee suggestion box and one of the suggestions was to use most of the scrap to make leather watch bands. The management of Luxury is interested in this idea as the machines necessary to produce the watch bands are the same as the ones used in making belts and would merely need reprogramming for the cutting and stitching processes on the watch bands. The process to attach the buckle would be the same for the watch bands as it was for the belts, thus this would require no additional worker training. Luxury would have additional costs for new packaging and for the supply and insertion of the pins that connect the band to the watch. The total variable cost to produce the watch band would be $2.85. Fixed costs would increase by $85,000 per year for the lease of the packaging equipment, and Luxury estimates it could produce and sell 100,000 watch bands per year. Finished watch bands could be sold for $15.00 each. Should Luxury continue to sell the scrap leather or should Luxury process the scrap into watch bands to sell?

Solution

	Sell at Split-Off	Process Further
Selling price per lb of scrap	$ 2.25	
Selling price per watch band		$ 15.00
Variable costs to sell	0	2.85
Contribution margin	2.25	12.15
Units sold	400,000*	100,000**
Total contribution margin	900,000	1,215,000
Additional fixed costs	0	85,000
Effect on operating income	$900,000	$1,130,000

*lbs of scrap
**watch bands

Luxury should process the leather scrap further into watch bands. Not only does the act of processing the scrap further result in an increase in operating income, it offers Luxury another product line that may draw customers to its other products.

Sample Data

Ainsley's Apples grows organic apples and sells them to national grocery chains, local grocers, and markets. Ainsley purchased a machine for $450,000 that sorts the apples by size. The largest apples are sold as loose apples to the various stores, the medium sized apples are bagged and sold to the grocers in their bagged state, and the smallest apples are sold to deep discounters or to a local manufacturing plant that processes the apples into applesauce. Ainsley is considering keeping the small apples and processing them into apple juice that would be sold under Ainsley's own label to local grocers. The small apples currently sell to the deep discounters and local manufacturers for $1.10 per dozen. The variable cost to prepare the small apples for sale, including transporting the apples, is $0.30 per dozen. Ainsley can sell each gallon of organic apple juice for $3.50 per gallon. It takes two dozen small apples to make one gallon of apple juice. The cost to produce the organic apple juice will be $0.60 variable cost per gallon plus $200,000 fixed costs for the one-year lease of the equipment needed to make and bottle the juice. Ainsley normally harvests and sells 2,400,000 small apples per year. Should Ainsley continue to sell the small apples to local grocers and the applesauce manufacturer or

should Ainsley process the apples further into organic apple juice?

Calculations of Sample Data

In order to decide whether or not to process the small apples or to process them further into applesauce, Ainsley conducts an analysis of the relevant revenues and costs for the two alternatives: sell at split-off or process further into applesauce.

	Sell at Split-Off	Process Further
Selling price per dozen	$ 1.10	
Selling price per gallon		$ 3.50
Variable costs to sell	0.30	0.60
Contribution margin	0.80	2.90
Units sold	200,000*	100,000**
Total contribution margin	160,000	290,000
Additional fixed costs	0	200,000
Effect on operating income	$160,000	$ 90,000

*2,400,000 ÷ 12 = 200,000 dozen
**200,000 dozen ÷ 2 dozen per gallon = 100,000 gallons

Ainsley should continue to sell the apples at split-off rather than process them further, as selling them generates a $160,000 increase in operating income compared to only $90,000 if she processes the apples further.

Final Analysis of the Decision

When making the decision to sell or process further, the company also must consider that processing a product further may create a new successful market or it may undercut sales of already existing products. For example, a furniture manufacturer that sells unfinished furniture may lose sales of the unfinished pieces if it decides to stain some pieces and sell them as finished products.

THINK IT THROUGH

Disposing of Coffee Grounds

Return to Why It Matters in this chapter. With the knowledge you have gained thus far, answer these questions:

1. From your perspective, what are the alternatives for the used coffee grounds?
2. For the alternatives listed in question 1, what information do you need to evaluate between the alternatives?
3. What type of analysis would you do to choose between alternatives?
4. What qualitative factors might influence your decision regarding which alternative to select?
5. Do you think the quantitative and qualitative components both will lead you to the same decision? Why or why not?

10.6 Evaluate and Determine How to Make Decisions When Resources Are Constrained

Companies use various resources to be productive. These resources, which include time, labor, space, and machines, are limited, thus constraining the ability of a company to have unlimited productive capacity. For example, a retail store is constrained by the amount of floor space available to display its goods, while a law office may be constrained by the number of hours the paralegal team can feasibly work. These constraints require companies to make decisions on the best ways to allocate their resources in a way that maximizes the benefit to the firm. This situation is especially true when a company is operating at capacity or makes multiple products or provides multiple services.

The question as to which products and how many should be made is a common constraint problem. For example, consider a business that runs at capacity, making four products by running two eight-hour shifts per day, seven days a week for 50 weeks per year. This business is limited to 5,600 working hours per year (8 hr. shifts × 2 shifts × 7 days per week × 50 weeks) unless a third shift is added. Adding a third shift may be prohibitive for any number of reasons, including local ordinances that prevent operating twenty-four hours a day, Environmental Protection Agency constraints, or the down-time of the machines that is required several hours a day for maintenance and calibration. What is the best way for this company to use these work hours? Which products should it produce first and how many of each should it produce?

These types of situations constrain, or limit, management's ability to use their facilities and workforce. Having limited availability of a resource, such as time, labor, or machine hours means that item becomes a scarce resource. A **constraint** is a scarce resource that limits the output or productive capacity of the organization.

Ordinarily, there are very few actual constraints in any process. Sometimes, there is only one. However, the existence of a constraint can have a major effect on the productivity of an organization. This fact applies to all types of entities, such as production facilities or service providers. One way to view this issue is to consider the old cliché that *a chain is only as strong as its weakest link.* In the example, when trying to measure or estimate an organization's maximum efficiency, its results will often be reduced by the overall negative effects of the constraints. When the constraint slows production, it is called a **bottleneck**. Managers are often faced with the problem of deciding how to best use a scarce resource to prevent bottlenecks. Under the constraint of limited resources, how do managers make decisions when they are working within these conditions?

Fundamentals of How to Make Decisions When Resources are Constrained

As with other short-term decisions, a company must consider the relevant costs and revenues when making decisions when resources are constrained. Whether the organization facing a constraint is a merchandising, manufacturing, or service organization, the initial step in allocating scarce or constrained resources is to determine the **unit contribution margin**, which is the selling price per unit minus the variable cost per unit, for each product or service. The company should produce or provide the products or services that generate the highest contribution margin first, followed by those with the second highest, and so forth. The total contribution margin will be maximized by promoting those products or accepting those orders with the highest contribution margin in relation to the scarce resource. In other words, products or services should be ranked based on their **unit contribution margin per production restraint**, which is the unit contribution margin divided by the production restraint.

If constraints are not managed, a bottleneck usually results, meaning that production slows and a back-up occurs at stages prior to the bottleneck. For example, in producing boxes of cereal, if the cereal is produced at

a rate of 1,000 ounces per minute but the bagging machines can only bag 800 ounces per minute, this will create a bottleneck. Similarly, if on a Saturday morning before a home football game, the local grocery store has ten checkout lines but only opens four of them, long lines will result from the constraint of too few checkout lanes available. Management must decide how many scarce resources (employees, in this example) to pull from stocking the shelves to running cash registers. It may be difficult to see how bottlenecks affect profitability, and they appear to be more of a timing or throughput issue. But bottlenecks can affect profitability in a number of ways. Bottlenecks at the grocery story can result in customers leaving to store shop elsewhere or can negatively affect the reputation of the store, which can impact future sales. In the cereal example, bottlenecks in the packaging area can slow the delivery of boxes of cereal to distributors and individual stores. Poor or inconsistent delivery may drive customers to purchase from other cereal manufacturers, which would have a definite impact on profitability.

A common problem relating to constraints occurs in multi-product production environments. Management will need to evaluate the constraints to determine the best mix of products that will minimize the effects of the constraints. In addition to making sure that the best product mix is chosen, managers should seek ways to increase the effective capacity of the constraint. Conceptually, there are two ways a company can do this: increase the rate of output at the bottleneck, or increase the time available at the bottleneck. Increasing the capacity of the constraint or bottleneck is also called *relaxing the constraint* or *elevating the constraint*. Some specific examples of ways to relax the constraint include:

- Keep the production facilities open longer hours. This may allow the work-flow through the bottleneck area to be slowed and thus prevent the bottleneck from occurring. However, this may require paying workers overtime pay.
- If working extra hours is not a viable option, then moving additional workers to the bottleneck area may be beneficial as long as the areas from which they were moved are adequately covered and additional problem areas do not result.
- Instead of using current workers, additional staff may be hired to smooth the work flow through the bottleneck area.
- Outsource some or all of the work in the area of the bottleneck. It may be cheaper and more cost effective to buy parts of components than to slow production due to the bottleneck.
- Redesign the production process to prevent the bottleneck by adding more resources to eliminate the bottleneck, reorganizing the process to distribute the bottleneck-causing activities to different parts of the production process, or managing processing times at other stages prior to the bottleneck to help prevent the bottleneck form occurring.
- Insuring a minimal number of defects and rework, since they typically slow the production process and thus add to the bottleneck.

Preventing and minimizing bottlenecks can have significant benefits to the bottom line of the company. The reduction of bottlenecks allows the company to move more products through the production phase and thus be ready to sell.

ETHICAL CONSIDERATIONS

When to Include a Lifesaving Option: The Case of the Ford Pinto

The case of the fiery Ford Pinto demonstrates that more than cost and revenue should be considered when making an ethical business decision. In the early 1970s, the Ford Motor Company set out to build a Pinto for less than $2,000. Cars were much less expensive then, and Ford had to determine whether or not to include a component part that cost around $10. Given the high cost, Ford decided not to include the component, a rubber bladder for the gas tank. However, in rear-end collisions at over 21 miles per hour, the rubber bladder component functions to prevent the gas tank from flooding the interior of the car with gasoline and gas fumes. Because of the decision not to include the component, a number of Pintos involved in collisions exploded into flames, injuring and sometimes killing the occupants.

Although Ford was aware of the defect, the company's cost/benefit analysis indicated it was less expensive to build Pintos without the rubber bladder, even when including expected reimbursement costs for anyone injured or killed. However, the decision to allow a defective product to be built in order to reduce overall costs caused a significant hit to Ford's reputation. Ultimately, the litigation costs for knowingly constructing a defective car were higher than the original cost of including the rubber bladder component. While Ford's decision seemed profitable in the short-term, their financial analysis could have been improved if it also took into account long-term impacts.

Sample Data

Wood World, Inc., produces wooden desks, chairs, and bookcases. These items are produced using the same machines, and there is a maximum of 80,000 machine-hours available during the year. The information about the production time and costs for these three items is:

	Desks	Chair	Bookcase
Hours to produce	1	0.50	0.25
Selling price	$350	$200	$175
Direct materials	$ 40	$ 30	$ 35
Direct labor	$ 70	$ 65	$ 50
Variable overhead	$ 55	$ 50	$ 45
Fixed overhead	$ 28	$ 32	$ 24

Wood World is limited in producing its products by the number of possible machine-hours. Orders have been received for 60,000 desks, 48,000 chairs, and 40,000 bookcases, which will require 94,000 machine-hours to produce. Since there are not enough machine-hours available to fill all of the orders, which orders should Wood World fill first?

Calculations Using Sample Data

To address this question, Wood World must find the contribution margin per machine-hour since machine-hours are the constraining factor for production.

	Desks	Chair	Bookcase
Selling price	$ 350	$ 200	$ 175
Direct materials	$ 40	$ 30	$ 35
Direct labor	$ 70	$ 65	$ 50
Variable overhead	$ 55	$ 50	$ 42
Contribution margin	$ 185	$ 55	$ 48
Hours to produce	1	0.50	0.25
Contribution margin per machine-hour	$ 185	$ 110	$ 192

Final Analysis of the Decisions

Wood World should fulfill the orders for bookcases first, desks second, and chairs last. The bookcases provide the highest contribution margin per machine-hour, followed by desks and then chairs. Maximizing the contribution margin per constraint, in this case per machine-hour, is the best way for Wood World to manage the constraint. How many of each item will be produced?

Available machine hours	80,000
Hours to fill bookcase orders (40,000 × 0.25)	10,000
Remaining hours	70,000
Hours to fill desk orders (60,000 × 1)	60,000
Remaining hours	10,000
Hours needed to produce chairs	÷ 0.50
Chair orders that would be filled	20,000

Therefore, based on contribution margin and the constraint of machine hours, Wood World should fill all 40,000 of the bookcase orders first, then fill the 60,000 desk orders and, and fill 20,000 of the chair orders last.

Are there any qualitative issues that Wood World should consider? One concern may be that customers who typically buy a desk and chair together may not be able to do so if the chair production is affected by a bottleneck. Another qualitative issue in keeping with the furniture example is that a company might find producing dining room tables to be significantly more profitable than matching chairs or matching cupboards. However, they will still be required to produce the less profitable chairs and cupboards, because many consumers will want to buy all three items as a set.

The benefits of effectively managing constraints can be enormous. Managers need to understand the positive impact effective management of constrained resources can have on the company's bottom line. The contribution margin per unit of the scarce resource can be used to assess the value of relaxing the constraint. When there is unsatisfied demand for a single product because of a constraint, the value of additional time on the constraint is simply the contribution margin per unit of the scarce resource for that product. When there are two or more products with unsatisfied demand, the value of additional time on the bottleneck would be the largest contribution margin per unit of the scarce resource for any product whose demand is unsatisfied. In many situations, when dealing with conflicting time constraints an evaluation of multiple bottlenecks might identify a viable solution. While many bottleneck issues and their solutions could be somewhat complex, others might be addressed more simply. For example, in some cases the problem might be solved by the addition of an additional work shift.

CONCEPTS IN PRACTICE

Distributing Caseloads at a Law Firm

As a new business school graduate, you landed you first job in the human resources department of large national law firm in New York City. Your position is providing you with many opportunities to learn about the company and the various tasks for which the human resources department is responsible. Your most recent assignment is to determine the best way to distribute caseloads to the junior level attorneys based on their areas of expertise and to assign paralegal hours to assist the junior level attorneys. What are the constraints with which you are dealing? What information do you need to properly complete this assignment? What type of analysis would be required to effectively allocate caseload hours?

Key Terms

allocated costs costs that are generated by non–revenue generating portions of the business, such as corporate headquarters, that are assigned based on some formula to the revenue generating portions of the business

avoidable cost cost that can be eliminated (in whole or in part) by choosing one alternative over another

bottleneck point at which a constraint slows production

constraint scarce resource that limits output or productive capacity of an organization

differential analysis type of analysis that considers only the differences between variables that are important to the analysis

differential cost difference between costs for alternatives

differential revenue difference between revenues for alternatives

irrelevant cost cost that has no effect on the decision being made because it is the same under either alternative

irrelevant revenue revenue that has no effect on the decision being made

joint costs costs that have been shared by products up to the split-off point

normal capacity company's maximum production level, without adding additional production resources, or within the company's relevant range

opportunity costs costs associated with not choosing the other alternative

outsourcing act of using another company to provide goods or services that your company requires

qualitative factor component of a decision-making process that cannot be measured numerically

quantitative factor component of a decision-making process that can be measured numerically

relevant cost cost that influences the decision being made

relevant range quantitative range of units that can be produced based on the company's current productive assets; for example, if a company has sufficient fixed assets to produce up to 10,000 units of product, the relevant range would be between 0 and 10,000 units

relevant revenue revenue that influences the decision being made

segment portion of the business that management believes has sufficient similarities in product lines, geographic locations, or customers to warrant reporting that portion of the company as a distinct part of the entire company

short-term decision analysis determining the appropriate elements of information necessary for making a decision that will impact the company in the short term, usually 12 months or fewer, and using that information in a proper analysis in order to reach an informed decision among alternatives

special order one-time order that does not typically affect current sales

split-off point point at which some products are removed from production and sold while others receive additional processing

sunk cost cost that cannot be avoided because it has already occurred

unavoidable cost cost that does not go away in the short-run by choosing one alternative over another

unit contribution margin selling price per unit minus variable cost per unit

unit contribution margin per production restraint unit contribution margin divided by the production restrain

Summary

10.1 Identify Relevant Information for Decision-Making

- Decision-making involves choosing between alternatives.
- A critical step in the decision-making process is identification of all the relevant information for each alternative. Relevant information is any information that would have an impact on the decision.
- Relevant information can come in the form of costs or revenues, or be nonfinancial in form. For information regarding costs, this means determining which costs are avoidable and which are unavoidable.

10.2 Evaluate and Determine Whether to Accept or Reject a Special Order

- Deciding to accept or reject a special order is a choice between alternatives.
- Accepting or rejecting a special order involves comparing the purchase price associated with the special order to the cost to produce the items.
- This decision is highly influenced by whether the firm being offered the special order is operating below or at capacity.
- Qualitative factors would include consequences such as potential loss of current customers or displacement of jobs.

10.3 Evaluate and Determine Whether to Make or Buy a Component

- Deciding to outsource a component of the operations or manufacturing of a business is a choice between alternatives.
- Choosing whether to make or to buy a product, or choosing to have services performed by an outside company, are outsourcing decisions.
- Outsourcing decisions involve comparing the cost to keep the product or service in-house to the cost of buying the product or service from an outside party.
- An important consideration in these types of decisions is unavoidable costs.

10.4 Evaluate and Determine Whether to Keep or Discontinue a Segment or Product

- Deciding to keep or discontinue a product line or a segment of a business is a choice between alternatives.
- The choice to keep or eliminate involves comparing the business's total operating income generated from keeping the product or segment and comparing this to the business's total operating income generated if the product or segment is eliminated.
- An important consideration in these types of decisions is allocated costs.

10.5 Evaluate and Determine Whether to Sell or Process Further

- Deciding to do more work on a product to develop it into a new product is a choice between alternatives.
- Choosing whether to sell a product as is or to process it further involves comparing the selling price without further processing (at split-off) to the net price (selling price less additional processing costs) that would be obtained if the product were processed further.
- An important consideration in these types of decisions is the realization that the costs incurred up to the split-off point are irrelevant to the decision.

10.6 Evaluate and Determine How to Make Decisions When Resources Are Constrained

- Deciding to how to use scare resources is a choice between alternatives.
- Scarce resources can include anything that limits productive capacity, such as machine-hours or labor hours.
- Choosing how to use the scarce resource involves determining the contribution margin for each product or service that uses the constrained resource. The products or services with the highest contribution margin have the largest impact on income.

- Choosing how to manage the scarce resource will help reduce bottlenecks.

Multiple Choice

1. LO 10.1 _____ are the costs associated with *not* choosing the other alternative.

A. Sunk costs
B. Opportunity costs
C. Differential costs
D. Avoidable costs

2. LO 10.1 Which type of incurred costs are *not* relevant in decision-making (i.e., they have no bearing on future events) and should be excluded in decision-making?

A. avoidable costs
B. unavoidable costs
C. sunk costs
D. differential costs

3. LO 10.1 The managerial decision-making process has which of the following as its third step?

A. Review, analyze and evaluate the results of the decision.
B. Decide, based upon the analysis, the best course of action.
C. Identify alternative courses of action to achieve a goal or solve a problem.
D. Perform a comprehensive differential (differential) analysis of potential solutions.

4. LO 10.1 Which of the following is *not* one of the five steps in decision-making process?

A. identify alternatives
B. review, analyze, and evaluate decision
C. decide best action
D. consult with CFO concerning variable costs

5. LO 10.2 Which of the following is sometimes referred to as the "Anti Chain Store Act"?

A. Sarbanes-Oxley Act
B. Robinson-Patman Act
C. Wright-Patman Act
D. Securities Act of 1939

6. LO 10.2 Jansen Crafters has the capacity to produce 50,000 oak shelves per year and is currently selling 44,000 shelves for $32 each. Cutrate Furniture approached Jansen about buying 1,200 shelves for bookcases it is building and is willing to pay $26 for each shelf. No packaging will be required for the bulk order. Jansen usually packages shelves for Home Depot at a price of $1.50 per shelf. The $1.50 per-shelf cost is included in the unit variable cost of $27, with annual fixed costs of $320,000. However, the $1.50 packaging cost will not apply in this case. The fixed costs will be unaffected by the special order and the company has the capacity to accept the order. Based on this information, what would be the profit if Jansen accepts the special order?

A. Profits will decrease by $1,200.
B. Profits will increase by $31,200.
C. Profits will increase by $600.
D. Profits will increase by $7,200.

7. LO 10.3 _____ is the act of using another company to provide goods or services that your company requires.

A. Allocating
B. Outsourcing
C. Segmenting
D. Leasing

8. LO 10.3 Which of the following is a disadvantage of outsourcing?

A. freeing up capacity
B. freeing up capital
C. transferring production and technology risks
D. limiting ability to upsize or downsize production

9. LO 10.3 Which of the following is *not* a qualitative decision that should be considered in an outsourcing decision?

A. employee morale
B. product quality
C. company reputation
D. relevant costs

10. LO 10.4 Which of the following is one of the two approaches used to analyze data in the decision to keep or discontinue a segment?

A. comparing contribution margins and fixed costs
B. comparing contribution margins and variable costs
C. comparing gross margin and variable costs
D. comparing total contribution margin under each alternative

11. LO 10.4 When should a segment be dropped?

A. only when the decrease in total contribution margin is less than the decrease in fixed cost
B. only when the decrease in total contribution margin is equal to fixed cost
C. only when the increase in total contribution margin is more than the decrease in fixed cost
D. only when the decrease in total contribution margin is less than the decrease in variable cost

12. LO 10.4 Youngstown Construction plans to discontinue its roofing segment. Last year, this segment generated a contribution margin of $65,000 and incurred $70,000 in fixed costs. Discontinuing the segment will allow the company to avoid half of the fixed costs. What effect is expected to occur to the company's overall profit?

A. a decrease of $5,000
B. a decrease of $30,000
C. a decrease of $5,000
D. an increase of $30,000

13. LO 10.5 Mallory's Video Supply has changed its focus tremendously and as a result has dropped the selling price of DVD players from $45 to $38. Some units in the work-in-process inventory have costs of $30 per unit associated with them, but Mallory can only sell these units in their current state for $22 each. Otherwise, it will cost Mallory $11 per unit to rework these units so that they can be sold for $38 each. How much is the financial impact if the units are processed further?

A. $5 per unit profit
B. $16 per unit profit
C. $3 per unit loss
D. $12 per unit loss

14. LO 10.6 A company produces two products, E and F, in batches of 100 units. The production and cost data are:

	Product E	Product F
Contribution margin per batch	$450	$340
Machine set-ups needed per batch	25	20

The company can only perform 12,000 set-ups each period yet there is unlimited demand for each product. What is the differential profit from producing product E instead of product F for the year?

A. $216,000
B. $204,000
C. $12,000
D. $54,000

15. LO 10.6 When operating in a constrained environment, which products should be produced?

A. products with the highest contribution margin per unit
B. products with the highest contribution margin per unit of the constrained process
C. products with the highest selling price
D. products with the lowest allocated joint cost

Questions

1. LO 10.1 Your roommate at school believes that all fixed costs are always avoidable. Do you agree? How would you explain your point of view to your roommate?

2. LO 10.1 Explain how to differentiate short-term decisions from long-term decisions of a business and the changes in analyses that influence these decisions.

3. LO 10.1 Felipe's Restaurant and Pie Shop needs help defining the costs for his business. He also wants to know which costs are relevant or irrelevant to his decision. Identify each cost as relevant or irrelevant. Then identify the type of cost (sunk, fixed, variable, or opportunity).

Cost	Relevant or Irrelevant?	Sunk, Fixed, Variable, or Opportunity?
Rent		
Baker wages		
Felipe's culinary school tuition		
Berries for pies		
Painting dining area last year		
Felipe's decision not to attend graduate school		

4. LO 10.2 What factors must any company consider before accepting a special-order contract?

5. LO 10.2 What are some of the qualitative issues that a special order can create?

6. LO 10.3 In "The Trouble with Outsourcing," a Schumpeter column in *The Economist*, there is a statement of advice to companies, who outsource products or services: "they need to think harder about what is their core business, and what is peripheral."[5] What types of problems do you think they are talking about? In your answer, present at least five (5) problems that companies should consider when outsourcing products or services.

7. LO 10.3 Many outsourced jobs have resulted in "offshoring" jobs, rather than using domestic outsourcing. If a U.S. company wants to offshore a service like customer service, for example, what are some of their considerations? In your answer, address offshoring disadvantages as compared with domestic outsourcing.

8. LO 10.4 What type of qualitative issues should management consider if a quantitative analysis reveals that a segment should be dropped?

9. LO 10.4 In the decision by a grocery company that is trying to decide whether to keep or drop the bakery department in its grocery stores, what would the bakery manager's salary be in relationship to the decision if the manager will be laid off?

10. LO 10.5 What is of key importance for a company whose products can be processed further?

11. LO 10.5 What is a general rule to remember with respect to a sell-or-process-further environment, and what costs are irrelevant to the decision?

5 "The Trouble with Outsourcing." *The Economist*. July 30, 2011. https://www.economist.com/business/2011/07/30/the-trouble-with-outsourcing

Exercise Set A

EA1. LO 10.1 Garrison Boutique, a small novelty store, just spent $4,000 on a new software program that will help in organizing its inventory. Due to the steep learning curve required to use the new software, Garrison must decide between hiring two part-time college students or one full-time employee. Each college student would work 20 hours per week, and would earn $15 per hour. The full-time employee would work 40 hours per week and would earn $15 per hour plus the equivalent of $2 per hour in benefits. Employees are given two polo shirts to wear as their uniform. The polo-shirts cost Garrison $10 each. What are the relevant costs, relevant revenues, sunk costs, and opportunity costs for Garrison?

EA2. LO 10.1 Derek Dingler conducts corporate training seminars on managerial accounting techniques all around the country. An upcoming training seminar is to be held in Philadelphia. Just prior to that engagement, Derek will be in New York City. He plans to stay in Philadelphia the night of the seminar, as the next morning he plans to meet with clients about future training seminar possibilities. One travel option is to fly from New York to Philadelphia on the first flight on Friday morning, which will get him to Philadelphia two hours before the start of his seminar. The cost of that flight is $287. Uber fees for his time in Philadelphia will cost $68. His meal per diem is $40 for each full day and $25 for each half day. The hotel cost is $225 per night. His second option is the rent a car and drive the two hours to Philadelphia from New York City the afternoon before the seminar. The cost of the rental car including gas is $57 per day and the car will be needed for two full days. At the end of the meetings he will return to New York City. What are the relevant costs, relevant revenues, sunk costs, and opportunity costs that Derek Dingler has to consider in making the decision whether to fly or drive from New York City to Philadelphia?

EA3. LO 10.1 Bridget Youhzi works for a large firm. Her alma mater has asked her to make a presentation to the upcoming accounting honor society's annual scholarship dinner. Her firm supports the presentation because it hopes to recruit more excellent employees like Bridget. The university is 196 miles from her office. In order to get to the dinner by 5:00 p.m., she will need to leave work at 1:00 pm. She can drive her personal car and be reimbursed $0.50 per mile. The dinner ends at 9:00 p.m. Company policy allows her to spend the night if the return trip is four hours or more. There is a student-run inn and conference center across the street from campus that charges $101 per night.

Instead of driving, she could catch a 3:00 p.m. flight that has a round-trip fare of $300. Flying would require her to rent a car for $39 per day and pay an airport parking fee of $25 for the day. The company pays a per diem of $35 for incidentals if the employee spends at least six hours out of town. (The per diem would be for one 24-hour period for either flying or driving.) As a manager, Bridget is responsible for recruiting within a budget and wants to determine which is more economical.

Use the information provided to answer these questions.

A. What is the total amount of expenses Bridget would include on her expense report if she drives?
B. What is the total amount of expenses she would include on her expense report if she flies?
C. What is the relevant cost of driving?
D. What is the relevant cost of flying?
E. What is the differential cost of flying over driving?
F. What other factors should Bridget consider in her decision between driving and flying?

EA4. LO 10.2 Zena Technology sells arc computer printers for $55 per unit. Unit product costs are:

Direct materials	$14
Direct labor	20
Manufacturing overhead	3
Total	$37

A special order to purchase 15,000 arc printers has recently been received from another company and Zena has idle capacity to fill the order. Zena will incur an additional $2 per printer for additional labor costs due to a slight modification the buyer wants made to the original product. One-third of the manufacturing overhead costs is fixed and will be incurred no matter how many units are produced. When negotiating the price, what is the minimum selling price that Zena should accept for this special order?

EA5. LO 10.2 Shelby Industries has a capacity to produce 45,000 oak shelves per year and is currently selling 40,000 shelves for $32 each. Martin Hardwoods has approached Shelby about buying 1,200 shelves for a new project and is willing to pay $26 each. The shelves can be packaged in bulk; this saves Shelby $1.50 per shelf compared to the normal packaging cost. Shelves have a unit variable cost of $27 with fixed costs of $350,000. Because the shelves don't require packaging, the unit variable costs for the special order will drop from $27 per shelf to $25.50 per shelf. Shelby has enough idle capacity to accept the contract. What is the minimum price per shelf that Shelby should accept for this special order?

EA6. LO 10.3 Reuben's Deli currently makes rolls for deli sandwiches it produces. It uses 30,000 rolls annually in the production of deli sandwiches. The costs to make the rolls are:

Materials	$0.24 per roll
Labor	0.40 per roll
Variable overhead	0.16 per roll
Fixed overhead	0.20 per roll

A potential supplier has offered to sell Reuben the rolls for $0.90 each. If the rolls are purchased, 30% of the fixed overhead could be avoided. If Reuben accepts the offer, what will the effect on profit be?

EA7. LO 10.3 Almond Treats manufactures various types of cereals that feature almonds. Acme Cereal Company has approached Almond Treats with a proposal to sell the company its top selling cereal at a price of $22,000 for 20,000 pounds. The costs shown are associated with production of 20,000 pounds of almond cereal:

Direct material	$13,000
Direct labor	5,000
Manufacturing overhead	7,000
Total	$25,000

The manufacturing overhead consists of $2,000 of variable costs with the balance being allocated to fixed costs. Should Almond Treats make or buy the almond cereal?

EA8. LO 10.4 Party Supply is trying to decide whether or not to continue its costume segment. The information shown is available for Party Supply's business segments. Assume that neither the Direct fixed costs nor the Allocated common fixed costs may be eliminated, but will be allocated to the two remaining segments.

	Costumes	Party Supplies	Floral Decorations
Sales	$160,000	$110,000	$210,000
Variable costs	84,000	50,000	120,000
Contribution margin	76,000	60,000	90,000
Direct fixed costs	50,000	20,000	25,000
Allocated common fixed costs	30,000	25,000	30,000
Net income	$ (4,000)	$ 15,000	$ 35,000

If costumes are dropped, what change will occur to profit?

EA9. LO 10.5 Underground Food Store has 4,000 pounds of raw beef nearing its expiration date. Each pound has a cost of $4.50. The beef could be sold "as is" for $3.00 per pound to the dog food processing plant, or roasted and sold in the deli. The cost of roasting the beef will be $2.80 per pound, and each pound could be sold for $6.50. What should be done with the beef, and why?

EA10. LO 10.5 Ralston Dairy gathered this data about the two products that it produces:

Product	Current Sales Value	Estimated Added Processing Costs	Sales Value If Processed Further
Frozen yogurt	$ 8,000	$2,000	$11,000
Ice cream	12,000	7,000	18,000

Which of the products should be processed further?

EA11. LO 10.6 Rough Stuff makes 2 products: khaki shorts and khaki pants for men. Each product passes through the cutting machine area, which is the chief constraint during production. Khaki shorts take 15 minutes on the cutting machine and have a contribution margin per pair of shorts of $16. Khaki pants take 24 minutes on the cutting machine and have a contribution margin per pair of pants of $32. If it is assumed that Rough Stuff has 4,800 hours available on the cutting machine to service a minimum demand for each product of 3,000 units, how much will profits increase if 100 more hours of machine time can be obtained?

EA12. LO 10.6 Rough Stuff makes 2 products: khaki shorts and khaki pants for men. Each product passes through the cutting machine area, which is the chief constraint during production. Khaki shorts take 15 minutes on the cutting machine and have a contribution margin per pair of shorts of $16. Khaki pants take 24 minutes on the cutting machine and have a contribution margin per pair of pants of $32. If it is assumed that Rough Stuff has 4,800 hours available on the cutting machine to service a minimum demand for each product of 3,000 units, how many of each product should be made?

Exercise Set B

EB1. LO 10.1 Ella Maksimov is CEO of her own marketing firm. The firm recently moved from a strip mall in the suburbs to an office space in a downtown building, in order to make the firm's employees more accessible to clients. Two new clients are interested in using Ella's advertising services but both clients are in the same line of business, meaning that Ella's company can represent only one of the clients. Pampered Pooches wants to hire Ella's firm for a one-year contract for web, newspaper, radio, and direct mail advertising. Pampered will pay $126,000 for these services. Ella estimates the cost of the services requested by Pampered Pooches to be $83,000. Delightful Dogs is interested in hiring Ella to produce mass mailings and web ads. Delightful will pay Ella $94,000 for these services and Ella estimates the cost of these services to be $47,000. Identify any relevant costs, relevant revenues, sunk costs, and opportunity costs that Ella Graham has to consider in making the decision whether to represent Pampered Pooches or Delightful Dogs.

EB2. LO 10.1 You are trying to decide whether to take a job after you graduate or go onto graduate school. Consider the following questions as you make your decision.

A. Which of these costs, for the most part, would be relevant (R), and which would be irrelevant (IR)?
   - Cost of your undergraduate education
   - Salary with an undergraduate degree
   - Salary with both an undergraduate degree and a graduate degree
   - Rent
   - Car Insurance
   - Graduate school tuition and fees
   - Food costs
   - Moving expenses

B. Which of these costs could have a differential amount that is relevant/irrelevant, depending upon the location and or policies of your new job?

EB3. LO 10.1 You are working for a large firm that has asked you to attend a career fair at a university that is 185 miles from your office. You need to be there at 9:00 a.m. on a Monday morning. You can drive your personal car and be reimbursed $0.55 per mile, but you would need to leave home at 5:30 a.m. to get to the event and set up on time. Company policy allows you to spend the night if you must leave town before 6:00 a.m. The hotel across the street from campus charges $85 per night. Instead of driving, you could catch a 7:00 a.m. flight with a round-trip fare of $260. Flying would require you to rent a car for $29 per day, and you would have an airport parking fee of $20 for the day. The company pays a per diem of $40 for incidentals if you spend at least 6 hours out of town. (The per diem would be for one 24-hour period for either flying or driving.) As a manager, you are responsible for recruiting within a budget and want to determine which is more economical.

Use the information provided to answer these questions.

A. What is the total amount of expenses you would include on your expense report if you drive?
B. What is the total amount of expenses you would include on your expense report if you fly?
C. What is the relevant cost of driving?
D. What is the relevant cost of flying?
E. What is the differential cost of flying over driving?
F. What other factors should you consider in your decision between driving and flying?

EB4. LO 10.2 Dimitri Designs has capacity to produce 30,000 desk chairs per year and is currently selling all 30,000 for $240 each. Country Enterprises has approached Dimitri to buy 800 chairs for $210 each. Dimitri's normal variable cost is $165 per chair, including $50 per unit in direct labor per chair. Dimitri can produce the special order on an overtime shift, which means that direct labor would be paid overtime at 150% of the normal pay rate. The annual fixed costs will be unaffected by the special order and the contract will not disrupt any of Dimitri's other operations. What will be the impact on profits of accepting the order?

EB5. LO 10.2 Aspen Enterprises makes award pins for various events. Budget information regarding the current period is:

Revenue (200,000 pins at $3.00)	$600,000
Direct materials	120,000
Direct labor	220,000
Variable manufacturing overhead	50,000
Fixed manufacturing overhead	70,000

A fraternity with which Aspen has a long relationship approached Aspen with a special order for 6,000 pins at a price of $2.75 per pin. Variable costs will be the same as the current production, and the special order will not impact the rest of the company's orders. However, Aspen is operating at capacity and will incur an additional $5,000 in fixed manufacturing overhead if the order is accepted. Based on this information, what is the differential income (loss) associated with accepting the special order?

EB6. LO 10.3 Country Diner currently makes cookies for its boxed lunches. It uses 40,000 cookies annually in the production of the boxed lunches. The costs to make the cookies are:

Materials	$0.30 per cookie
Labor	0.30 per cookie
Variable overhead	0.20 per cookie
Fixed overhead	0.10 per cookie

A potential supplier has offered to sell Country Diner the cookies for $0.85 each. If the cookies are purchased, 10% of the fixed overhead could be avoided. If Jason accepts the offer, what will the effect on profit be?

EB7. LO 10.3 Oat Treats manufactures various types of cereal bars featuring oats. Simmons Cereal Company has approached Oat Treats with a proposal to sell the company its top selling oat cereal bar at a price of $27,500 for 20,000 bars. The costs shown are associated with production of 20,000 oat bars currently.

Direct material	$14,000
Direct labor	6,000
Manufacturing overhead	8,000
Total	$28,000

The manufacturing overhead consists of $3,000 of variable costs with the balance being allocated to fixed costs. Should Oat Treats make or buy the oat bars?

EB8. LO 10.4 The Party Zone is trying to decide whether or not to continue its costume segment. The information shown is available for Party Supply's business segments. Assume that neither the Direct fixed costs nor the Allocated common fixed costs may be eliminated, but will be allocated to the two remaining segments.

	Costumes	Party Supplies	Floral Decorations
Sales	$160,000	$112,000	$215,000
Variable costs	94,000	52,000	125,000
Contribution margin	66,000	60,000	90,000
Direct fixed costs	50,000	22,000	28,000
Allocated common fixed costs	20,000	27,000	32,000
Net income	$ (4,000)	$ 11,000	$ 30,000

If costumes are dropped, what change will occur to profit?

EB9. LO 10.5 Beretti's Food Mart has 6,000 pounds of raw pork nearing its expiration date. Each pound has a cost of $5.50. The pork could be sold "as is" for $2.50 per pound to the dog food processing plant, or it could be made into custom Italian sausage and sold in the meat department. The cost of the sausage making is $3.00 per pound and each pound could be sold for $7.50. What should be done with the pork and why?

EB10. LO 10.5 Balcom Dairy gathered this data about the two products that it produces:

Product	Current Sales Value	Estimated Added Processing Costs	Sales Value If Processed Further
Cream	$ 9,000	$3,000	$14,000
Milk	14,000	9,000	20,000

Which of the products should be processed further?

EB11. LO 10.6 Power Corp. makes 2 products: blades for table saws and blades for handsaws. Each product passes through the sharpening machine area, which is the chief constraint during production. Handsaw blades take 15 minutes on the sharpening machine and have a contribution margin per blade of $15. Table saw blades take 20 minutes on the sharpening machine and have a contribution margin per blade of $35. If it is assumed that Power Corp. has 5,000 hours available on the sharpening machine to service a minimum demand for each product of 4,000 units, how much will profits increase if 200 more hours of machine time can be obtained?

EB12. LO 10.6 Power Corp. makes 2 products: blades for table saws and blades for handsaws. Each product passes through the sharpening machine area, which is the chief constraint during production. Handsaw blades take 15 minutes on the sharpening machine and have a contribution margin per blade of $15. Table saw blades take 20 minutes on the sharpening machine and have a contribution margin per blade of $35. If it is assumed that Power Corp. has 5,000 hours available on the sharpening machine to service a minimum demand for each product of 4,000 units, how many of each product should be made?

Problem Set A

PA1. LO 10.1 Artisan Metalworks has a bottleneck in their production that occurs within the engraving department. Jamal Moore, the COO, is considering hiring an extra worker, whose salary will be $55,000 per year, to solve the problem. With this extra worker, the company could produce and sell 3,000 more units per year. Currently, the selling price per unit is $25 and the cost per unit is $7.85. Using the information provided, calculate the annual financial impact of hiring the extra worker.

Direct materials	$3.50
Direct labor	1.10
Variable overhead	0.45
Fixed overhead (primarily depreciation of equipment)	2.80
Total	$7.85

PA2. LO 10.1 Syntech makes digital cameras for drones. Their basic digital camera uses $80 in variable costs and requires $1,500 per month in fixed costs. Syntech sells 100 cameras per month. If they process the camera further to enhance its functionality, it will require an additional $45 per unit of variable costs, plus an increase in fixed costs of $1,000 per month. The current price of the camera is $160. The marketing manager is positive that they can sell more and charge a higher price for the improved version. At what price level would the upgraded camera begin to improve operational earnings?

PA3. LO 10.2 Marcotti Cupcakes bakes and sells a basic cupcake for $1.25. The cost of producing 600,000 cupcakes in the prior year was:

Revenues	$750,000
Direct materials	330,000
Direct labor	66,000
Manufacturing overhead (fixed)	132,000
Manufacturing overhead (variable)	84,000

At the start of the current year, Marcotti received a special order for 15,000 cupcakes to be sold for $1.10 per cupcake. To complete the order, the company must incur an additional $700 in total fixed costs to lease a special machine that will stamp the cupcakes with the customer's logo. This order will not affect any of Marcotti's other operations and it has excess capacity to fulfill the contract. Should the company accept the special order? (Show your work.)

PA4. LO 10.2 Ken Owens Construction specializes in small additions and repairs. His normal charge is $400/day plus materials. Due to his physical condition, David, an elderly gentleman, needs a downstairs room converted to a bathroom. Ken has produced a bid for $5000 to complete the bathroom. He did not provide David with the details of the bid. However, they are shown here.

Ken's Bid Detail Dollars	
Direct material	$2200
Direct labor	1600
Variable overhead	200
Fixed overhead	600
Profit	400
	$5000

A. The town's social services has asked Ken if he could reduce his bid to $4000. Should Ken accept the counter offer?

	Current Bid	New Bid
Direct material	$2200	$2200
Direct labor	1600	1600
Variable overhead	200	200
Fixed overhead	600	
Profit	400	
	5000	4000

B. How much would his income be reduced?

C. If the town's social services guaranteed him another job next month at his normal price, could he accept this job at $4000?

PA5. LO 10.3 Boston Executive, Inc., produces executive limousines and currently manufactures the mini-bar inset at these costs:

	Cost per Unit
Variable costs:	
Direct material	$ 950
Direct labor	650
Variable overhead	300
Total variable costs	$1,900
Fixed costs:	
Depreciation of equipment	500
Depreciation of building	200
Supervisor salaries	300
Total fixed costs	1,000
Total cost	$2,900

The company received an offer from Elite Mini-Bars to produce the insets for $2,100 per unit and supply 1,000 mini-bars for the coming year's estimated production. If the company accepts this offer and shuts down production of this part of the business, production workers and supervisors will be reassigned to other areas. Assume that for the short-term decision-making process demonstrated in this problem, the company's total labor costs (direct labor and supervisor salaries) will remain the same if the bar inserts are purchased.

The specialized equipment cannot be used and has no market value. However, the space occupied by the mini-bar production can be used by a different production group that will lease it for $55,000 per year. Should the company make or buy the mini-bar insert?

PA6. LO 10.3 Gent Designs requires three units of part A for every unit of A1 that it produces. Currently, part A is made by Gent, with these per-unit costs in a month when 4,000 units were produced:

Direct materials	$4.00
Direct labor	1.50
Manufacturing overhead	1.30
Total	$6.80

Variable manufacturing overhead is applied at $1.00 per unit. The other $0.30 of overhead consists of allocated fixed costs. Gent will need 6,000 units of part A for the next year's production.

Cory Corporation has offered to supply 6,000 units of part A at a price of $7.00 per unit. If Gent accepts the offer, all of the variable costs and $1,200 of the fixed costs will be avoided. Should Gent Designs accept the offer from Cory Corporation?

PA7. LO 10.4 Trifecta Distributors has decided to discontinue manufacturing its X Plus model. Currently, the company has 4,600 partially completed X Plus models on hand. The government has put a recall on a particular part in the X Plus model, so each base model must now be reworked to accommodate the style of the new part. The company has spent $110 per unit to manufacture these X Plus models to their current state. Reworking each X Plus model will cost $20 for materials and $20 for direct labor. In addition, $7 of variable overhead and $32 of allocated fixed overhead (relating primarily to depreciation of plant and equipment) will be allocated per unit. If Trifecta completes the X Plus models, it can sell them for $160 per unit. On the other hand, another manufacturer is interested in purchasing the partially completed units for $104 each and converting them into Z Plus models. Prepare a differential analysis per unit to determine if Trifecta should complete the X Plus models or sell them in their current state.

PA8. LO 10.4 Extreme Sports sells logo sports merchandise. The company is contemplating whether or not to continue its custom embroidery service. All of the company's direct fixed costs can be avoided if a segment is dropped. This information is available for the segments.

	Custom Embroidery	Logo Apparel
Sales	$60,000	$250,000
Variable costs	30,000	110,000
Contribution margin	30,000	140,000
Direct fixed costs	22,000	40,000
Allocated common fixed costs	12,000	50,000
Net income	$(4,000)	$ 50,000

A. What will be the impact on net income if the embroidery segment is dropped?
B. Assume that if the embroidery segment is dropped, apparel sales will increase 10%. What is the impact on the contribution margin and net income solely for the apparel?
C. Identify one cost that is not relevant in this analysis.

PA9. LO 10.4 Hong Publishing has purchased Lang Publishing. After reviewing titles from both companies, a decision must be made to determine what titles must be dropped. The following information is available to make the decision.

	Title X	Title Y	Title Z
Sales	$100,000	$150,000	$200,000
Variable cost	50,000	75,000	100,000
Contribution margin	50,000	75,000	100,000
Direct fixed cost	20,000	30,000	40,000
Allocated common fixed cost	10,000	15,000	20,000
Net income	20,000	30,000	40,000

A. What is the total income if all titles were produced?
B. If Title X was dropped, what would be the effect on Net Income?
C. How much did Title X Contribute to Fixed Costs?
D. Determine the cost and the amount that will remain even if Title X is dropped?
E. Which costs and amount will be eliminated if Title X is dropped?

PA10. LO 10.5 Calcion Industries produces two joint products, Y and Z. Prior to the split-off point, the company incurred costs of $36,000. Product Y weighs 25 pounds and product Z weighs 75 pounds. Product Y sells for $150 per pound and product Z sells for $125 per pound. Based on a physical measure of output, allocate joint costs to products Y and Z.

PA11. LO 10.5 Quality Clothing, Inc., produces skorts and jumper uniforms for school children. In the process of cutting out the cloth pieces for each product, a certain amount of scrap cloth is produced. Quality has been selling this cloth scrap to Jorge's Scrap Warehouse for $3.25 per pound. Last year, the company sold 40,000 lb. of scrap, which would be enough to make 10,000 teddy bears that the management of Quality is now interested in producing. Their processes would need some reprogramming, particularly in the cutting and stitching processes, but it would require no additional worker training. However, new packaging would be needed. The total variable cost to produce the teddy bears $3.85. Fixed costs would increase by $95,000 per year for the lease of the packaging equipment and Quality estimates it could produce and sell 10,000 teddy bears per year. Finished teddy bears could be sold for $18.00 each. Should Quality continue to sell the scrap cloth or should Quality process the scrap into teddy bears to sell?

PA12. LO 10.6 At Gems in the Rough, a jewelry company, the engraving department is a bottleneck. The company is considering hiring an extra worker, whose salary will be $56,000 per year, to ease the problem. Using the extra worker, the company will be able to engrave 8,000 more units per year. The selling price per unit is $16. The cost per unit currently is $11.85 as shown:

Direct material	$ 4.50
Direct labor	2.10
Variable overhead	1.45
Fixed overhead (primarily depreciation of equipment)	3.80
Total	$11.85

What is the annual financial impact of hiring the extra worker for the bottleneck process?

PA13. LO 10.6 Sports Specialists makes baseballs and softballs in a three-step process. Unfortunately, the sewing machine process has been identified as a bottleneck. Each softball has a contribution margin of $6.00 and each baseball has a contribution margin of $2.00. The sewing machine can make 10 softballs or 25 baseballs in one hour.

A. If demand for both products is unlimited and the sewing machine capacity cannot be expanded, which product should be produced?
B. If demand for each ball is limited to 6,000 balls and there are 800 hours available on the machine, how many of each product should be produced?

Problem Set B

PB1. LO 10.1 Variety Artisans has a bottleneck in their production that occurs within the engraving department. Arjun Naipul, the COO, is considering hiring an extra worker, whose salary will be $45,000 per year, to solve the problem. With this extra worker, the company could produce and sell 3,500 more units per year. Currently, the selling price per unit is $18 and the cost per unit is $5.85. Using the information provided, calculate the annual financial impact of hiring the extra worker.

Direct materials	$2.50
Direct labor	1.10
Variable overhead	0.45
Fixed overhead (primarily depreciation of equipment)	1.80
Total	$5.85

PB2. LO 10.1 Mortech makes digital cameras for drones. Their basic digital camera uses $80 in variable costs and requires $1,500 per month in fixed costs. Mortech sells 200 cameras per month. If they process the camera further to enhance its functionality, it will require an additional $45 per unit of variable costs, plus an increase in fixed costs of $1,000 per month. The current price of the camera is $200. The marketing manager is positive that they can sell more and charge a higher price for the improved version. At what price level would the upgraded camera begin to improve operational earnings?

PB3. LO 10.2 Cinnamon Depot bakes and sells cinnamon rolls for $1.75 each. The cost of producing 500,000 rolls in the prior year was:

Revenues	$875,000
Direct materials	425,000
Direct labor	75,000
Manufacturing overhead (fixed)	125,000
Manufacturing overhead (variable)	90,000

At the start of the current year, Cinnamon Depot received a special order for 18,000 rolls to be sold for $1.50 per roll. The company estimates it will incur an additional $1,000 in total fixed costs in order to lease a special machine that forms the rolls in the shape of a heart per the customer's request. This order will not affect any of its other operations. Should the company accept the special order? (Show your work.)

PB4. LO 10.2 Myrna White is a mobile housekeeper. The price for a standard house cleaning is $150 and takes 5 hours. Each worker is paid $25/hour, uses $15 of materials and $0.50 per mile to use their own vehicle to travel from job to job. The average job is 5 miles. Arniz Meyroyan has a family reunion at her house and needs her house freshened up. She offers $75 for this emergency tidy-up service. This service includes vacuuming and cleaning floors, dusting, and cleaning the bathrooms. Only $5 of materials would be used.

A. Prepare an Excel spread sheet to determine the differential income if the emergency tidy-up service is priced at $75. The tidy-up service will take 2 hours.
B. If a $25 surcharge was included to make the price of $100 how would the differential income change?
C. If the hourly worker rate increased to $30/hour, how would net income change?
D. What other issue would you need to consider?

PB5. LO 10.2 Blake Cohen Painting Service specializes in small paint jobs. His normal charge is $350/day plus materials. Moesha needs her basement painted. Blake has produced a bid for $1500 to complete the basement painting. Blake completed a cost estimate for his service as shown.

Direct material	$200
Direct labor	700
Variable overhead	50
Fixed overhead	60
Profit	100
	$1,110

A. Moesha mentions that she can't pay the $1500. She is a widow and you feel an obligation to take care of widows but can't lose money. How much would you charge and still be able to make a profit?
B. Moesha has asked you to paint the rest of her house. Could you continue to give her the same deal?

PB6. LO 10.3 Regal Executive, Inc., produces executive motor coaches and currently manufactures the tent awnings that accompany them at these costs:

	Cost per Unit
Variable costs:	
Direct material	$1,250
Direct labor	750
Variable overhead	500
Total variable costs	$2,500
Fixed costs:	
Depreciation of equipment	500
Depreciation of building	400
Supervisor salaries	300
Total fixed costs	1,200
Total cost	$3,700

The company received an offer from Saied Tents to produce the awnings for $3,200 per unit and supply 1,000 awnings for the coming year's estimated production. If the company accepts this offer and shuts down production of this part of the business, production workers and supervisors will be reassigned to other areas. Assume that for the short-term decision-making process demonstrated in this problem, the company's total labor costs (direct labor and supervisor salaries) will remain the same if the bar inserts are purchased.

The specialized equipment cannot be used and has no market value. However, the space occupied by the awning production can be used by a different production group that will lease it for $60,000 per year. Should the company make or buy the awnings?

PB7. LO 10.3 Remarkable Enterprises requires four units of part A for every unit of A1 that it produces. Currently, part A is made by Remarkable, with these per-unit costs in a month when 4,000 units were produced:

Direct materials	$4.80
Direct labor	2.00
Manufacturing overhead	2.10
Total	$8.90

Variable manufacturing overhead is applied at $1.60 per unit. The other $0.50 of overhead consists of allocated fixed costs. Remarkable will need 8,000 units of part A for the next year's production.

Altoona Corporation has offered to supply 8,000 units of part A at a price of $8.00 per unit. If Remarkable accepts the offer, all of the variable costs and $2,000 of the fixed costs will be avoided. Should Remarkable accept the offer from Altoona Corporation?

PB8. LO 10.3 Colin O'Shea has a carpentry shop that employs 4 carpenters. Colin received an order for 1,000 coffee tables. The coffee tables have a round table top and four decorative legs. An offer for $500 per table was received. Colin found an unfinished round table top that he could buy for $50 each.

A. Using this quantitative cost data to make the table top, should Colin buy the table top or make it?

Direct materials	$10
Direct labor	35
Variable overhead	10
Fixed overhead	7

B. What qualitative factors would be included in your decision.

B. Can the vendor make it to the same quality standards? Can it be completed on time? Is there idle capacity in the factory that could be used?

PB9. LO 10.4 ZZOOM, Inc., has decided to discontinue manufacturing its Z Best model. Currently, the company has 4,600 partially completed Z Best models on hand. The government has put a recall on a particular part in the Z Best model, so each base model must now be reworked to accommodate the style of the new part. The company has spent $110 per unit to manufacture these Z Best models to their current state. Reworking each Z Best model will cost $22 for materials and $25 for direct labor. In addition, $9 of variable overhead and $34 of allocated fixed overhead (relating primarily to depreciation of plant and equipment) will be allocated per unit. If ZZOOM completes the Z Best models, it can sell them for $180 per unit. On the other hand, another manufacturer is interested in purchasing the partially completed units for $105 each and converting them into Z Plus models. Prepare a differential analysis per unit to determine if ZZOOM should complete the Z Best models or sell them in their current state.

PB10. LO 10.4 Cable paper company produces many colors of paper. The current popular color is grey. To increase the production of grey paper, a decision must be made to determine what color must be dropped. The following information is available to make the decision.

	Custom Embroidery	Logo Apparel
Sales	$60,000	$275,000
Variable costs	20,000	115,000
Contribution margin	40,000	160,000
Direct fixed costs	22,000	50,000
Allocated common fixed costs	22,000	50,000
Net income	$(4,000)	$ 60,000

A. What is the total income if all colors were produced?
B. If Peach was dropped, what would be the effect on Net Income?
C. How much did Peach paper contribute to Fixed Costs?
D. Determine the cost and the amount that will remain even if Peach is dropped?
E. Which costs and amount will be eliminated if Peach is dropped?

PB11. LO 10.5 Strawberry Sweet Company makes a variety of jams and jellies. During June, 55,000 gallons of strawberry mash was processed at a joint cost of $40,000. This produced 42,000 gallons of preserve-grade mix and 4,000 gallons of strawberry juice for jelly. The juice could be processed further into energy drinks, and the preserve mix could be processed further into ice cream flavoring. Information on these items is shown:

Product	Sales Value at Split-Off Point	Estimated Further Processing Cost	Sales Value after Processing
Preserve mix	$104,500	$ 8,000	$125,000
Juice for jelly	50,500	40,000	70,000

A. Assume that the joint cost is allocated to the products based on the physical quantity of output of each product. How much joint cost should be assigned to each product?
B. How much joint cost should be assigned to each product if the relative sales value allocation method is used?
C. Which products should be processed further?

PB12. LO 10.5 Laramie Industries produces two joint products, H and C. Prior to the split-off point, the company incurred costs of $66,000. Product H weighs 44 pounds and product C weighs 66 pounds. Product H sells for $250 per pound and product C sells for $295 per pound.

Based on a physical measure of output, allocate joint costs to products H and C.

PB13. LO 10.5 Jamboree Outfitters, Inc., produces pocket knives and fillet knives for outdoor sporting. In the process of making the knives, some irregularities occur and no further work is performed on the blades. Jamboree has been selling these irregular blades to scrap dealers for $5.00 per pound. Last year, the company sold 50,000 lbs. of scrap. The company found that Amazon will buy the irregular knives for $12 each provided Jamboree finishes producing the knives into sellable form and also assuming there are enough irregular blades to make 50,000 completed knives. Jamboree's processes would not need reprogramming, particularly in the shaping and sharpening processes. However, this would require one additional worker, and new packaging would be needed. The total variable cost to produce the irregulars is $4.85. Fixed costs would increase by $175,000 per year for the lease of the packaging equipment and the new worker. Jamboree estimates it could produce and sell 50,000 knives per year. Should Jamboree continue to sell the scrap blades or should Jamboree process the irregulars to sell to Amazon?

PB14. LO 10.5 Daisy Hernandez sells girls christening dresses through the online store, Etsy. Her customers have asked if she has necklaces that could be included with the dress. Daisy found white glossy ceramic hearts from another Etsy vendor for $20. Daisy has the talent and already has a fully depreciated kiln to make these hearts.

A. Using the provided quantitative cost data to make the heart, should Daisy buy from her fellow Etsy vendor or make it herself?

Direct materials	$3
Direct labor	5
Variable overhead	2
Fixed overhead	7

B. What qualitative factors would be included in your decision.

PB15. LO 10.5 Dr. Detail is a mobile car wash. The price for a standard wash is $35 and takes half an hour. Each worker is paid $20/hr, uses $5 of materials and $0.50 per mile to use their own vehicle to travel from job to job. The average job is 5 miles.

Ernest Kuhn's son got sick in the car, and Ernest Kuhn has asked Dr. Detail to detail his car instead of doing a simple wash and vacuum.

A. Determine the differential income if $100 was charged to detail the car. Each car detail will take 2 hours. The materials used by the worker is three times that of a standard car wash.
B. If the price is raised to $150, what is the differential income change?
C. Keeping the price at $150, if the worker rate per hour would increase to $20/hr how would the differential income change? Prepare an Excel spreadsheet.
D. What other issues would you need to consider?

PB16. LO 10.6 At Stardust Gems, a faux gem and jewelry company, the setting department is a bottleneck. The company is considering hiring an extra worker, whose salary will be $67,000 per year, to ease the problem. Using the extra worker, the company will be able to produce and sell 9,000 more units per year. The selling price per unit is $20. The cost per unit currently is $15.85 as shown:

Direct material	$ 5.50
Direct labor	3.10
Variable overhead	2.45
Fixed overhead (primarily depreciation of equipment)	4.80
Total	$15.85

What is the annual financial impact of hiring the extra worker for the bottleneck process?

PB17. LO 10.6 Sports Buffs makes basketballs and footballs in a three-step process. Unfortunately, the stem insertion process has been identified as a bottleneck. Each basketball has a contribution margin of $15.00 and each football has a contribution margin of $4.00. The stem insertion equipment can make 10 basketballs or 30 footballs in one hour.

A. If demand for both products is unlimited and the stem insertion machine capacity cannot be expanded, which product should be produced?
B. If demand for each ball is limited to 9,000 balls and there are 4,000 hours available on the machine, how many of each product should be produced?

Thought Provokers

TP1. LO 10.2 Seda Sarkisian makes wedding cakes from her home. A customer has requested two duplicate wedding cakes: one for the wedding and one to be frozen for their anniversary. The couple has offered $400 for both cakes instead of $500 ($250 each). The cost information to make one cake is shown.

	One Cake
Direct materials	$ 50
Direct labor	100
Variable overhead	25
Fixed overhead	10

A. What is the cost for the first cake?
B. What cost would not be included in the second cake?
C. What is the cost of the second cake?
D. What would be the total cost of this order if the offer was accepted?
E. How much profit will Seda be recording for this special order?
F. If your company policy is to always have a 15% profit on all order, would you still accept this order?
G. If you would not accept the order, what price would you negotiate?

TP2. LO 10.3 You are a management accountant for Time Treasures Company, whose company has recently signed an outsourcing agreement with Spotless, Inc., a janitorial service company. Spotless will provide all of Time Treasures' janitorial services, including sweeping floors, hauling trash, washing windows, stocking restrooms, and performing minor repairs. Time Treasures will be billed at an hourly rate based on the type of service performed. The work of common laborers (sweeping, hauling trash) is to be billed at $8 per hour. More skilled (repairs) and more dangerous work (washing outside windows on the 23rd floor) are to be billed at $18 per hour. Supervisory time is to be billed at $20 per hour. Spotless will submit monthly invoices, which will show the number and types of hours for which Time Treasures is being charged. The outsourcing contract is simple and straightforward.

A. What are some of the internal control problems you foresee as a result of outsourcing the janitorial service with this contract?
B. Explain recommendations to control risk that would you suggest after reviewing the contract.

TP3. LO 10.5 Brindi's Babysitting Center currently rents a 1200 sq foot facility for her 20-child facility. Her business has gotten five stars on Yelp, which has prompted more applications. She has to make a decision between expanding her operations to an 1,800 sq foot facility or staying in the current facility. Shown is the cost data of the options:

	Expand	Stay
Children served	30	20
Annual rent	$1,500	$1,000
Utilities	$ 500	$ 300
Food and materials	$2,100	$1,400
Direct labor	$6,000	$4,000
Moving cost	$5,000	

What is the differential cost of the two alternatives: A) move to a larger facility or B) stay in current facility?

TP4. LO 10.6 Akimoto's Bicycle Co assembles three types of bicycles: Charger, Sublime, Kidde. Due to their residential location they operate with one 8 hour shift, 5 days per week, 50 weeks a year. Balancing the bikes is the bottleneck. The information about production time and costs for these three bicycles are:

	Charger	Sublime	Kidde
Hours to produce	2	1.75	0.5
Selling price	$600	$300	$200
Direct material	$100	$ 75	$ 50
Direct labor	$150	$100	$ 75
Variable overhead	$ 50	$ 25	$ 25
Fixed overhead	$ 25	$ 25	$ 20

A. How many of each bicycle should be produced to maximize profits?
B. What qualitative factors would you need to consider?

11

Capital Budgeting Decisions

Figure 11.1 Milling Manufacturing. Long-term project investment requires careful capital budgeting analysis. (credit: modification of "Parts for CNC Machine" by Andy Malmin/Flickr, CC BY 2.0)

Chapter Outline

Why It Matters

Jerry Price owns Milling Manufacturing, a production facility geared toward entrepreneurial product development. Initially, Jerry purchased several milling machines, but after seven years, the machines have become obsolete due to technological advances. Jerry must purchase new machines to continue business growth, and there are several options available. How does he choose the best machines for his business? What factors must he consider before purchase?

Jerry must consider several important factors—both financial and non-financial—as he makes this decision. First, he needs to consider the commitment of his initial capital investment. He also needs to compare differences between options such as warranties, the production capacities of different machines, and maintenance and repair costs. Another factor is the useful life of the new equipment—in other words, both its physical and the technological life. He will also consider how long it will take to recoup the cost of the investment, the impact on cash flow, and how the passage of time affects the value of the asset to the

organization—it's monetary value that considered depreciation to determine what the asset is actually worth to the organization in terms of dollars (i.e., "what could we sell it for?"). Jerry will consider the value of the dollar invested today in purchasing the machine as opposed to the value of the dollar in the future that might be better spent on another project. This last factor is significant because the new equipment will probably provide part of his down payment on future replacement equipment. There are also nonfinancial factors to consider, such as changes to customer satisfaction and employee morale.

Jerry knows this equipment choice goes well beyond color or price preferences. The decision has a long-lasting influence on company direction and opportunity, and he needs to utilize capital budgeting analysis to help him make this decision.

11.1 Describe Capital Investment Decisions and How They Are Applied

Assume that you own a small printing store that provides custom printing applications for general business use. Your printers are used daily, which is good for business but results in heavy wear on each printer. After some time, and after a few too many repairs, you consider whether it is best to continue to use the printers you have or to invest some of your money in a new set of printers. A capital investment decision like this one is not an easy one to make, but it is a common occurrence faced by companies every day. Companies will use a step-by-step process to determine their capital needs, assess their ability to invest in a capital project, and decide which capital expenditures are the best use of their resources.

Fundamentals of Capital Investment Decisions

Capital investment (sometimes also referred to as capital budgeting) is a company's contribution of funds toward the acquisition of long-lived (long-term or capital) assets for further growth. Long-term assets can include investments such as the purchase of new equipment, the replacement of old machinery, the expansion of operations into new facilities, or even the expansion into new products or markets. These capital expenditures are different from operating expenses. An **operating expense** is a regularly-occurring expense used to maintain the current operations of the company, but a capital expenditure is one used to grow the business and produce a future economic benefit.

Capital investment decisions occur on a frequent basis, and it is important for a company to determine its project needs to establish a path for business development. This decision is not as obvious or as simple as it may seem. There is a lot at stake with a large outlay of capital, and the long-term financial impact may be unknown due to the capital outlay decreasing or increasing over time. To help reduce the risk involved in capital investment, a process is required to thoughtfully select the best opportunity for the company.

The process for capital decision-making involves several steps:

1. Determine capital needs for both new and existing projects.
2. Identify and establish resource limitations.
3. Establish baseline criteria for alternatives.
4. Evaluate alternatives using screening and preference decisions.
5. Make the decision.

The company must first determine its needs by deciding what capital improvements require immediate attention. For example, the company may determine that certain machinery requires replacement before any new buildings are acquired for expansion. Or, the company may determine that the new machinery and building expansion both require immediate attention. This latter situation would require a company to

consider how to choose which investment to pursue first, or whether to pursue both capital investments concurrently.

CONCEPTS IN PRACTICE

Brexit

The decision to invest money in capital expenditures may not only be impacted by internal company objectives, but also by external factors. In 2016, Great Britain voted to leave the European Union (EU) (termed "Brexit"), which separates their trade interests and single-market economy from other participating European nations. This has led to uncertainty for United Kingdom (UK) businesses.

Because of this instability, capital spending slowed or remained stagnant immediately following the Brexit vote and has not yet recovered growth momentum.[1] The largest decrease in capital spending has occurred in the expansions of businesses into new markets. The UK is expected to separate from the EU in 2019.

The second step, exploring resource limitations, evaluates the company's ability to invest in capital expenditures given the availability of funds and time. Sometimes a company may have enough resources to cover capital investments in many projects. Many times, however, they only have enough resources to invest in a limited number of opportunities. If this is the situation, the company must evaluate both the time and money needed to acquire each asset. Time allocation considerations can include employee commitments and project set-up requirements. Fund limitations may result from a lack of capital fundraising, tied-up capital in non-liquid assets, or extensive up-front acquisition costs that extend beyond investment means (Table 11.1). Once the ability to invest has been established, the company needs to establish baseline criteria for alternatives.

Resource Limitations

Time Considerations	Money Considerations
• Employee commitments • Project set-up • Time-frame necessary to secure financing	• Lack of liquidity • Tied up in non-liquid assets • Up-front acquisition costs

Table 11.1 When resources are limited, capital budgeting procedures are needed.

Alternatives are the options available for investment. For example, if a company needs to purchase new printing equipment, all possible printing equipment options are considered alternatives. Since there are so many alternative possibilities, a company will need to establish baseline criteria for the investment. Baseline criteria are measurement methods that can help differentiate among alternatives. Common measurement methods include the payback method, accounting rate of return, net present value, or internal rate of return.

1 G. Jackson "UK Business Investment Stalls in Year since Brexit Vote." *The Financial Times*. August 24, 2017. https://www.ft.com/content/daff3ffe-88ac-11e7-8bb1-5ba57d47eff7

These methods have varying degrees of complexity and will be discussed in greater detail in Evaluate the Payback and Accounting Rate of Return in Capital Investment Decisions and Explain the Time Value of Money and Calculate Present and Future Values of Lump Sums and Annuities

To evaluate alternatives, businesses will use the measurement methods to compare outcomes. The outcomes will not only be compared against other alternatives, but also against a predetermined rate of return on the investment (or minimum expectation) established for each project consideration. The rate of return concept is discussed in more detail in Balanced Scorecard and Other Performance Measures. A company may use experience or industry standards to predetermine factors used to evaluate alternatives. Alternatives will first be evaluated against the predetermined criteria for that investment opportunity, in a screening decision. The **screening decision** allows companies to remove alternatives that would be less desirable to pursue given their inability to meet basic standards. For example, if there were three different printing equipment options and a minimum return had been established, any printers that did not meet that minimum return requirement would be removed from consideration.

If one or more of the alternatives meets or exceeds the minimum expectations, a preference decision is considered. A **preference decision** compares potential projects that meet screening decision criteria and will rank the alternatives in order of importance, feasibility, or desirability to differentiate among alternatives. Once the company determines the rank order, it is able to make a decision on the best avenue to pursue (Figure 11.2). When making the final decision, all financial and non-financial factors are deliberated.

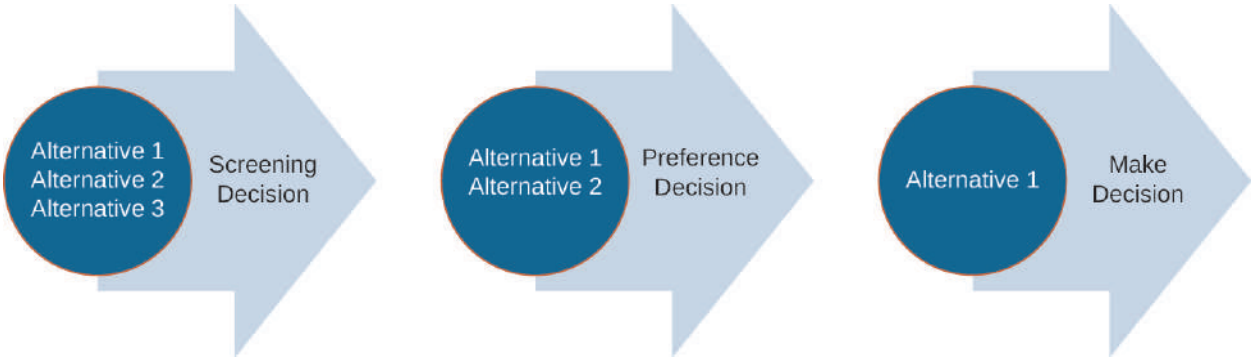


Figure 11.2 Select Between Alternatives. Screening and preference decisions can narrow alternatives in making a selection. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

ETHICAL CONSIDERATIONS

Volkswagen Diesel Emissions Scandal

Sometimes a company makes capital decisions due to outside pressures or unforeseen circumstances. The *New York Times* reported in 2015 that the car company Volkswagen was "scarred by an emissions-cheating scandal," and "would need to cut its budget next year for new technology and research—a reversal after years of increased spending aimed at becoming the world's biggest carmaker."[2] This was a huge setback for Volkswagen, not only because the company had budgeted and planned to become the largest car company in the world, but also because the scandal damaged its reputation and set it back financially.

Volkswagen "set aside about 9 billion euros ($9.6 billion) to cover costs related to making the cars compliant with pollution regulations;" however, the sums were "unlikely to cover the costs of potential legal judgments or other fines."[3] All of the costs related to the company's unethical actions needed to be included in the capital budget, as company resources were limited. Volkswagen used capital budgeting procedures to allocate funds for buying back the improperly manufactured cars and paying any legal claims or penalties. Other companies might take other approaches, but an unethical action that results in lawsuits and fines often requires an adjustment to the capital decision-making process.

Let's broadly consider what the five-step process for capital decision-making looks like for Melanie's Sewing Studio. Melanie owns a sewing studio that produces fabric patterns for wholesale.

1. Determine capital needs for both new and existing projects.
   Upon review of her future needs, Melanie determines that her five-year-old commercial sewing machine could be replaced. The old machine is still working, but production has slowed in recent months with an increase in repair needs and replacement parts. Melanie expects a new sewing machine to make her production process more efficient, which could also increase her current business volume. She decides to explore the possibility of purchasing a new sewing machine.
2. Identify and establish resource limitations.
   Melanie must consider if she has enough time and money to invest in a new sewing machine. The Sewing Studio has been in business for three years and has shown steady financial growth year over year. Melanie expects to make enough profit to afford a capital investment of $50,000. If she does purchase a new sewing machine, she will have to train her staff on how to use the machine and will have to cease production while the new machine is installed. She anticipates a loss of $20,000 for training and production time. The estimation of the $20,000 loss is based on the downtime in production for both labor and product output.
3. Establish baseline criteria for alternatives.
   Melanie is considering two different sewing machines for purchase. Before she evaluates which option is a better investment, she must establish minimum requirements for the investment. She determines that the new machine must return her initial investment back to her in three years at a rate of 20%, and the initial investment cost cannot exceed her future earnings. This established a baseline for what she considers reasonable for this type of investment, and she will not consider any investment alternative that does not meet these minimum criteria.
4. Evaluate alternatives using screening and preference decisions.
   Now that she has established minimum requirements for the new machine, she can evaluate each of these machines to see if they meet or exceed her criteria. The first sewing machine costs $45,000. She is expected to recoup her initial investment in two-and-a-half years. The return rate is 25%, and her future earnings would exceed the initial cost of the machine.
   The second machine will cost $55,000. She expects to recoup her initial investment in three years. The return rate is $18%, and her future earnings would be less than the initial cost of the machine.
5. Make the decision.

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2 Jack Ewing and Jad Mouawad. "VW Cuts Its R&D Budget in Face of Costly Emissions Scandal." *New York Times*. November 20, 2015. https://www.nytimes.com/2015/11/21/business/international/volkswagen-emissions-scandal.html

3 Jack Ewing and Jad Mouawad. "VW Cuts Its R&D Budget in Face of Costly Emissions Scandal." *New York Times*. November 20, 2015. https://www.nytimes.com/2015/11/21/business/international/volkswagen-emissions-scandal.html

Melanie will now decide which sewing machine to invest in. The first machine meets or exceeds her established minimum requirements in cost, payback, return rate, and future earnings compared to the initial investment. For the second machine, the $55,000 cost exceeds the cash available for investment. In addition, the second machine does not meet the return rate of 20% and the anticipated future earnings does not compare well to the value of the initial investment. Based on this information, Melanie would choose to purchase the first sewing machine.

These steps make it seem as if narrowing down the alternatives and making a selection is a simple process. However, a company needs to use analysis techniques, including the payback method and the accounting rate of return method, as well as other, more sophisticated and complex techniques, to help them make screening and preference decisions. These techniques can assist management in making a final investment decision that is best for the company. We begin learning about these various screening and preference decisions in Evaluate the Payback and Accounting Rate of Return in Capital

LINK TO LEARNING

More and more companies are using capital expenditure software in budgeting analysis management. One company using this software is Solarcentury, a United Kingdom-based solar company. Read this case study on Solarcentury's advantages to capital budgeting resulting from this software investment (https://openstax.org/l/50Solarcentury) to learn more.

11.2 Evaluate the Payback and Accounting Rate of Return in Capital Investment Decisions

Many companies are presented with investment opportunities continuously and must sift through both viable and nonviable options to identify the best possible expenditure for business growth. The process to select the best option requires careful budgeting and analysis. In conducting their analysis, a company may use various evaluation methods with differing inputs and analysis features. These methods are often broken into two broad categories: (1) those that consider the time value of money, or the fact that a dollar today differs from a dollar in the future due to inflation and the ability to invest today's money for future growth, and (2) those analysis methods that do not consider the time value of money. We will examine the non-time value methods first.

Non-Time Value Methods

Non-time value methods do not compare the value of a dollar today to the value of a dollar in the future and are often used as screening tools. Two non-time value evaluative methods are the payback method and the accounting rate of return.

Fundamentals of the Payback Method

The **payback method (PM)** computes the length of time it takes a company to recover their initial investment.

In other words, it calculates how long it will take until either the amount earned or the costs saved are equal to or greater than the costs of the project. This can be useful when a company is focused solely on retrieving their funds from a project investment as quickly as possible.

Businesses do not want their money tied up in capital assets that have limited liquidity. The longer money is unavailable, the less ability the company has to use these funds for other growth purposes. This extended length of time is also a concern because it produces a riskier opportunity. Therefore, a company would like to get their money returned to them as quickly as possible. One way to focus on this is to consider the payback period when making a capital budget decision. The payback method is limited in that it only considers the time frame to recoup an investment based on expected annual cash flows, and it doesn't consider the effects of the time value of money.

The payback period is calculated when there are even or uneven annual cash flows. **Cash flow** is money coming into or out of the company as a result of a business activity. A **cash inflow** can be money received or cost savings from a capital investment. A **cash outflow** can be money paid or increased cost expenditures from capital investment. Cash flow will estimate the ability of the company to pay long-term debt, its liquidity, and its ability to grow. Cash flows appear on the statement of cash flows. Cash flows are different than net income. Net income will represent all company activities affecting revenues and expenses regardless of the occurrence of a cash transaction and will appear on the income statement.

A company will estimate the future cash inflows and outflows to be generated by the capital investment. It's important to remember that the cash inflows can be caused by an increase in cash receipts or by a reduction in cash expenditures. For example, if a new piece of equipment would reduce the production costs for a company from $120,000 a year to $80,000 a year, we would consider this is a $40,000 cash inflow. While the company does not actually receive the $40,000 in cash, it does save $40,000 in operating costs giving it a positive cash inflow of $40,000.

Cash flow can also be generated through increased production volume. For example, a company purchases a new building costing $100,000 that will allow them to house more space for production. This new space allows them to produce more product to sell, which increases cash sales by $300,000. The $300,000 is a new cash inflow.

The difference between cash inflows and cash outflows is the net cash inflow or outflow, depending on which cash flow is larger.

$$\textbf{Net annual cash flows} = \textbf{Cash Inflows} - \textbf{Cash Outflows}$$

Annual net cash flows are then related to the initial investment to determine a payback period in years. When the expected net annual cash flow is an even amount each period, payback can be computed as follows:

$$\textbf{Payback Period} = \frac{\textbf{Initial Investment}}{\textbf{Net Annual Cash Flow}}$$

The result is the number of years it will take to recover the cash made in the original investment. For example, a printing company is considering a printer with an initial investment cost of $150,000. They expect an annual net cash flow of $20,000. The payback period is

$$\text{Payback Period} = \frac{\$150{,}000}{\$20{,}000} = 7.5 \text{ years}$$

The initial investment cost of $150,000 is divided by the annual cash flow of $20,000 to compute an expected payback period of 7.5 years. Depending on the company's payback period requirements for this type of investment, they may pass this option through the screening process to be considered in a preference decision. For example, the company might require a payback period of 5 years. Since 7.5 years is greater than 5 years, the company would probably not consider moving this alternative to a preference decision. If the company required a payback period of 9 years, the company would consider moving this alternative to a preference decision, since the number of years is less than the requirement.

When net annual cash flows are uneven over the years, as opposed to even as in the previous example, the company requires a more detailed calculation to determine payback. Uneven cash flows occur when different amounts are returned each year. In the previous printing company example, the initial investment cost was $150,000 and even cash flows were $20,000 per year. However, in most examples, organizations experience uneven cash flows in a multiple-year ownership period. For example, an uneven cash flow distribution might be a return of $10,000 in year one, $20,000 in years two and three, $15,000 in years four and five, and $20,000 in year six and beyond.

Year	Yearly Cash Flow	Outflow or Inflow	Remaining to Recoup	Number of Years	Cumulative Number of Years for Repayment
0	$150,000	Outflow	$150,000		
1	10,000	Inflow	140,000	1	1
2	20,000	Inflow	120,000	1	2
3	20,000	Inflow	100,000	1	3
4	15,000	Inflow	85,000	1	4
5	15,000	Inflow	70,000	1	5
6	20,000	Inflow	50,000	1	6
7	20,000	Inflow	30,000	1	7
8	20,000	Inflow	10,000	1	8
9	20,000	Inflow	$\left(\frac{10,000}{20,000}\right)$	0.5	8.5

In this case, then, the payback period is 8.5 years.

In a second example of the payback period for uneven cash flows, consider a company that will need to determine the net cash flow for each period and figure out the point at which cash flows equal or exceed the initial investment. This could arise in the middle of a year, prompting a calculation to determine the partial year payback.

$$\text{Partial Year Payback} = \frac{\text{Initial Investment Outstanding}}{\text{Net cash flow for current period}}$$

The company would add the partial year payback to the prior years' payback to get the payback period for uneven cash flows. For example, a company may make an initial investment of $40,000 and receive net cash flows of $10,000 in years one and two, $5,000 in year three and four, and $7,500 for years five and beyond.

Year	Cash Flow	Outflow or Inflow	Remaining to Recoup	Number of years
0	(40,000.00)	Outflow	40,000.00	
1	10000	Inflow	30,000.00	1
2	10000	Inflow	20,000.00	1
3	5000	Inflow	15,000.00	1
4	5000	Inflow	10,000.00	1
5	7500	Inflow	2,500.00	1
6	7500	Inflow	(5,000.00)	0.33
				5.33

Figure 11.3 Cash Flow. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

We know that somewhere between years 5 and 6, the company recovers the money. In years one and two they recovered a total of $20,000 (10,000 + 10,000), in years three and four they recovered and additional $10,000 (5,000 + 5,000), and in year five they recovered $7,500, for a total through year five of $37,500. This left an outstanding balance after year five of $2,500 (40,000 – 37,500) to fully recover the costs of the investment. In year six, they had a cash flow of $7,500. This is more than they needed to recoup their initial investment. To get a more specific calculation, we need to compute the partial year's payback.

$$\text{Partial Year Payback} = \frac{\$2{,}500}{\$7{,}500} = 0.33 \text{ years (rounded)}$$

Therefore, the total payback period is 5.33 years (5 years + 0.33 years).

Demonstration of the Payback Method

For illustration, consider Baby Goods Manufacturing (BGM), a large manufacturing company specializing in the production of various baby products sold to retailers. BGM is considering investment in a new metal press machine. The payback period is calculated as follows:

$$\text{Payback Period} = \frac{\$50{,}000}{\$15{,}000} = 3.33 \text{ years}$$

We divide the initial investment of $50,000 by the annual inflow of $15,000 to arrive at a payback period of 3.33 years. Assume that BGM will not allow a payback period of more than 7 years for this type of investment. Since this computed payback period meets their initial screening requirement, they can pass this investment opportunity on to a preference decision level. If BGM had an expected or maximum allowable payback period of 2 years, the same investment would not have passed their screening requirement and would be dropped from consideration.

To illustrate the concept of uneven cash flows, let's assume BGM shows the following expected net cash flows instead. Recall that that the initial investment in the metal press machine is $50,000.

Year	Net Cash Flow	Outstanding Initial Investment	Calculations
0	($50,000)	($50,000)	Initial Investment
1	$10,000	$(40,000)	50,000 – 10,000
2	5,000	(35,000)	40,000 – 5,000
3	7,000	(28,000)	35,000 – 7,000
4	3,000	(25,000)	28,000 – 3,000
5	10,000	(15,000)	25,000 – 10,000
6	10,000	(5,000)	15,000 – 5,000
7	10,000	5,000	10,000 – 5,000

Between years 6 and 7, the initial investment outstanding balance is recovered. To determine the more specific payback period, we calculate the partial year payback.

$$\text{Payback Period} = \frac{\$5{,}000}{\$10{,}000} = 0.5 \text{ years}$$

The total payback period is 6.5 years (6 years + 0.5 years).

THINK IT THROUGH

Capital Investment

You are the accountant at a large firm looking to make a capital investment in a future project. Your company is considering two project investments. Project A's payback period is 3 years, and Project B's payback period is 5.5 years.

Your company requires a payback period of no more than 5 years on such projects. Which project should they further consider? Why? Is there an argument that can be made to advance either project or neither project? Why? What other factors might be necessary to make that decision?

Fundamentals of the Accounting Rate of Return Method

The **accounting rate of return (ARR)** computes the return on investment considering changes to net income. It shows how much extra income the company could expect if it undertakes the proposed project. Unlike the payback method, ARR compares income to the initial investment rather than cash flows. This method is useful because it reviews revenues, cost savings, and expenses associated with the investment and, in some cases, can provide a more complete picture of the impact, rather than focusing solely on the cash flows produced. However, ARR is limited in that it does not consider the value of money over time, similar to the payback method.

The accounting rate of return is computed as follows:

$$\textbf{Accounting Rate of Return} = \frac{\textbf{Incremental Revenues – Incremental Expenses}}{\textbf{Initial Investment}}$$

Incremental revenues represent the increase to revenue if the investment is made, as opposed to if the investment is rejected. The increase to revenues includes any cost savings that occur because of the project.

Incremental expenses show the change to expenses if the project is accepted as opposed to maintaining the current conditions. Incremental expenses also include depreciation of the acquired asset. The difference between incremental revenues and incremental expenses is called the incremental net income. The initial investment is the original amount invested in the project; however, any salvage (residual) value for the capital asset needs to be subtracted from the initial investment before obtaining ARR.

The concept of salvage value was addressed in Long-Term Assets (http://cnx.org/content/m67894/latest/) . Basically, it is the anticipated future fair market value (FMV) of an asset when it is to be sold or used as a trade-in for a replacement asset. For example, assume that you bought a commercial printer for $40,000 five years ago with an anticipated salvage value of $8,000, and you are now considering replacing it. Assume that as of the date of replacement after the five-year holding period, the old printer has an FMV of $8,000. If the new printer has a purchase price of $45,000 and the seller is going to take the old printer as a trade-in, then you would owe $37,000 for the new printer. If the printer had been sold for $8,000, instead being used as a trade-in, the $8,000 could have been used as a down payment, and the company would still owe $37,000. This amount is the price of $45,000 minus the FMV value of $8,000.

$$\text{Accounting Rate of Return (ARR)} = \frac{\text{Incremental Net Income}}{\text{Initial Investment – Salvage Value}}$$

There is one more point to make with this example. The fair market value is not the same as the book value. The book value is the original cost less the accumulated depreciation that has been taken. For example, if you buy a long-term asset for $60,000 and the accumulated depreciation that you have taken is $42,000, then the asset's book value would be $18,000. The fair market value could be more, less, or the same as the book value.

For example, a piano manufacturer is considering investment in a new tuning machine. The initial investment will cost $300,000. Incremental revenues, including cost savings, are $200,000, and incremental expenses, including depreciation, are $125,000. ARR is computed as:

$$\text{ARR} = \frac{(\$200{,}000 - \$125{,}000)}{\$300{,}000} = 0.25 \text{ or } 25\%$$

This outcome means the company can expect an increase of 25% to net income, or an extra 25 cents on each dollar, if they make the investment. The company will have a minimum expected return that this project will need to meet or exceed before further consideration is given. ARR, like payback method, should not be used as the sole determining factor to invest in a capital asset. Also, note that the ARR calculation does not consider uneven annual income growth, or other depreciation methods besides straight-line depreciation.

Demonstration of the Accounting Rate of Return Method

Returning to the BGM example, the company is still considering the metal press machine because it passed the payback period method of less than 7 years. BGM has a set rate of return of 25% expected for the metal press machine investment. The company expects incremental revenues of $22,000 and incremental expenses of $12,000. Remember that the initial investment cost is $50,000. BGM computes ARR as follows:

$$\text{ARR} = \frac{(\$20{,}000 - \$5{,}000)}{\$50{,}000} = 0.3 \text{ or } 30\%$$

The ARR in this situation is 30%, exceeding the required hurdle rate of 25%. A **hurdle rate** is the minimum required rate of return on an investment to consider an alternative for further evaluation. In this case, BGM would move this investment option to a preference decision level. If we were to add a salvage value of $5,000

into the situation, the computation would change as follows:

$$\text{ARR} = \frac{(\$20{,}000 - \$5{,}000)}{\$50{,}000 - \$5{,}000)} = 0.33 \text{ or } 33\% \text{ (rounded)}.$$

The ARR still exceeds the hurdle rate of 25%, so BGM would still forward the investment opportunity for further consideration. Let's say BGM changes their required return rate to 35%. In both cases, the project ARR would be less than the required rate, so BGM would not further consider either investment.

YOUR TURN

Analyzing Hurdle Rate

Turner Printing is looking to invest in a printer, which costs $60,000. Turner expects a 15% rate of return on this printer investment. The company expects incremental revenues of $30,000 and incremental expenses of $15,000. There is no salvage value for the printer. What is the accounting rate of return (ARR) for this printer? Did it meet the hurdle rate of 15%?

Solution

ARR is 25% calculated as ($30,000 – $15,000) / $60,000. 25% exceeds the hurdle rate of 15%, so the company would consider moving this alternative to a preference decision.

Both the payback period and the accounting rate of return are useful analytical tools in certain situations, particularly when used in conjunction with other evaluative techniques. In certain situations, the non-time value methods can provide relevant and useful information. However, when considering projects with long lives and significant costs to initiate, there are more advanced models that can be used. These models are typically based on time value of money principles, the basics of which are explained here.

YOUR TURN

Analyzing Investments

Your company is considering making an investment in equipment that will cost $240,000. The equipment is expected to generate annual cash flows of $60,000, provide incremental cash revenues of $200,000, and provide incremental cash expenses of $140,000 annually. Depreciation expense is included in the $140,000 incremental expense.

Calculate the payback period and the accounting rate of return.

Solution

$$\text{Payback Period} = \frac{\$240{,}000}{60{,}000} = 4 \text{ years}$$

$$\text{ARR} = \frac{(\$200{,}000 - \$140{,}000)}{240{,}000} = 25\%$$

11.3 Explain the Time Value of Money and Calculate Present and Future Values of Lump Sums and Annuities

Your mother gives you $100 cash for a birthday present, and says, “Spend it wisely.” You want to purchase the latest cellular telephone on the market but wonder if this is really the best use of your money. You have a choice: You can spend the money now or spend it in the future. What should you do? Is there a benefit to spending it now as opposed to saving for later use? Does time have an impact on the value of your money in the future? Businesses are confronted with these questions and more when deciding how to allocate investment money. A major factor that affects their investment decisions is the concept of the time value of money.

Time Value of Money Fundamentals

The concept of the **time value of money** asserts that the value of a dollar today is worth more than the value of a dollar in the future. This is typically because a dollar today can be used now to earn more money in the future. There is also, typically, the possibility of future inflation, which decreases the value of a dollar over time and could lead to a reduction in economic buying power.

At this point, potential effects of inflation can probably best be demonstrated by a couple of examples. The first example is the Ford Mustang. The first Ford Mustang sold in 1964 for $2,368. Today’s cheapest Mustang starts at a list price of $25,680. While a significant portion of this increase is due to additional features on newer models, much of the increase is due to the inflation that occurred between 1964 and 2019.

Similar inflation characteristics can be demonstrated with housing prices. After World War II, a typical small home often sold for between $16,000 and $30,000. Many of these same homes today are selling for hundreds of thousands of dollars. Much of the increase is due to the location of the property, but a significant part is also attributed to inflation. The annual inflation rate for the Mustang between 1964 and 2019 was approximately 4.5%. If we assume that the home sold for $16,500 in 1948 and the price of the home in 2019 was about $500,000, that’s an annual appreciation rate of almost 5%.

Today’s dollar is also more valuable because there is less risk than if the dollar was in a long-term investment, which may or may not yield the expected results. On the other hand, delaying payment from an investment may be beneficial if there is an opportunity to earn interest. The longer payment is delayed, the more available earning potential there is. This can be enticing to businesses and may persuade them to take on the risk of deferment.

Businesses consider the time value of money before making an investment decision. They need to know what the future value is of their investment compared to today’s present value and what potential earnings they could see because of delayed payment. These considerations include present and future values.

Before you learn about present and future values, it is important to examine two types of cash flows: lump sums and annuities.

Lump Sums and Annuities

A **lump sum** is a one-time payment or repayment of funds at a particular point in time. A lump sum can be either a present value or future value. For a lump sum, the present value is the value of a given amount today. For example, if you deposited $5,000 into a savings account today at a given rate of interest, say 6%, with the goal of taking it out in exactly three years, the $5,000 today would be a present value-lump sum. Assume for

simplicity's sake that the account pays 6% at the end of each year, and it also compounds interest on the interest earned in any earlier years.

In our current example, interest is calculated once a year. However, interest can also be calculated in numerous ways. Some of the most common interest calculations are daily, monthly, quarterly, or annually. One concept important to understand in interest calculations is that of compounding. **Compounding** is the process of earning interest on previous interest earned, along with the interest earned on the original investment.

Returning to our example, if $5,000 is deposited into a savings account for three years earning 6% interest compounded annually, the amount the $5,000 investment would be worth at the end of three years is $5,955.08 ($5,000 × 1.06 – $5,300 × 1.06 – $5,618 × 1.06 – $5,955.08). The $5,955.08 is the future value of $5,000 invested for three years at 6%. More formally, **future value** is the amount to which either a single investment or a series of investments will grow over a specified time at a given interest rate or rates. The initial $5,000 investment is the present value. Again, more formally, **present value** is the current value of a single future investment or a series of investments for a specified time at a given interest rate or rates. Another way to phrase this is to say the $5,000 is the present value of $5,955.08 when the initial amount was invested at 6% for three years. The interest earned over the three-year period would be $955.08, and the remaining $5,000 would be the original deposit of $5,000.

As shown in the example the future value of a lump sum is the value of the given investment at some point in the future. It is also possible to have a series of payments that constitute a series of lump sums. Assume that a business receives the following four cash flows. They constitute a series of lump sums because they are *not all* the same amount.

December 31, 2019	$12,000
December 31, 2020	12,000
December 31, 2021	11,500
December 31, 2022	12,000

The company would be receiving a stream of four cash flows that are all lump sums. In some situations, the cash flows that occur each time period are the same amount; in other words, the cash flows are even each period. These types of even cash flows occurring at even intervals, such as once a year, are known as an **annuity**. The following figure shows an annuity that consists of four payments of $12,000 made at the end of each of four years.

December 31, 2019	$12,000
December 31, 2020	12,000
December 31, 2021	12,000
December 31, 2022	12,000

The nature of cash flows—single sum cash flows, even series of cash flows, or uneven series of cash flows—have different effects on compounding.

Compounding

Compounding can be applied in many types of financial transactions, such as funding a retirement account or college savings account. Assume that an individual invests $10,000 in a four-year certificate of deposit account that pays 10% interest at the end of each year (in this case 12/31). Any interest earned during the year will be

retained until the end of the four-year period and will also earn 10% interest annually.

Year	Interest Earned	Investment Balance
0		$10,000
1	($10,000 × 10%) $1,000	11,000
2	(11,000 × 10%) 1,100	12,100
3	(12,100 × 10%) 1,210	13,310
4	(13,310 × 10%) 1,331	14,641
Total Interest Earned	4,641	

Through the effects of compounding—earning interest on interest—the investor earned $4,641 in interest from the four-year investment. If the investor had removed the interest earned instead of reinvesting it in the account, the investor would have earned $1,000 a year for four years, or $4,000 interest ($10,000 × 10% = $1,000 per year × 4 years = $4,000 total interest). Compounding is a concept that is used to determine future value (more detailed calculations of future value will be covered later in this section). But what about present value? Does compounding play a role in determining present value? The term applied to finding present value is called discounting.

Discounting

Discounting is the procedure used to calculate the present value of an individual payment or a series of payments that will be received in the future based on an assumed interest rate or return on investment. Let's look at a simple example to explain the concept of discounting.

Assume that you want to accumulate sufficient funds to buy a new car and that you will need $5,000 in three years. Also, assume that your invested funds will earn 8% a year for the three years, and you reinvest any interest earned during the three-year period. If you wanted to take out adequate funds from your savings account to fund the three-year investment, you would need to invest $3,969.16 today and invest it in the account earning 8% for three years. After three years, the $3,969.16 would earn $1,030.84 and grow to exactly the $5,000 that you will need. This is an example of discounting. Discounting is the method by which we take a future value and determine its current, or present, value. An understanding of future value applications and calculations will aid in the understanding of present value uses and calculations.

Future Value

There are benefits to investing money now in hopes of a larger return in the future. These future earnings are possible because of interest payments received as an incentive for tying up money long-term. Knowing what these future earnings will be can help a business decide if the current investment is worth the long-term potential. Recall, the **future value (FV)** as the value of an investment after a certain period of time. Future value considers the initial amount invested, the time period of earnings, and the earnings interest rate in the calculation. For example, a bank would consider the future value of a loan based on whether a long-time client meets a certain interest rate return when determining whether to approve the loan.

To determine future value, the bank would need some means to determine the future value of the loan. The bank could use formulas, future value tables, a financial calculator, or a spreadsheet application. The same is true for present value calculations. Due to the variety of calculators and spreadsheet applications, we will present the determination of both present and future values using tables. In many college courses today, these tables are used primarily because they are relatively simple to understand while demonstrating the

material. For those who prefer formulas, the different formulas used to create each table are printed at the top of the corresponding table. In many finance classes, you will learn how to utilize the formulas. Regarding the use of a financial calculator, while all are similar, the user manual or a quick internet search will provide specific directions for each financial calculator. As for a spreadsheet application such as Microsoft Excel, there are some common formulas, shown in Table 11.2. In addition, Appendix C provides links to videos and tutorials on using specific aspects of Excel, such as future and present value techniques.

Excel Formulas

Time Value Component	Excel Formula Shorthand	Excel Formula Detailed
Present Value Single Sum	=PV	=PV(Rate, N, Payment, FV)
Future Value Single Sum	+FV	=FV(Rate, N, Payment, PV)
Present Value Annuity	=PV	=PV(Rate, N, Payment, FV, Type)
Future Value Annuity	=FV	=FV(Rate, N, Payment, PV, Type)
Net Present Value	=NPV	=NPV(Rate, CF2, CF3, CF4) + CF1
Internal Rate of Return	=IRR	=IRR(Invest, CF1, CF2, CF3)
Rate = annual interest rate		
N = number of periods		
Payment = annual payment amount, entered as a negative number, use 0 when calculating both present value of a single sum and future value of a single sum		
FV = future value		
PV = current or present value		
Type = 0 for regular annuity, 1 for annuity due		
CF = cash flow for a period, thus CF1 – cash flow period 1, CF2 – cash flow period 2, etc.		
Invest = initial investment entered as a negative number		

Table 11.2

Since we will be using the tables in the examples in the body of the chapter, it is important to know there are four possible table, each used under specific conditions (Table 11.3.

Time Value of Money Tables

Situation	Table Heading
Future Value – Lump Sum	Future Value of $1

Table 11.3

Time Value of Money Tables

Situation	Table Heading
Future Value – Annuity (even payment stream)	Future Value of an Annuity
Present Value – Lump Sum	Present Value of $1
Present Value – Annuity (even payment stream)	Present Value of an Annuity

Table 11.3

In the prior situation, the bank would use either the Future Value of $1 table or Future Value of an Ordinary Annuity table, samples of which are provided in Appendix B. To use the correct table, the bank needs to determine whether the customer will pay them back at the end of the loan term or periodically throughout the term of the loan. The Future Value of $1 table is used if the customer will pay back at the end of the period; if the payments will be made periodically throughout the term of the loan, they will use the Future Value of an Annuity table. Choosing the correct table to use is critical for accurate determination of the future value. The application in other business matters is the same: a business needs to also consider if they are making an investment with a repayment in one lump sum or in an annuity structure before choosing a table and making the calculation. In the tables, the columns show interest rates (i) and the rows show periods (n). The interest columns represent the anticipated interest rate payout for that investment. Interest rates can be based on experience, industry standards, federal fiscal policy expectations, and risk investment. Periods represent the number of years until payment is received. The intersection of the expected payout years and the interest rate is a number called a future value factor. The future value factor is multiplied by the initial investment cost to produce the future value of the expected cash flows (or investment return).

Future Value of $1

A lump sum payment is the present value of an investment when the return will occur at the end of the period in one installment. To determine this return, the Future Value of $1 table is used.

For example, you are saving for a vacation you plan to take in 6 years and want to know how much your initial savings will yield in the future. You decide to place $4,500 in an investment account now that yields an anticipated annual return of 8%. Looking at the FV table, n = 6 years, and i = 8%, which return a future value factor of 1.587. Multiplying this factor by the initial investment amount of $4,500 produces $7,141.50. This means your initial savings of $4,500 will be worth approximately $7,141.50 in 6 years.

Future Value of $1 Table
Factor = $(1 + i)^n$

Period (n)	Rate (i)				
	1%	2%	3%	5%	8%
1	1.010	1.020	1.030	1.050	1.080
2	1.020	1.040	1.061	1.103	1.166
3	1.030	1.061	1.093	1.158	1.260
4	1.041	1.082	1.126	1.216	1.360
5	1.051	1.104	1.159	1.276	1.469
6	1.062	1.126	1.194	1.340	**1.587**

Future Value of an Ordinary Annuity

An **ordinary annuity** is one in which the payments are made at the end of each period in equal installments. A future value ordinary annuity looks at the value of the current investment in the future, if periodic payments were made throughout the life of the series.

For example, you are saving for retirement and expect to contribute $10,000 per year for the next 15 years to a 401(k) retirement plan. The plan anticipates a periodic interest yield of 12%. How much would your investment be worth in the future meeting these criteria? In this case, you would use the Future Value of an Ordinary Annuity table. The relevant factor where n = 15 and i = 12% is 37.280. Multiplying the factor by the amount of the cash flow yields a future value of these installment savings of (37.280 × $10,000) $372,800. Therefore, you could expect your investment to be worth $372,800 at the end of 15 years, given the parameters.

Future Value of an Ordinary Annuity Table

$$\text{Factor} = \frac{[(1 + i)^n - 1]}{i}$$

Period (n) \ Rate (i)	1%	2%	3%	5%	8%	10%	12%
1	1.000	1.000	1.000	1.000	1.000	1.000	1. 000
2	2.010	2.020	2.030	2.050	2.080	2.100	2.120
3	3.030	3.060	3.091	3.153	3.246	3.310	3.374
4	4.060	4.122	4.184	4.310	4.506	4.641	4.779
5	5.101	5.204	5.309	5.526	5.867	6.105	6.353
6	6.152	6.308	6.468	6.802	7.336	7.716	8.115
7	7.214	7.434	7.662	8.142	8.923	9.487	10.089
8	8.286	8.583	8.892	9.549	10.637	11.436	12.300
9	9.369	9.755	10.159	11.027	12.488	13.579	14.776
10	10.462	10.950	11.464	12.578	14.487	15.937	17.549
11	11.567	12.169	12.808	14.207	16.645	18.531	20.655
12	12.683	13.412	14.192	15.917	18.977	21.384	24.133
13	13.809	14.680	15.618	17.713	21.495	24.523	28.029
14	14.947	15.974	17.086	19.599	24.215	27.975	32.393
15	16.097	17.293	18.599	21.579	27.152	31.772	**37.280**

Let's now examine how present value differs from future value in use and computation.

YOUR TURN

Determining Future Value

Determine the future value for each of the following situations. Use the future value tables provided in Appendix B when needed, and round answers to the nearest cent where required.

A. You are saving for a car and you put away $5,000 in a savings account. You want to know how much your initial savings will be worth in 7 years if you have an anticipated annual interest rate of 5%.
B. You are saving for retirement and make contributions of $11,500 per year for the next 14 years to your 403(b) retirement plan. The interest rate yield is 8%.

Solution

A. Use FV of $1 table. Future value factor where *n* = 7 and *i* = 5 is 1.407. 1.407 × 5,000 = $7,035. B. Use FV of an ordinary annuity table. Future value factor where *n* = 14 and *i* = 8 is 24.215. 24.215 × 11,500 = $278,472.50.

Present Value

It is impossible to compare the value or potential purchasing power of the future dollar to today's dollar; they exist in different times and have different values. **Present value (PV)** considers the future value of an investment expressed in today's value. This allows a company to see if the investment's initial cost is more or less than the future return. For example, a bank might consider the present value of giving a customer a loan before extending funds to ensure that the risk and the interest earned are worth the initial outlay of cash.

Similar to the Future Value tables, the columns show interest rates (*i*) and the rows show periods (*n*) in the Present Value tables. Periods represent how often interest is compounded (paid); that is, periods could represent days, weeks, months, quarters, years, or any interest time period. For our examples and assessments, the period (*n*) will almost always be in years. The intersection of the expected payout years (*n*) and the interest rate (*i*) is a number called a present value factor. The present value factor is multiplied by the initial investment cost to produce the present value of the expected cash flows (or investment return).

Present Value = Present Value Factor × Initial Investment Cost

The two tables provided in Appendix B for present value are the Present Value of $1 and the Present Value of an Ordinary Annuity. As with the future value tables, choosing the correct table to use is critical for accurate determination of the present value.

Present Value of $1

When referring to present value, the lump sum return occurs at the end of a period. A business must determine if this delayed repayment, with interest, is worth the same as, more than, or less than the initial investment cost. If the deferred payment is more than the initial investment, the company would consider an investment.

To calculate present value of a lump sum, we should use the Present Value of $1 table. For example, you are interested in saving money for college and want to calculate how much you would need put in the bank today to return a sum of $40,000 in 10 years. The bank returns an interest rate of 3% per year during these 10 years. Looking at the PV table, *n* = 10 years and *i* = 3% returns a present value factor of 0.744. Multiplying this factor by the return amount of $40,000 produces $29,760. This means you would need to put in the bank now approximately $29,760 to have $40,000 in 10 years.

Present Value of $1 Table Factor = $\frac{1}{(1+i)^n}$					
	Rate (*i*)				
Period (*n*)		1%	2%	**3%**	5%
	1	0.990	0.980	0.971	0.952
	2	0.980	0.961	0.943	0.907
	3	0.971	0.942	0.915	0.864
	4	0.961	0.924	0.888	0.823
	5	0.952	0.906	0.863	0.784
	6	0.942	0.888	0.837	0.746
	7	0.933	0.871	0.813	0.711
	8	0.924	0.853	0.789	0.677
	9	0.914	0.837	0.766	0.645
	10	0.905	0.820	0.744	0.614
	11	0.896	0.804	0.722	0.585

As mentioned, to determine the present value or future value of cash flows, a financial calculator, a program such as Excel, knowledge of the appropriate formulas, or a set of tables must be used. Though we illustrate examples in the text using tables, we recognize the value of these other calculation instruments and have included chapter assessments that use multiple approaches to determining present and future value. Knowledge of different approaches to determining present and future value is useful as there are situations, such as having fractional interest rates, 8.45% for example, in which a financial calculator or a program such as Excel would be needed to accurately determine present or future value.

Annuity Table

As discussed previously, annuities are a series of equal payments made over time, and ordinary annuities pay the equal installment at the end of each payment period within the series. This can help a business understand how their periodic returns translate into today's value.

For example, assume that Sam needs to borrow money for college and anticipates that she will be able to repay the loan in $1,200 annual payments for each of 5 years. If the lender charges 5% per year for similar loans, how much cash would the bank be willing to lend Sam today? In this case, she would use the Present Value of an Ordinary Annuity table in Appendix B, where $n = 5$ and $i = 5\%$. This yields a present value factor of 4.329. The current value of the cash flow each period is calculated as 4.329 × $1,200 = $5,194.80. Therefore, Sam could borrow $5,194.80 now given the repayment parameters.

Present Value of an Ordinary Annuity Table Factor = $\frac{[1 - 1/(1+i)^n]}{i}$				
	Rate (*i*)			
Period (*n*)	1%	2%	3%	5%
1	0.990	0.980	0.971	0.952
2	1.970	1.942	1.913	1.859
3	2.941	2.884	2.829	2.723
4	3.902	3.808	3.717	3.546
5	4.853	4.713	4.580	**4.329**

Our focus has been on examples of *ordinary* annuities (annuities due and other more complicated annuity examples are addressed in advanced accounting courses). With **annuities due**, the cash flow occurs at the

start of the period. For example, if you wanted to deposit a lump sum of money into an account and make monthly rent payments starting today, the first payment would be made the same day that you made the deposit into the funding account. Because of this timing difference in the withdrawals from the annuity due, the process of calculating annuity due is somewhat different from the methods that you've covered for ordinary annuities.

YOUR TURN

Determining Present Value

Determine the present value for each of the following situations. Use the present value tables provided in Appendix B when needed, and round answers to the nearest cent where required.

a. You are saving for college and you want to return a sum of $100,000 in 12 years. The bank returns an interest rate of 5% after these 12 years.
b. You need to borrow money for college and can afford a yearly payment to the lending institution of $1,000 per year for the next 8 years. The interest rate charged by the lending institution is 3% per year.

Solution

a. Use PV of $1 table. Present value factor where n = 12 and i = 5 is 0.557. 0.557 × $100,000 = $55,700. b. Use PV of an ordinary annuity table. Present value factor where n = 8 and i = 3 is 7.020. 7.020 × $1,000 = $7,020.

LINK TO LEARNING

For a lucky few, winning the lottery can be a dream come true and the option to take a one-time payout or receive payments over several years does not seem to matter at the time. This lottery payout calculator (https://openstax.org/l/50LotteryCalc) shows how time value of money may affect your take-home winnings.

11.4 Use Discounted Cash Flow Models to Make Capital Investment Decisions

Your company, Rudolph Incorporated, has begun analyzing two potential future project alternatives that have passed the basic screening using the non–time value methods of determining the payback period and the accounting rate of return. Both proposed projects seem reasonable, but your company typically selects only one option to pursue. Which one should you choose? How will you decide? A discounted cash flow model can assist with this process. In this section, we will discuss two commonly used time value of money–based options: the net present value method (NPV) and the internal rate of return (IRR). Both of these methods are based on the discounted cash flow process.

Fundamentals of the Discounted Cash Flow Model

The **discount cash flow model** assigns a value to a business opportunity using time-value measurement tools. The model considers future cash flows of the project, discounts them back to present time, and compares the outcome to an expected rate of return. If the outcome exceeds the expected rate of return and initial investment cost, the company would consider the investment. If the outcome does not exceed the expected rate of return or the initial investment, the company may not consider investment. When considering the discounted cash flow process, the time value of money plays a major role.

Time Value-Based Methods

As previously discussed, time value of money methods assume that the value of money today is worth more now than in the future. The payback period and accounting rate of return methods do not consider this concept when performing calculations and analyzing results. That is why they are typically only used as basic screening tools. To decide the best option between alternatives, a company performs preference measurement using tools, such as net present value and internal rate of return that do consider the time value of money concept. **Net present value (NPV)** discounts future cash flows to their present value at the expected rate of return and compares that to the initial investment. NPV does not determine the actual rate of return earned by a project. The **internal rate of return (IRR)** shows the profitability or growth potential of an investment at the point where NPV equals zero, so it determines the actual rate of return a project earns. As the name implies, net present value is stated in dollars, whereas the internal rate of return is stated as an interest rate. Both NPV and IRR require the company to determine a rate of return to be used as the target return rate, such as the minimum required rate of return or the weighted average cost of capital, which will be discussed in Balanced Scorecard and Other Performance Measures.

A positive NPV implies that the present value of the cash inflows from the project are greater than the present value of the cash outflows, which represent the expenses and costs associated with the project. In an NPV calculation, a positive NPV is typically considered a potentially good investment or project. However, other extenuating circumstances should be considered. For example, the company might not wish to borrow the necessary funding to make the investment because the company might be anticipating a downturn in the national economy.

An IRR analysis compares the calculated IRR with either a predetermined rate of return or the cost of borrowing the money to invest in the project in order to determine whether a potential investment or project is favorable. For example, assume that the investment or equipment purchase is expected to generate an IRR of 15% and the company's expected rate of return is 12%. In this case, similar to the NPV calculation, we assume that the proposed investment would be undertaken. However, remember that other factors must be considered, as they are with NPV.

When considering cash inflows—whether using NPV or IRR—the accountant should examine both profits generated or expenses reduced. Investments that are made may generate additional revenue or could reduce production costs. Both cases assume that the new product or other type of investment generates a positive cash inflow that will be compared to the cost outflows to determine whether there is an overall positive or negative net present value.

Additionally, a company would determine whether the projects being considered are mutually exclusive or not. If the projects or investment options are mutually exclusive, the company can evaluate and identify more than one alternative as a viable project or investment, but they can only invest in one option. For example, if a

company needs one new delivery truck, it might solicit proposals from five different truck dealers and conduct NPV and IRR evaluations. Even if all proposals pass the financial requirements of the NPV and IRR methods, only one proposal will be accepted.

Another consideration occurs when a company has the ability to evaluate and accept multiple proposals. For example, an automobile manufacturer is considering expanding its number of dealerships in the United States over the next ten-year period and has allocated $30,000,000 to buy the land. They could purchase any number of properties. They conduct NPV and IRR analyses of fifteen properties and determine that four meet their required standards and market feasibility needs and then purchase those four properties. The opportunities were not mutually exclusive: the number of properties purchased was driven by research and expansion projections, not by their need for only one option.

CONTINUING APPLICATION AT WORK

Capital Budgeting Decisions

Gearhead Outfitters has expanded to many locations throughout its twenty-plus years in business. How did company management decide to expand? One of the financial tools a business can use is capital budgeting, which addresses many different issues involving the use of current cash flow for future return. As you've learned, capital outlay decisions can be evaluated through payback period, net present value, and methods involving rates of return.

With this in mind, think about the capital budgeting issues Gearhead's management might have faced. For example, in deciding to expand, should the company buy a building or lease one? What method should be used to evaluate this? Purchasing a building might require more initial outlay, but the company will retain an asset. How will such a decision affect the bottom line? With respect to equipment, Gearhead could maintain a fleet of vehicles. Should the vehicles be purchased or leased? What will need to be considered in the process?

In developing and maintaining its strategy for sustainability, a business must not only consider day-to-day operations, but also address long-term decisions. Common capital budgeting items like equipment purchases to increase efficiency or reduce costs, decisions about replacement versus repair, and expansion all involve significant cash outlay. How will these items be evaluated? How long will recouping the initial investment take? How much revenue will be generated (or costs saved) through capital outlay? Does the company require a minimum rate of return before it moves forward with investment? If so, how is that return determined? Considering Gearhead's decision to expand, what are some specific capital budgeting decisions important for the company to consider in their long-term strategy?

Basic Characteristics of the Net Present Value Model

Net present value helps companies choose between alternatives at a particular point in time by determining which produces the higher NPV. To determine the NPV, the initial investment is subtracted from the present value of cash inflows and outflows associated with a project at a required rate of return. If the outcome is positive, the company should consider investment. If the outcome is negative, the company would forgo investment.

We previously discussed the calculation for present value using the present value tables, where *n* is the

number of years and *i* is the expected interest rate. Once the present value factor is determined, it is multiplied by the expected net cash flows to produce the present value of future cash flows. The initial investment is subtracted from this present value calculation to determine the net present value.

Net present value = Sum of Present Value of net cash flows – Initial Investment

Recall that the Present Value of $1 table is used for a lump sum payout, whereas the Present Value of an Ordinary Annuity table is used for a series of equal payments occurring at the end of each period. Taking this distinction one step further, NPV requires use of different tables depending on whether the future cash flows are equal or unequal in each time period. If the cash flows each period are equal, the company uses the Present Value of an Ordinary Annuity table, where the present value factor is multiplied by the cash flow amount for one period to get the present value. If the cash flows each period are unequal, the company uses the Present Value of $1 table, where the total present value is the sum of each of the unequal cash flows multiplied by the appropriate present value factor for each time period. This concept is discussed in the following example.

Assume that your company, Rudolph Incorporated, is determining the NPV for a new X-ray machine. The X-ray machine has an initial investment of $200,000 and an expected cash flow of $40,000 each period for the next 10 years. The expected $40,000 cash flows from the new X-ray machine can be attributed to either additional revenue generated or cost savings realized by more efficient operations of the new machine. Since these annual cash flows of $40,000 are the same amount in each period over the ten-years this will be a stream of annuity amounts received. The required rate of return on such an investment is 8%. The present value factor (i = 8, n = 10) is 6.710 using the Present Value of an Ordinary Annuity table. Multiplying the present value factor (6.710) by the equal cash flow ($40,000) gives a present value of $268,400. NPV is found by taking the present value of $268,400 and subtracting the initial investment of $200,000 to arrive at $68,400. This is a positive NPV, so the company would consider investment.

Present Value of an Ordinary Annuity Table

Period (*n*)	Rate (*i*)				
	1%	2%	3%	5%	8%
1	0.990	0.980	0.971	0.952	0.926
2	1.970	1.942	1.913	1.859	1.783
3	2.941	2.884	2.829	2.723	2.577
4	3.902	3.808	3.717	3.546	3.312
5	4.853	4.713	4.580	4.329	3.993
6	5.795	5.601	5.417	5.076	4.623
7	6.728	6.472	6.230	5.786	5.206
8	7.652	7.325	7.020	6.463	5.747
9	8.566	8.162	7.786	7.108	6.247
10	9.471	8.983	8.530	7.722	**6.710**

If there are two investments that have a positive NPV, and the investments are mutually exclusive, meaning only one can be chosen, the more profitable of the two investments is typically the appropriate one for a company to choose. We can also use the profitability index to compare them. The profitability index measures the amount of profit returned for each dollar invested in a project. This is particularly useful when projects being evaluated are of a different size, as the profitability index scales the projects to make them comparable. The profitability index is found by taking the present value of the net cash flows and dividing by the initial investment cost.

$$\text{Profitability index} = \frac{\text{Present value of cash flows}}{\text{Initial investment cost}}$$

For example, Rudolph Incorporated is considering the X-ray machine that had present value cash flows of $268,400 (not considering salvage value) and an initial investment cost of $200,000. Another x-ray equipment option, option B, produces present value cash flows of $290,000 and an initial investment cost of $240,000. The profitability index is computed as follows.

$$\text{Option A: } \frac{\$268{,}400}{\$200{,}000} = 1.342$$

$$\text{Option B: } \frac{\$290{,}000}{\$240{,}000} = 1.208$$

Based on this outcome, the company would invest in Option A, the project with a higher profitability index of 1.342.

If there were unequal cash flows each period, the Present Value of $1 table would be used with a more complex calculation. Each year's present value factor is determined and multiplied by that year's cash flow. Then all cash flows are added together to get one overall present value figure. This overall present value figure is used when finding the difference between present value and the initial investment cost.

For example, let's say the X-ray machine information is the same, except now cash flows are as follows:

Year	Cash Flow Amount
1	$20,000
2	25,000
3	20,000
4	40,000
5	40,000
6	60,000
7	30,000
8	35,000
9	25,000
10	45,000

To find the overall present value, the following calculations take place using the present value of $1 table.

Year	Cash Flow Amount	Present Value Factor (i = 8, n = specific year)	Present Value
1	$ 20,000	(i = 8, n = 1) = 0.926	0.926 × $20,000 = $18,520
2	25,000	(i = 8, n = 2) = 0.857	0.857 × 25,000 = 21,425
3	20,000	(i = 8, n = 3) = 0.794	0.794 × 20,000 = 15,880
4	40,000	(i = 8, n = 4) = 0.735	0.735 × 40,000 = 29,400
5	40,000	(i = 8, n = 5) = 0.681	0.681 × 40,000 = 27,240
6	60,000	(i = 8, n = 6) = 0.630	0.630 × 60,000 = 37,800
7	30,000	(i = 8, n = 7) = 0.583	0.583 × 30,000 = 17,490
8	35,000	(i = 8, n = 8) = 0.540	0.540 × 35,000 = 18,900
9	25,000	(i = 8, n = 9) = 0.500	0.500 × 25,000 = 12,500
10	45,000	(i = 8, n = 10) = 0.463	0.463 × 45,000 = 20,835
Total	**$340,000**		**$219,990**

The Present Value of $1 table is used because, each year, a new "lump sum" cash flow is received, so the cash

flow in each period is different. The cash flows are treated as one-time lump sum payouts during that year. The present value for each period looks at each year's present value factor at an interest rate of 8%. All the PVs are added together for a total present value of $219,990. The initial investment of $200,000 is subtracted from the $219,990 to arrive at a positive NPV of $19,990. In this case, the company would consider investment since the outcome is positive. (More complex considerations, such as depreciation, the effects of income taxes, and inflation, which could affect the overall NPV, are covered in advanced accounting courses.)

YOUR TURN

Analyzing a Postage Meter Investment

Yellow Industries is considering investment in a new postage meter system. The postage meter system would have an initial investment cost of $135,000. Annual net cash flows are $40,000 for the next 5 years, and the expected interest rate return is 10%. Calculate net present value and decide whether or not Yellow Industries should invest in the new postage meter system.

Solution

Use the Present Value of an Ordinary Annuity table. Present value factor at $n = 5$ and $i = 10\%$ is 3.791. Present value = 3.791 × $40,000 = $151,640. NPV = $151,640 − $135,000 = $16,640. In this case, Yellow Industries should invest since the NPV is positive.

Calculation and Discussion of the Results of the Net Present Value Model

To demonstrate NPV, assume that a company, Rayford Machining, is considering buying a drill press that will have an initial investment cost of $50,000 and annual cash flows of $10,000 for the next 7 years. Assume that Rayford expects a 5% rate of return on such an investment. We need to determine the NPV when cash flows are equal. The present value factor ($i = 5$, $n = 7$) is 5.786 using the Present Value of an Ordinary Annuity table. We multiply 5.786 by the equal cash flow of $10,000 to get a present value of $57,860. NPV is found by taking the present value of $57,860 and subtracting the initial investment of $50,000 to arrive at $7,860. This is a positive NPV, so the company would consider the investment.

Present Value of an Ordinary Annuity Table

Period (*n*)	Rate (*i*)			
	1%	2%	3%	5%
1	0.990	0.980	0.971	0.952
2	1.970	1.942	1.913	1.859
3	2.941	2.884	2.829	2.723
4	3.902	3.808	3.717	3.546
5	4.853	4.713	4.580	4.329
6	5.795	5.601	5.417	5.076
7	6.728	6.472	6.230	**5.786**

Let's say Rayford Machining has another option, Option B, for a drill press purchase with an initial investment cost of $56,000 that produces present value cash flows of $60,500. The profitability index is computed as follows.

$$\text{Option A: } \frac{\$57{,}860}{\$50{,}000} = 1.157$$

$$\text{Option B: } \frac{\$60{,}500}{\$56{,}000} = 1.080$$

Based on this outcome, the company would invest in Option A, the project with a higher profitability potential of 1.157.

Now let's assume cash flows are unequal. Unequal cash flow information for Rayford Machining is summarized here.

Year	Net Cash Flow
1	$10,000
2	5,000
3	7,000
4	3,000
5	10,000
6	10,000
7	10,000

To find the overall present value, the following calculations take place using the Present Value of $1 table.

Year	Cash Flow Amount	Present Value Factor (i = 5, n = specific year)	Present Value
1	$10,000	(i = 5, n = 1) = 0.952	0.952 × $10,000 = $9,520
2	5,000	(i = 5, n = 2) = 0.907	0.907 × 5,000 = 4,535
3	7,000	(i = 5, n = 3) = 0.864	0.864 × 7,000 = 6,048
4	3,000	(i = 5, n = 4) = 0.823	0.823 × 3,000 = 2,469
5	10,000	(i = 5, n = 5) = 0.784	0.784 × 10,000 = 7,840
6	10,000	(i = 5, n = 6) = 0.746	0.746 × 10,000 = 7,460
7	10,000	(i = 5, n = 7) = 0.711	0.711 × 10,000 = 7,110
Total	**$55,000**		**$44,982**

The present value for each period looks at each year's present value factor at an interest rate of 5%. All individual year present values are added together for a total present value of $44,982. The initial investment of $50,000 is subtracted from the $44,982 to arrive at a negative NPV of $5,018. In this case, Rayford Machining would not invest, since the outcome is negative. The negative NPV value does not mean the investment would be unprofitable; rather, it means the investment does not return the desired 5% the company is looking for in the investments that it makes.

Basic Characteristics of the Internal Rate of Return Model

The internal rate of return model allows for the comparison of profitability or growth potential among alternatives. All external factors, such as inflation, are removed from calculation, and the project with the highest return rate percentage is considered for investment.

IRR is the discounted rate (interest rate) point at which NPV equals zero. In other words, the IRR is the point at which the present value cash inflows equal the initial investment cost. To consider investment, IRR needs to meet or exceed the required rate of return for the investment type. If IRR does not meet the required rate of return, the company will forgo investment.

To find IRR using the present value tables, we need to know the cash flow number of return periods (n) and

the intersecting present value factor. To calculate present value factor, we use the following formula.

$$\text{Present Value Factor} = \frac{\text{Initial Investment Cost}}{\text{Annual Net Cash Flows}}$$

We find the present value factor in the present value table in the row with the corresponding number of periods (*n*). We find the matching interest rate (*i*) at this present value factor. The corresponding interest rate at the number of periods (*n*) is the IRR. When cash flows are equal, use the Present Value of an Ordinary Annuity table to find IRR.

For example, a car manufacturer needs to replace welding equipment. The initial investment cost is $312,000 and each annual net cash flow is $49,944 for the next 9 years. We need to find the internal rate of return for this welding equipment. The expected rate of return for such a purchase is 6%. In this case, *n* = 9 and the present value factor is computed as follows.

$$\text{Present Value Factor} = \frac{\$312{,}000}{\$49{,}944} = 6.247 \text{ (rounded)}$$

Looking at the Present Value of an Ordinary Annuity table, where *n* = 9 and the present value factor is 6.247, we discover that the corresponding return rate is 8%. This exceeds the expected return rate, so the company would typically invest in the project.

Present Value of an Ordinary Annuity Table

Period (*n*)	Rate (*i*)					
	1%	2%	3%	5%	8%	10%
1	0.990	0.980	0.971	0.952	0.926	0.909
2	1.970	1.942	1.913	1.859	1.783	1.736
3	2.941	2.884	2.829	2.723	2.577	2.487
4	3.902	3.808	3.717	3.546	3.312	3.170
5	4.853	4.713	4.580	4.329	3.993	3.791
6	5.795	5.601	5.417	5.076	4.623	4.355
7	6.728	6.472	6.230	5.786	5.206	4.868
8	7.652	7.325	7.020	6.463	5.747	5.335
9	8.566	8.162	7.786	7.108	**6.247**	5.759

If there is more than one viable option, the company will select the alternative with the highest IRR that exceeds the expected rate of return.

Our tables are limited in scope, and therefore, a present value factor may fall in between two interest rates. When this is the case, you may choose to identify an IRR range instead of a single interest rate figure. A spreadsheet program or financial calculator can produce a more accurate result and can also be used when cash flows are unequal.

Calculation and Discussion of the Results of the Internal Rate of Return Model

Assume that Rayford Machining wants to know the internal rate of return for the new drill press. The drill press has an initial investment cost of $50,000 and an annual cash flow of $10,000 for each of the next seven years. The company expects a 7% rate of return on this type of investment. We calculate the present value factor as:

$$\text{Present Value Factor} = \frac{\$50{,}000}{\$10{,}000} = 5.000$$

Scanning the Present Value of an Ordinary Annuity table reveals that the interest rate where the present value factor is 5 and the number of periods is 7 is between 8 and 10%. Since the required rate of return was 7%, Rayford would consider investment in this metal press machine.

Present Value of an Ordinary Annuity Table

Period (*n*)	Rate (*i*)					
	1%	2%	3%	5%	8%	10%
1	0.990	0.980	0.971	0.952	0.926	0.909
2	1.970	1.942	1.913	1.859	1.783	1.736
3	2.941	2.884	2.829	2.723	2.577	2.487
4	3.902	3.808	3.717	3.546	3.312	3.170
5	4.853	4.713	4.580	4.329	3.993	3.791
6	5.795	5.601	5.417	5.076	4.623	4.355
7	6.728	6.472	6.230	5.786	**5.206**	**4.868**
8	7.652	7.325	7.020	6.463	5.747	5.335
9	8.566	8.162	7.786	7.108	6.247	5.759

Consider another example using Rayford, where they have two drill press purchase options. Option A has an IRR between 8% and 10%. The other option, Option B, has an initial investment cost of $60,500 and equal annual net cash flows of $13,256 for the next seven years. We calculate the present value factor as:

$$\text{Present Value Factor} = \frac{\$60{,}500}{\$13{,}256} = 4.564 \text{ (rounded)}$$

Scanning the Present Value of an Ordinary Annuity table reveals that, when the present value factor is 4.564 and the number of periods is 7, the interest rate is 12%. This not only exceeds the 7% required rate, it also exceeds Option A's return of 8% to 10%. Therefore, if resources were limited, Rayford would select Option B over Option A.

Present Value of an Ordinary Annuity Table

Period (*n*)	Rate (*i*)						
	1%	2%	3%	5%	8%	10%	12%
1	0.990	0.980	0.971	0.952	0.926	0.909	0.893
2	1.970	1.942	1.913	1.859	1.783	1.736	1.690
3	2.941	2.884	2.829	2.723	2.577	2.487	2.402
4	3.902	3.808	3.717	3.546	3.312	3.170	3.037
5	4.853	4.713	4.580	4.329	3.993	3.791	3.605
6	5.795	5.601	5.417	5.076	4.623	4.355	4.111
7	6.728	6.472	6.230	5.786	5.206	4.868	**4.564**

Final Summary of the Discounted Cash Flow Models

The internal rate of return (IRR) and the net present value (NPV) methods are types of discounted cash flow analysis that require taking estimated future payments from a project and discounting them into present values. The difference between the two methods is that the NPV calculation determines the project's estimated return in dollars and the IRR provides the percentage rate of return from a project needed to break even.

When the NPV is determined to be $0, the present value of the cash inflows and the present value of the cash outflows are equal. For example, assume that the present value of the cash inflows is $10,000 and the present value of the cash outflows is also $10,000. In this example, the NPV would be $0. At a net present value of zero,

the IRR would be exactly equal to the interest rate that was used to perform the NPV calculation. For example, in the previous example, where both the cash inflows and the cash outflows have present values of $10,000 and the NPV is $0, assume that they were discounted at an 8% interest rate. If you were to then calculate the internal rate of return, the IRR would be 8%, the same interest rate that gave us an NPV of $0.

Overall, it is important to understand that a company must consider the time value of money when making capital investment decisions. Knowing the present value of a future cash flow enables a company to better select between alternatives. The net present value compares the initial investment cost to the present value of future cash flows and requires a positive outcome before investment. The internal rate of return also considers the present value of future cash flows but considers profitability stated in terms of percentage of return on the investment or project. These models allows two or more options to be compared to eliminate bias with raw financial figures.

THINK IT THROUGH

Choosing Investments

Companies are presented with viable alternatives that sometimes produce nearly identical results and profitability goals. If they have the ability to invest in both alternatives, they may do so. But what about when resources are constrained? How do they choose which investment is best for their company?

Consider this: you have two projects that met the payback period and accounting rate of return screenings identically. Project 1 produced an NPV of $45,000 and had an IRR between 5% and 8%. Project 2 produced a NPV of $35,000 and had an IRR of 10%. This leaves you with a difficult choice, since each alternative has a measurement that exceeds the other and the other variables are the same. Which project would you invest in and why?

11.5 Compare and Contrast Non-Time Value-Based Methods and Time Value-Based Methods in Capital Investment Decisions

When an investment opportunity is presented to a company, there are many financial and non-financial factors to consider. Using capital budgeting methods to narrow down the choices by removing unviable alternatives is an important process for any successful business. The four methods for capital budgeting analysis—payback period, accounting rate of return, net present value, and internal rate of return—all have their strengths and weaknesses, which are discussed as follows.

Summary of the Strengths and Weaknesses of the Non-Time Value-Based Capital Budgeting Methods

Non-time value-based capital budgeting methods are best used in an initial screening process when there are many alternatives to choose from. Two such methods are payback method and accounting rate of return. Their strengths and weaknesses are discussed in Table 11.4 and Table 11.5.

The payback method determines the length of time needed to recoup an investment.

Payback Method

Strengths	Weaknesses
• Simple calculation • Screens out many unviable alternatives quickly • Removes high-risk investments from consideration	• Does not consider time value of money • Profitability of an investment is ignored • Cash flows beyond investment return are not considered

Table 11.4

Accounting rate of return measures incremental increases to net income. This method has several strengths and weaknesses that are similar to payback period but include a deeper evaluation of income.

Accounting Rate of Return

Strengths	Weaknesses
• Simple calculation • Screens out many unviable options quickly • Considers the impact on income rather than cash flows only (profitability)	• Does not consider the time value of money • Return rates for the entire lifespan of the investment is not considered • External factors, such as inflation, are ignored • Return rates override the risk of investment

Table 11.5

Because of the limited information each of the non-time value-based methods give, they are typically used in conjunction with time value-based capital budgeting methods.

Summary of the Strengths and Weaknesses of the Time Value-Based Capital Budgeting Methods

Time value-based capital budgeting methods are best used after an initial screening process, when a company is choosing between few alternatives. They help determine the best of the alternatives that a company should pursue. Two such methods are net present value and internal rate of return. Their strengths and weaknesses are presented in Table 11.6 and Table 11.7.

Net present value converts future cash flow dollars into current values to determine if the initial investment is less than the future returns.

Net Present Value

Strengths	Weaknesses
• Considers the time value of money • Acknowledges higher risk investments • Comparable future earnings with today's value • Allows for a selection of investment	• Requires a more difficult calculation than non-time value methods • Required return rate is an estimate, thus any changes to this condition and the impact that has on earnings are unknown • Difficult to compare alternatives that have varying investment amounts

Table 11.6

Internal rate of return looks at future cash flows as compared to an initial investment to find the rate of return on investment. The goal is to have an interest rate higher than the predetermined rate of return to consider investment.

Internal Rate of Return

Strengths	Weaknesses
• Considers the time value of money • Easy to compare different-sized investments, removes dollar bias • A predetermined rate of return is not required • Allows for a selection of investment	• Does not acknowledge higher risk investments because the focus is on return rates • More difficult calculation than non-time value methods, and outcome may be uncertain if not using a financial calculator or spreadsheet program • If the time for return on investment is important, IRR will not place more importance on shorter-term investments

Table 11.7

After a time-value based capital budgeting method is analyzed, a company can be move toward a decision on an investment opportunity. This is of particular importance when resources are limited.

Before discussing the mechanics of choosing the NPV versus the IRR method for decision-making, we first need to discuss one cardinal rule of using the NPV or IRR methods to evaluate time-sensitive investments or asset purchases: If a project or investment has a positive NPV, then it will, by definition, have an IRR that is above the interest rate used to calculate the NPV.

For example, assume that a company is considering buying a piece of equipment. They determine that it will cost $30,000 and will save them $10,000 a year in expenses for five years. They have decided that the interest rate that they will choose to calculate the NPV and to evaluate the purchase IRR is 8%, predicated on current

loan rates available. Based on this sample data, the NPV will be positive $9,927 ($39,927 PV for inflows and $30,000 PV for the outflows), and the IRR will be 19.86%. Since the calculations require at least an 8% return, the company would accept the project using either method. We will not spend additional time on the calculations at this point, since our purpose is to create numbers to analyze. If you want to duplicate the calculations, you can use a software program such as Excel or a financial calculator.

CONCEPTS IN PRACTICE

Solar Energy as Capital Investment

A recent capital investment decision that many company leaders need to make is whether or not to invest in solar energy. Solar energy is replacing fossil fuels as a power source, and it provides a low-cost energy, reducing overhead costs. The expensive up-front installation costs can deter some businesses from making the initial investment.

Businesses must now choose between an expensive initial capital outlay and the long-term benefits of solar power. A capital investment such as this would require an initial screening and preference process to determine if the cost savings and future benefits are worth more today than the current capital expenditure. If it makes financial sense, they may look to invest in this increasingly popular energy source.

Now, we return to our comparison of the NPV and IRR methods. There are typically two situations that we want to consider. The first involves looking at projects that are not mutually exclusive, meaning we can consider more than one possibility. If a company is considering non-mutually exclusive opportunities, they will generally consider all options that have a positive NPV or an IRR that is above the target rate of interest as favorable options for an investment or asset purchase. In this situation, the NPV and IRR methods will provide the same accept-or-reject decision. If the company accepts a project or investment under the NPV calculation, then they will accept it under the IRR method. If they reject it under the NPV calculation, then they will also reject under the IRR method.

The second situation involves mutually exclusive opportunities. For example, if a company has one computer system and is considering replacing it, they might look at seven options that have favorable NPVs and IRRs, even though they only need one computer system. In this case, they would choose only one of the seven possible options.

In the case of mutually exclusive options, it is possible that the NPV method will select Option A while the IRR method might choose Option D. The primary reason for this difference is that the NPV method uses dollars and the IRR uses an interest rate. The two methods may select different options if the company has investments with major differences in costs in terms of dollars. While both will identify an investment or purchase that exceeds the required standards of a positive NPV or an interest rate above the target interest rate, they might lead the company to choose different positive options. When this occurs, the company needs to consider other conditions, such as qualitative factors, to make their decision. Future cost accounting or finance courses will cover this content in more detail.

Final Comparison of the Four Capital Budgeting Options

A company will be presented with many alternatives for investment. It is up to management to analyze each investment's possibilities using capital budgeting methods. The company will want to first screen each possibility with the payback method and accounting rate of return. The payback method will show the company how long it will take to recoup their investment, while accounting rate of return gives them the profitability of the alternatives. This screening will typically get rid of non-viable options and allow the company to further consider a select few alternatives. A more detailed analysis is found in time-value methods, such as net present value and internal rate of return. Net present value converts future cash flows into today's valuation for comparability purposes to see if an initial outlay of cash is worth future earnings. The internal rate of return determines the minimum expected return on a project given the present value of cash flow expectations and the initial investment. Analyzing these opportunities, with consideration given to time value of money, allows a company to make an informed decision on how to make large capital expenditures.

ETHICAL CONSIDERATIONS

Barclays and the LIBOR Scandal

As discussed in Volkswagen Diesel Emissions Scandal, when a company makes an unethical decision, it must adjust its budget for fines and lawsuits. In 2012, Barclays, a British financial services company, was caught illegally manipulating LIBOR interest rates. LIBOR sets the interest rate for many types of loans. As CNN reported, "LIBOR, which stands for London Interbank Offered Rate, is the rate at which banks lend to each other, and is used globally to price financial products, such as mortgages, worth hundreds of trillions of dollars."[4]

While Volkswagen decided to cover the costs related to fines and lawsuits by reducing its capital budget for technology and research, Barclays took a different approach. The company chose to "cut or claw back of about 450 million pounds ($680 million) of pay from its staff" and from past pay packages "another 140 million pounds ($212 million)."[5] Instead of reducing other areas of its capital budget, Barclays decided to cover its fines and lawsuits by cutting employee compensation.

The LIBOR scandal involved a number of international banks and rocked the international banking community. An independent review of Barclays reported that "if Barclays is to achieve a material improvement in its reputation, it will need to continue to make changes to its top levels of pay so as to reflect talent and contribution more realistically, and in ways that mean something to the general public."[6] Previously, as described by the company website, "Barclays has been a leader in innovation; funding the world's first industrial steam railway, naming the UK's first female branch manager and introducing the world's first ATM machine."[7] The positive reputation Barclays built over 300 years was tarnished by just one scandal, and demonstrates the difficulty of calculating just how much unethical behavior will cost a company's reputation.

4 Charles Riley. "Remember the Libor Scandal? Well It's Coming Back to Haunt the Bank of England." CNN. April 10, 2017. https://money.cnn.com/2017/04/10/investing/bank-of-england-libor-barclays/index.html

5 Steve Slater. "Barclays to Cut Pay by $890 Million over Scandals: Source." Reuters. February 27, 2013. https://www.reuters.com/article/us-barclays-libor-pay/barclays-to-cut-pay-by-890-million-over-scandals-source-idUSBRE91Q0SD20130227

6 Anthony Salz. *Salz Review: An Independent Review of Barclays' Business Practices.* April 3, 2018. https://online.wsj.com/public/resources/documents/SalzReview04032013.pdf

7 "Our History." Barclays. n.d. https://www.banking.barclaysus.com/our-history.html

LINK TO LEARNING

A popular television show, *Shark Tank*, explores the decision-making process investors use when considering ownership in a new business. Entrepreneurs will pitch their business concept and current position to the "sharks," who will evaluate the business using capital budgeting methods, such as payback period and net present value, to decide whether or not to invest in the entrepreneur's company. Learn more about Shark Tank's concept and success stories (https://openstax.org/l/50SharkTank) on the web.

Key Terms

accounting rate of return (ARR) return on investment considering changes to net income
alternatives options available for investment
annuities due equal installments paid at the beginning of each payment period within the series
annuity series of equal payments made over time
capital investment company's contribution of funds toward long-term assets for further growth; also called *capital budgeting*
cash flow cash receipts and cash disbursements as a result of business activity
cash inflow money received or cost savings from a capital investment
cash outflow money paid or increased cost expenditures from capital investment
compounding earning interest on previous interest earned, along with the interest earned on the original investment
discounted cash flow model assigns a value to a business opportunity using time-value measurement tools
discounting process that determines the present value of a single payment or stream of payments to be received
future value (FV) value of an investment after a certain period of time
hurdle rate minimum required rate of return on an investment to consider an alternative for further evaluation
internal rate of return method (IRR) calculation to determine profitability or growth potential of an investment, expressed as a percentage, at the point where NPV equals zero
lump sum one-time payment or repayment of funds at a particular point in time
net present value method (NPV) discounts future cash flows to their present value at the expected rate of return, and compares that to the initial investment
non-time value methods analysis that does not consider the comparison value of a dollar today to a dollar in the future
operating expenses daily operational costs not associated with the direct selling of products or services
ordinary annuities equal installments paid at the end of each payment period within the series
payback method (PM) calculation of the length of time it takes a company to recoup their initial investment
preference decision process of comparing potential projects that meet screening decision criteria, and will rank order of importance, feasibility, and desirability to differentiate among alternatives
present value (PV) future value of an investment expressed in today's value
screening decision process of removing alternatives from the decision-making process that would be less desirable to pursue given their inability to meet basic standards
time value of money assertion that the value of a dollar today is worth more than the value of a dollar in the future

Summary

11.1 Describe Capital Investment Decisions and How They Are Applied

- Capital investment decisions select a project for future business development. These projects typically require a large outlay of cash, provide an uncertain return, and tie up resources for an extended period of time.
- Having a large number of alternatives requires a careful budgeting and analysis process. This process includes determining capital needs, exploring resource limitations, establishing baseline criteria for

alternatives, evaluating alternatives using screening and preference decisions, and making the decision.
- Screening decisions help eliminate undesirable alternatives that may waste time and money. Preference decisions rank alternatives emerging from the screening process to help make the final decision. Both decision avenues use capital budgeting methods to select between alternatives.

11.2 Evaluate the Payback and Accounting Rate of Return in Capital Investment Decisions

- The payback method determines how long it will take a company to recoup their investment. Annual cash flows are compared to the initial investment but the time value of money is not considered and cashflows beyond the payback period are ignored.
- The accounting rate of return considers incremental net income as it compares to the initial investment. Time value of money is not considered with this method.
- Incremental net income determines the net income expected if the company accepts the investment opportunity, as opposed to not investing. Incremental net income is the difference between incremental revenues and incremental expenses.

11.3 Explain the Time Value of Money and Calculate Present and Future Values of Lump Sums and Annuities

- A dollar is worth more today than it will be in the future. This is due to many reasons including the power of investment in today's economy, market inflation, and the ability to use the money in the present to make more money in the future, with interest.
- Present value expresses the future value of a dollar in today's (present) value. Present value tables, showing the present value factor intersection of periods and interest rate, are used to multiply by the final payout amount to compute today's value.
- The future value shows what the value of an investment will be after a certain period of time. Future value tables, showing the future value factor intersection of periods and interest rate, are used to multiply by the initial investment amount to compute future value.
- A lump sum is a one-time payment after a certain period of time, whereas an ordinary annuity involves equal installments in a series of payments over time. A business can use lump sum or ordinary annuity calculations for present value and future value calculations.

11.4 Use Discounted Cash Flow Models to Make Capital Investment Decisions

- The discounted cash flow model assigns values to a project's alternatives using time value of money and discounts future rates back to present value. Two measurement tools are used in discounted cash flows: net present value and internal rate of return.
- Net present value considers an expected rate of return, converts future cash flows into present value, and compares that to the initial investment cost. If the outcome is positive, the company would look to invest in the project.
- Internal rate of return shows the profitability of an investment, where NPV equals zero. If the corresponding interest rate exceeds the expected rate of return, the company would invest in the project.

11.5 Compare and Contrast Non-Time Value-Based Methods and Time Value-Based Methods in Capital Investment Decisions

- The payback method uses a simple calculation, removes unviable alternatives quickly, and considers investment risk. However, it disregards the time value of money, ignores profitability, and does not consider cash flows after recouping the investment.
- The accounting rate of return uses a simple calculation, considers profitability, and removes unviable options quickly. However, it disregards the time value of money, values return rates more than risk, and ignores external influential factors.

- Net present value considers the time value of money, ranks higher risk investments, and compares future earnings in today's value. However, it cannot easily compare dissimilar investment opportunities, it uses a more difficult calculation, and it has limitations with the estimation of an expected rate of return.
- Internal rate of return considers the time value of money, removes the dollar bias, and leads a company to a decision, unlike non-time value methods. However, it has a bias toward return rates instead of higher risk investment consideration, it is a more difficult calculation, and it does not consider the time it will take to recoup an investment.

Multiple Choice

1. LO 11.1 Capital investment decisions often involve all of the following *except* _____.

A. qualitative factors or considerations
B. short periods of time
C. large amounts of money
D. risk

2. LO 11.1 Preference decisions compare potential projects that meet screening decision criteria and will be ranked in their preference order to differentiate between alternatives with respect to all of the following characteristics *except* _____.

A. political prominence
B. feasibility
C. desirability
D. importance

3. LO 11.1 The third step for making a capital investment decision is to establish baseline criteria for alternatives. Which of the following would *not* be an acceptable baseline criterion?

A. payback method
B. accounting rate of return
C. internal rate of return
D. inventory turnover

4. LO 11.3 You are explaining time value of money factors to your friend. Which factor would you explain as being larger?

A. The future value of $1 for 12 periods at 6% is larger.
B. The present value of $1 for 12 periods at 6% is larger.
C. Neither one is larger because they are equal.
D. There is not enough information given to answer this question.

5. LO 11.3 If you are saving the same amount each month in order to buy a new sports car when the new models are released, which of the following will help you determine the savings needed?

A. future value of one dollar ($1)
B. present value of one dollar ($1)
C. future value of an ordinary annuity
D. present value of an ordinary annuity

6. LO 11.3 You want to invest $8,000 at an annual interest rate of 8% that compounds annually for 12 years. Which table will help you determine the value of your account at the end of 12 years?

A. future value of one dollar ($1)
B. present value of one dollar ($1)
C. future value of an ordinary annuity
D. present value of an ordinary annuity

7. LO 11.3 Using the information provided, what transaction represents the best application of the present value of an annuity due of $1?

A. Falcon Products leases an office building for 8 years with annual lease payments of $100,000 to be made at the beginning of each year.
B. Compass, Inc., signs a note of $32,000, which requires the company to pay back the principal plus interest in four years.
C. Bahwat Company plans to deposit a lump sum of $100,000 for the construction of a solar farm in 4 years.
D. NYC Industries leases a car for 4 yearly annual lease payments of $12,000, where payments are made at the end of each year.

8. LO 11.3 Grummet Company is acquiring a new wood lathe with a cash purchase price of $80,000. The Wood Master Industries (the manufacturer) has agreed to accept $23,500 at the end of each of the next 4 years. Based on this deal, how much interest will Grummet pay over the life of the loan?

A. $94,000
B. $80,000
C. $23,500
D. $14,000

9. LO 11.3 The process that determines the present value of a single payment or stream of payments to be received is _____.

A. compounding
B. discounting
C. annuity
D. lump-sum

10. LO 11.3 The process of reinvesting interest earned to generate additional earnings over time is _____.

A. compounding
B. discounting
C. annuity
D. lump-sum

11. LO 11.4 The NPV method assumes that cash inflows associated with a particular investment occur when?

A. only at the time of the initial investment
B. only at the end of the year
C. only at the beginning of the year
D. at any of these times

12. LO 11.4 Which of the following does *not* assign a value to a business opportunity using time-value measurement tools?

A. internal rate of return (IRR) method
B. net present value (NPV)
C. discounted cash flow model
D. payback period method

13. LO 11.4 Which of the following discounts future cash flows to their present value at the expected rate of return, and compares that to the initial investment?

A. internal rate of return (IRR) method
B. net present value (NPV)
C. discounted cash flow model
D. future value method

14. LO 11.4 This calculation determines profitability or growth potential of an investment, expressed as a percentage, at the point where NPV equals zero

A. internal rate of return (IRR) method
B. net present value (NPV)
C. discounted cash flow model
D. future value method

15. LO 11.5 The IRR method assumes that cash flows are reinvested at _____.

A. the internal rate of return
B. the company's discount rate
C. the lower of the company's discount rate or internal rate of return
D. an average of the internal rate of return and the discount rate

16. LO 11.5 When using the NPV method for a particular invenstment deicision, if the present value of all cash inflows is greater than the present value of all cash outflows, then _____.

A. the discount rate used was too high
B. the investment provides an actual rate of return greater than the discount rate
C. the investment provides an actual rate of return equal to the discount rate
D. the discount rate is too low

Questions

1. LO 11.1 What are the steps involved in the process for capital decision-making?

2. LO 11.1 Why does a company evaluate both the money allocated to a project and the time allocated to the project?

3. LO 11.1 What is the next thing a company needs to do after it establishes investment criteria?

4. LO 11.1 What is the screening decision?

5. LO 11.1 Your supervisor is on the company's capital investment decision team that is to decide on alternatives for the acquisition of a new computer system for the company. The supervisor says, "The book value of the existing computer system for the firm that we are considering replacing is nothing but an accounting amount and as such is irrelevant in the capital expenditure analysis." Does this reasoning make sense? Why or why not?

6. LO 11.1 Ekon owns a small tow-truck business that responds to state patrol requests to tow cars involved in wrecks, as well as to private business requests from customers at various auto repair shops and individuals with stalled autos. Ekon's business is open 24/7 for 365 days a year. He is starting to see too many repairs on his three trucks, which either means that he loses business or must divert a truck from another area. He is now trying to consider whether it is best to continue use of the current trucks or whether he needs to invest some money in new trucks.

Using the steps for the process of capital decision-making, create an outline with sub-steps that include questions Ekon can use to guide his investigation or considerations of buying new trucks.

7. LO 11.2 What is the payback method used to determine?

8. LO 11.2 What are one advantage and one disadvantage of the payback method?

9. LO 11.2 What are one advantage and one disadvantage of the accounting rate of return method?

10. LO 11.2 What is the equation to calculate the payback period?

11. LO 11.2 What is the equation to calculate the accounting rate of return?

12. LO 11.3 What is future value and what is one example where it might be used?

13. LO 11.3 Why do businesses consider time value of money before making an investment decision?

14. LO 11.3 What determines the anticipated interest rate payout for an investment?

15. LO 11.3 To calculate present value of a lump sum, which table would be used?

16. LO 11.3 What is the definition of *present value*?

17. LO 11.4 What is the difference between the discount rate used for net present value and the internal rate of return methods?

18. LO 11.4 Briefly explain how NPV is computed and interpreted.

19. LO 11.4 What is the basic benefit of using IRR?

20. LO 11.4 How is the IRR determined if there are uneven cash flows?

21. LO 11.5 A fellow student studying managerial accounting says, "The net present value (NPV) weighs early receipts of cash much more heavily than more distant receipts of cash." Do you agree or disagree? Why?

22. LO 11.5 What are the strengths and weaknesses of NPV?

23. LO 11.5 What are the strengths and weaknesses of IRR?

24. LO 11.5 How does the size of the initial investment affect the internal rate of return on the net present value models?

Exercise Set A

EA1. LO 11.1 Bob's Auto Repair has determined that it needs new lift equipment to acquire more business opportunities. However, one or more alternatives meet or exceed the minimum expectations Bob has for the new lift equipment. As a result, what type of decision should Bob make for his company?

EA2. LO 11.1 In practice, external factors can impact a capital investment. Give a current external factor that may currently impact or cause instability of capital spending either here or abroad.

EA3. LO 11.2 If a copy center is considering the purchase of a new copy machine with an initial investment cost of $150,000 and the center expects an annual net cash flow of $20,000 per year, what is the payback period?

EA4. LO 11.2 Assume a company is going to make an investment of $450,000 in a machine and the following are the cash flows that two different products would bring in years one through four. Which of the two options would you choose based on the payback method?

Option A, Product A	Option B, Product B
$190,000	$150,000
190,000	180,000
60,000	60,000
20,000	70,000

EA5. LO 11.2 If a garden center is considering the purchase of a new tractor with an initial investment cost of $120,000, and the center expects a return of $30,000 in year one, $20,000 in years two and three, $15,000 in years four and five, and $10,000 in year six and beyond, what is the payback period?

EA6. LO 11.2 The management of Kawneer North America is considering investing in a new facility and the following cash flows are expected to result from the investment:

Year	Cash Outflow	Cash Inflow
1	$1,900,000	$100,000
2	550,000	200,000
3		360,000
4		480,000
5		510,000
6		600,000
7		590,000
8		300,000
9		250,000
10		250,000

A. What is the payback period of this uneven cash flow?
B. Does your answer change if year 10's cash inflow changes to $500,000?

EA7. LO 11.2 A mini-mart needs a new freezer and the initial investment will cost $300,000. Incremental revenues, including cost savings, are $200,000, and incremental expenses, including depreciation, are $125,000. There is no salvage value. What is the accounting rate of return (ARR)?

EA8. LO 11.3 You put $250 in the bank for 5 years at 12%.

A. If interest is added at the end of the year, how much will you have in the bank after one year? Calculate the amount you will have in the bank at the end of year two and continue to calculate all the way to the end of the fifth year.
B. Use the future value of $1 table in Appendix B and verify that your answer is correct.

EA9. LO 11.3 If you invest $12,000 today, how much will you have in (for further instructions on future value in Excel, see Appendix C):

A. 10 years at 9%
B. 8 years at 12%
C. 14 years at 15%
D. 19 years at 18%

EA10. LO 11.3 You have been depositing money into an account yearly based on the following investment amounts, rates and times, what is the value of that investment account at the end of that period?

Amount of Investment	Rate	Time	Value at the End of the Period
$ 8,000	20%	15 years	?
12,000	15%	10 years	?
15,500	12%	5 years	?
35,500	10%	2 years	?

EA11. LO 11.3 How much would you invest today in order to receive $30,000 in each of the following (for further instructions on present value in Excel, see Appendix C):

A. 10 years at 9%
B. 8 years at 12%
C. 14 years at 15%
D. 19 years at 18%

EA12. LO 11.3 Your friend has a trust fund that will pay her the following amounts at the given interest rate for the given number of years. Calculate the current (present) value of your friend's trust fund payments. For further instructions on future value in Excel, see Appendix C.

Amount of Yearly Receipt	Rate	Time	Current Value
$ 6,200	10%	5 years	?
12,200	12%	10 years	?
18,000	15%	15 years	?
22,500	20%	20 years	?

EA13. LO 11.3 Julio Company is considering the purchase of a new bubble packaging machine. If the machine will provide $20,000 annual savings for 10 years and can be sold for $50,000 at the end of the period, what is the present value of the machine investment at a 9% interest rate with savings realized at year end?

EA14. LO 11.3 How much must be invested now to receive $30,000 for 10 years if the first $30,000 is received one year from now and the rate is 8%?

EA15. LO 11.4 Project A costs $5,000 and will generate annual after-tax net cash inflows of $1,800 for five years. What is the NPV using 8% as the discount rate?

EA16. LO 11.4 Project B cost $5,000 and will generate after-tax net cash inflows of $500 in year one, $1,200 in year two, $2,000 in year three, $2,500 in year four, and $2,000 in year five. What is the NPV using 8% as the discount rate? For further instructions on net present value in Excel, see Appendix C.

EA17. LO 11.4 Gardner Denver Company is considering the purchase of a new piece of factory equipment that will cost $420,000 and will generate $95,000 per year for 5 years. Calculate the IRR for this piece of equipment. For further instructions on internal rate of return in Excel, see Appendix C.

EA18. LO 11.4 Consolidated Aluminum is considering the purchase of a new machine that will cost $308,000 and provide the following cash flows over the next five years: $88,000, 92,000, $91,000, $72,000, and $71,000. Calculate the IRR for this piece of equipment. For further instructions on internal rate of return in Excel, see Appendix C.

EA19. LO 11.4 Redbird Company is considering a project with an initial investment of $265,000 in new equipment that will yield annual net cash flows of $45,800 each year over its seven-year life. The company's minimum required rate of return is 8%. What is the internal rate of return? Should Redbird accept the project based on IRR?

EA20. LO 11.5 Towson Industries is considering an investment of $256,950 that is expected to generate returns of $90,000 per year for each of the next four years. What is the investment's internal rate of return?

EA21. LO 11.5 Cinemar Productions bought a piece of equipment for $55,898 that will last for 5 years. The equipment will generate net operating cash flows of $14,000 per year and will have no salvage value at the end of its life. What is the internal rate of return?

Exercise Set B

EB1. LO 11.1 Margo's Memories, a company that specializes in photography and creating family and group photo portfolios, has 50 stores in major malls around the U.S. The company is considering an online business, which will require a substantial investment in web design, security, payment processing, and technology in order to launch successfully. What potential advantages or disadvantages will be difficult to quantify from a capital investment standpoint?

EB2. LO 11.1 Boxer Production, Inc., is in the process of considering a flexible manufacturing system that will help the company react more swiftly to customer needs. The controller, Mick Morrell, estimated that the system will have a 10-year life and a required return of 10% with a net present value of negative $500,000. Nevertheless, he acknowledges that he did not quantify the potential sales increases that might result from this improvement on the issue of on-time delivery, because it was too difficult to quantify.

If there is a general agreement that qualitative factors may offer an additional net cash flow of $150,000 per year, how should Boxer proceed with this investment?

EB3. LO 11.2 A restaurant is considering the purchase of new tables and chairs for their dining room with an initial investment cost of $515,000, and the restaurant expects an annual net cash flow of $103,000 per year. What is the payback period?

EB4. LO 11.2 Assume a company is going to make an investment in a machine of $825,000 and the following are the cash flows that two different products would bring. Which of the two options would you choose based on the payback method?

Option A, Product A	Option B, Product B
$245,000	$225,000
195,000	345,000
295,000	250,000
245,000	225,000

EB5. LO 11.2 A grocery store is considering the purchase of a new refrigeration unit with an initial investment of $412,000, and the store expects a return of $100,000 in year one, $72,000 in years two and three, $65,000 in years four and five, and $38,000 in year six and beyond, what is the payback period?

EB6. LO 11.2 The management of Ryland International is considering investing in a new facility and the following cash flows are expected to result from the investment:

Year	Cash Outflow	Cash Inflow
1	$ 700,000	$200,000
2	2,100,000	400,000
3		260,000
4		360,000
5		260,000
6		800,000
7		480,000
8		400,000
9		420,000
10		420,000

A. What is the payback period of this uneven cash flow?
B. Does your answer change if year 6's cash inflow changes to $920,000?

EB7. LO 11.2 An auto repair company needs a new machine that will check for defective sensors. The machine has an initial investment of $224,000. Incremental revenues, including cost savings, are $120,000, and incremental expenses, including depreciation, are $50,000. There is no salvage value. What is the accounting rate of return (ARR)?

EB8. LO 11.3 You put $600 in the bank for 3 years at 15%.

A. If interest is added at the end of the year, how much will you have in the bank after one year? Calculate the amount you will have in the bank at the end of year two and continue to calculate all the way to the end of the third year.
B. Use the future value of $1 table in Appendix B and verify that your answer is correct.

EB9. LO 11.3 If you invest $15,000 today, how much will you have in (for further instructions on future value in Excel, see Appendix C):

A. 20 years at 22%
B. 12 years at 10%
C. 5 years at 14%
D. 2 years at 7%

EB10. LO 11.3 You have been depositing money into an account yearly based on the following investment amounts, rates and times. What is the value of that investment account at the end of that period?

Amount of Investment	Rate	Time	Value at the End of the Period
$ 4,000	12%	14 years	?
6,000	15%	10 years	?
13,500	10%	8 years	?
22,250	20%	6 years	?

EB11. LO 11.3 How much would you invest today in order to receive $30,000 in each of the following (for further instructions on present value in Excel, see Appendix C):

A. 20 years at 22%
B. 12 years at 10%
C. 5 years at 14%
D. 2 years at 7%

EB12. LO 11.3 Your friend has a trust fund that will pay her the following amounts at the given interest rate for the given number of years. Calculate the current (present) value of your friend's trust fund payments. For further instructions on present value in Excel, see Appendix C.

Amount of Yearly Receipt	Rate	Time	Current Value
$ 5,000	10%	5 years	?
7,500	12%	10 years	?
14,000	15%	15 years	?
25,000	20%	20 years	?

EB13. LO 11.3 Conestoga Plumbing plans to invest in a new pump that is anticipated to provide annual savings for 10 years of $50,000. The pump can be sold at the end of the period for $100,000. What is the present value of the investment in the pump at a 9% interest rate given that savings are realized at year end?

EB14. LO 11.3 How much must be invested now to receive $50,000 for 8 years if the first $50,000 is received in one year and the rate is 10%?

EB15. LO 11.4 Project X costs $10,000 and will generate annual net cash inflows of $4,800 for five years. What is the NPV using 8% as the discount rate?

EB16. LO 11.4 Project Y cost $8,000 and will generate net cash inflows of $1,500 in year one, $2,000 in year two, $2,500 in year three, $3,000 in year four and $2,000 in year five. What is the NPV using 8% as the discount rate?

EB17. LO 11.4 Caduceus Company is considering the purchase of a new piece of factory equipment that will cost $565,000 and will generate $135,000 per year for 5 years. Calculate the IRR for this piece of equipment. For further instructions on internal rate of return in Excel, see Appendix C.

EB18. LO 11.4 Garnette Corp is considering the purchase of a new machine that will cost $342,000 and provide the following cash flows over the next five years: $99,000, $88,000, $92,000, $87,000, and $72,000. Calculate the IRR for this piece of equipment. For further instructions on internal rate of return in Excel, see Appendix C.

EB19. LO 11.4 Wallace Company is considering two projects. Their required rate of return is 10%.

	Project A	Project B
Initial investment	$170,000	$48,000
Annual cash flows	$41,352	$12,022
Life of the project	6 years	5 years

Which of the two projects, A or B, is better in terms of internal rate of return?

EB20. LO 11.5 Taos Productions bought a piece of equipment for $79,860 that will last for 5 years. The equipment will generate net operating cash flows of $20,000 per year and will have no salvage value at the end of its life. What is the internal rate of return?

Problem Set A

PA1. LO 11.2 Your company is planning to purchase a new log splitter for its lawn and garden business. The new splitter has an initial investment of $180,000. It is expected to generate $25,000 of annual cash flows, provide incremental cash revenues of $150,000, and incur incremental cash expenses of $100,000 annually.

What is the payback period and accounting rate of return (ARR)?

PA2. LO 11.2 Jasmine Manufacturing is considering a project that will require an initial investment of $52,000 and is expected to generate future cash flows of $10,000 for years 1 through 3, $8,000 for years 4 and 5, and $2,000 for years 6 through 10. What is the payback period for this project?

PA3. LO 11.3 Use the tables in Appendix B to answer the following questions.

A. If you would like to accumulate $2,500 over the next 4 years when the interest rate is 15%, how much do you need to deposit in the account?
B. If you place $6,200 in a savings account, how much will you have at the end of 7 years with a 12% interest rate?
C. You invest $8,000 per year for 10 years at 12% interest, how much will you have at the end of 10 years?
D. You win the lottery and can either receive $750,000 as a lump sum or $50,000 per year for 20 years. Assuming you can earn 8% interest, which do you recommend and why?

PA4. LO 11.3 Ralston Consulting, Inc., has a $25,000 overdue debt with Supplier No. 1. The company is low on cash, with only $7,000 in the checking account and does not want to borrow any more cash. Supplier No. 1 agrees to settle the account in one of two ways:

Option 1: Pay $7,000 now and $23,750 when some large projects are finished, two years from today.

Option 2: Pay $35,000 three years from today, when even larger projects are finished.

Assuming that the only factor in the decision is the cost of money (8%), which option should Ralston choose?

PA5. LO 11.4 Falkland, Inc., is considering the purchase of a patent that has a cost of $50,000 and an estimated revenue producing life of 4 years. Falkland has a cost of capital of 8%. The patent is expected to generate the following amounts of annual income and cash flows:

	Year 1	Year 2	Year 3	Year 4
Net income	$ 5,100	$ 6,500	$ 6,300	$ 3,000
Operating cash flows	17,050	18,450	18,250	14,850

A. What is the NPV of the investment?
B. What happens if the required rate of return increases?

PA6. LO 11.4 There are two projects under consideration by the Rainbow factory. Each of the projects will require an initial investment of $35,000 and is expected to generate the following cash flows:

	Year 1	Year 2	Year 3	Total
Alpha Project	$32,000	$22,500	$ 5,000	$59,500
Beta Project	7,500	23,500	28,000	59,000

If the discount rate is 12%, compute the NPV of each project.

PA7. LO 11.4 There are two projects under consideration by the Rainbow factory. Each of the projects will require an initial investment of $35,000 and is expected to generate the following cash flows:

	Year 1	Year 2	Year 3	Total
Alpha Project	$32,000	$22,500	$ 5,000	$59,500
Beta Project	7,500	23,500	28,000	59,000

Use the information from the previous exercise to calculate the internal rate of return on both projects and make a recommendation on which one to accept. For further instructions on internal rate of return in Excel, see Appendix C.

PA8. LO 11.4 Pompeii's Pizza has a delivery car that it uses for pizza deliveries. The transmission needs to be replaced and there are several other repairs that need to be done. The car is nearing the end of its life, so the options are to either overhaul the car or replace it with a new car. Pompeii's has put together the following budgetary items:

	Present Car	New Car
Purchase cost new		$31,000
Transmission and other repairs	$ 8,500	
Annual cash operating cost	12,500	10,000
Fair market value now	5,000	
Fair market value in five years	500	5,000

If Pompeii's replaces the transmission of the pizza delivery vehicle, they expect to be able to use the vehicle for another 5 years. If they sell the old vehicle and purchase a new vehicle, they will use that vehicle for 5 years and then trade it in for another new pizza delivery vehicle. If they trade for the new delivery vehicle, their operating expenses will decrease because the new vehicle is more gas efficient and the maintenance on a new car is less. This project is analyzed using a discount rate of 12%. What should Pompeii's do?

PA9. LO 11.4 Pitt Company is considering two alternative investments. The company requires a 12% return from its investments. Neither option has a salvage value.

	Project X	Project Y
Initial investment	$180,000	$118,000
Net cash flows anticipated:		
Year 1	82,000	35,000
Year 2	59,000	55,000
Year 3	92,000	72,000
Year 4	81,000	68,000
Year 5	76,000	27,000

Compute the IRR for both projects and recommend one of them. For further instructions on internal rate of return in Excel, see Appendix C.

PA10. LO 11.5 The Ham and Egg Restaurant is considering an investment in a new oven that has a cost of $60,000, with annual net cash flows of $9,950 for 8 years. The required rate of return is 6%. Compute the net present value of this investment to determine whether or not you would recommend that Ham and Egg invest in this oven.

PA11. LO 11.5 Gallant Sports is considering the purchase of a new rock-climbing facility. The company estimates that the construction will require an initial outlay of $350,000. Other cash flows are estimated as follows:

Year 1	($ 60,000)
Year 2	$140,000
Year 3	$210,000
Year 4	$130,000

Assuming the company limits its analysis to four years due to economic uncertainties, determine the net present value of the rock-climbing facility. Should the company develop the facility if the required rate of return is 6%?

Problem Set B

PB1. LO 11.2 A bookstore is planning to purchase an automated inventory/remote marketing system, which includes an upgrade to a more sophisticated cash register system. The package has an initial investment cost of $360,000. It is expected to generate $144,000 of annual cash flows, reduce costs and provide incremental cash revenues of $326,000, and incur incremental cash expenses of $200,000 annually.

What is the payback period and accounting rate of return (ARR)?

PB2. LO 11.2 Markoff Products is considering two competing projects, but only one will be selected. Project A requires an initial investment of $42,000 and is expected to generate future cash flows of $6,000 for each of the next 50 years. Project B requires an initial investment of $210,000 and will generate $30,000 for each of the next 10 years. If Markoff requires a payback of 8 years or less, which project should it select based on payback periods?

PB3. LO 11.3 Use the tables in Appendix B to answer the following questions.

A. If you would like to accumulate $4,200 over the next 6 years when the interest rate is 8%, how much do you need to deposit in the account?
B. If you place $8,700 in a savings account, how much will you have at the end of 12 years with an interest rate of 8%?
C. You invest $2,000 per year, at the end of the year, for 20 years at 10% interest. How much will you have at the end of 20 years?
D. You win the lottery and can either receive $500,000 as a lump sum or $60,000 per year for 20 years. Assuming you can earn 3% interest, which do you recommend and why?

PB4. LO 11.3 Chang Consulting, Inc., has a $15,000 overdue debt with Supplier No. 1. The company is low on cash, with only $4,000 in the checking account and does not want to borrow any more cash. Supplier No. 1 agrees to settle the account in one of two ways:

Option 1: Pay $4,000 now and $18,750 when some large projects are finished, two years from today.

Option 2: Pay $25,000 three years from today, when even larger projects are finished.

Assuming that the only factor in the decision is the cost of money (8%), which option should Clary choose?

PB5. LO 11.4 Mason, Inc., is considering the purchase of a patent that has a cost of $85,000 and an estimated revenue producing life of 4 years. Mason has a required rate of return that is 12% and a cost of capital of 11%. The patent is expected to generate the following amounts of annual income and cash flows:

	Year 1	Year 2	Year 3	Total
Net income	$ 6,900	$ 9,600	$ 3,000	$ 6,300
Operating cash flows	19,500	18,700	20,250	15,900

A. What is the NPV of the investment?
B. What happens if the required rate of return increases?

PB6. LO 11.4 There are two projects under consideration by the Rainbow factory. Each of the projects will require an initial investment or $28,000 and is expected to generate the following cash flows:

	Year 1	Year 2	Year 3	Total
Alpha Project	22,000	23,500	5,000	50,500
Beta Project	12,700	22,000	15,800	50,500

If the discount rate is 5% compute the NPV of each project and make a recommendation of the project to be chosen.

PB7. LO 11.4 Use the information from the previous exercise to calculate the Internal Rate of Return on both projects and make a recommendation regarding which one to accept.

PB8. LO 11.4 D&M Pizza has a delivery car that is uses for pizza deliveries. The transmission needs to be replaced, and there are several other repairs that need to be done. The car is nearing the end of its life, so the options are to either overhaul the car or replace it with a new car. D&M's has put together the following budgetary items:

	Present Car	New Car
Purchase cost new		$30,000
Transmission and repairs	$6,500	
Annual cash operating cost	8,500	7,500
Fair market value now	6,000	
Fair market value in five years	1,000	6,000

If D&M replaces the transmission of the pizza delivery vehicle, they expect to be able to use the vehicle for another 5 years. If they purchase a new vehicle, they will sell the existing one and use the new vehicle for 5 years and then trade it in for another new pizza delivery vehicle. If they trade for the new delivery vehicle, their operating expenses will decrease because the new vehicle is more gas efficient. This project is analyzed using a discount rate of 15%. What should D&M do?

PB9. LO 11.4 Joliet Company is considering two alternative investments. The company requires an 18% return from its investments.

	Project X	Project Y
Initial investment	$108,000	$98,000
Net cash flows anticipated:		
Year 1	36,000	25,000
Year 2	39,000	45,000
Year 3	32,000	42,000
Year 4	34,000	28,000
Year 5	25,000	17,000

Compute the IRR for both Projects and recommend one of them. For further instructions on internal rate of return in Excel, see Appendix C.

PB10. LO 11.5 Bouvier Restaurant is considering an investment in a grill that costs $140,000, and will produce annual net cash flows of $21,950 for 8 years. The required rate of return is 6%.

Compute the net present value of this investment to determine whether Bouvier should invest in the grill.

Thought Provokers

TP1. LO 11.1 What is the benefit(s) of the accountant's involvement in the capital investment decision?

TP2. LO 11.1 Austin's cell phone manufacturer wants to upgrade their product mix to encompass an exciting new feature on their cell phone. This would require a new high-tech machine. You are excited about his new project and are recommending the purchase to your board of directors. Here is the information you have compiled in order to complete this recommendation:

Unit selling price	$ 45
Unit variable cost	$ 25
Fixed costs	$200,000
Deprecation costs	$ 35,000
Expected sales	10,000 units per year

According to the information, the project will last 10 years and require an initial investment of $800,000, depreciated with straight-line over the life of the project until the final value is zero. The firm's tax rate is 30% and the required rate of return is 12%. You believe that the variable cost and sales volume may be as much as 10% higher or lower than the initial estimate. Your boss understands the risks but asks you to explain the alternatives in a brief memo to the board. Write a memo to the Board of Directors objectively weighing out the pros and cons of this project and make your recommendation(s).

TP3. LO 11.3 Would you rather have $7,500 today or at the end of 20 years after it has been invested at 15%? Explain your answer.

The following are independent situations. For each capital budgeting project, indicate whether management should accept or reject the project and list a brief reason why.

TP4. LO 11.4 Midas Corp. evaluated a potential investment and determined the NPV to be zero. Midas Corp.'s required rate of return is 9.1% and its cost of capital is 6.4%.

TP5. LO 11.4 Giorgio Co. is looking at an investment project with an internal rate of return of 10.8%. The initial outlay for the investment is $90,000. The hurdle rate or minimum acceptable rate of return is 10.2%.

TP6. LO 11.4 Dinaro Inc. is looking at an investment project that has an NPV of ($5,000). The hurdle rate is 8%.

TP7. LO 11.4 You begin a new job at Cabrera Medical Supplies. The company is considering a new accounting system, with an initial investment of about half a million dollars for new software and hardware. You are excited for the opportunity to apply your managerial accounting skills regarding screening and preference methods to decide on the best system for the company. Your boss is a little old-school, and when you mention some of the things you learned in managerial accounting, he says, "Discounted cash flow methods are not the only way to approach this. I have more of a gut reaction approach that blows most managers out of the water when they become absorbed by discounted cash flow methods (DCF)."

How would you react and what would you discuss with your boss?

TP8. LO 11.5 Fenton, Inc., has established a new strategic plan that calls for new capital investment. The company has a 9.8% required rate of return and an 8.3% cost of capital. Fenton currently has a return of 10% on its other investments. The proposed new investments have equal annual cash inflows expected. Management used a screening procedure of calculating a payback period for potential investments and annual cash flows, and the IRR for the 7 possible investments are displayed in image. Each investment has a 6-year expected useful life and no salvage value.

	Payback Period	IRR	Investment Cost
Project A1	4.2	10.5%	$130,000
Project B2	5.9	5.1%	67,000
Project C3	5.0	13.4%	83,000
Project D4	4.8	7.4%	61,000
Project E5	3.2	12.1%	115,000
Project F6	4.0	9.9%	65,000
Project G7	6.3	9.8%	76,000

A. Identify which project(s) is/are unacceptable and briefly state the conceptual justification as to why each of your choices is unacceptable.

B. Assume Fenton has $330,000 available to spend. Which remaining projects should Fenton invest in and in what order?

C. If Fenton was not limited to a spending amount, should they invest in all of the projects given the company is evaluated using return on investment?

12

Balanced Scorecard and Other Performance Measures

Figure 12.1 Clean Room. A dorm room tidied up by Passing Inspection Cleaning and Organizing. (credit: modification of "170203-A-IE537-004" by U.S. Army Corp of Engineers's photostream/Flickr, CC BY 2.0)

Chapter Outline

Why It Matters

A friend comes to you in a panic. His parents are coming to visit, and his apartment is a complete mess. Although he and his roommates frequently say they should clean, now the apartment has gotten so messy that they don't even know where to begin. He knows your place always looks clean and orderly, so he is seeking your help. You offer to help your friend, and, in the process, come up with a business idea.

To address the needs of students like your friend, you create a company—Passing Inspection Cleaning and Organizing—that will clean and/or organize dorm rooms and apartments. You set up a list of ten standard cleaning tasks that will be performed for a flat fee, and put together a list of à la carte services, such as laundry, closet organization, and refrigerator cleaning. Four students sign on with you as employees. Because it is important for your company to have a good reputation, you want to motivate your employees to perform their tasks to a high standard. You also want your employees to solicit additional business whenever possible by handing out flyers or business cards to nearby rooms and apartments when on a cleaning assignment.

How can you motivate your employees to perform to your standards so that your company goals are met? Will an hourly wage be sufficient? Should you pay per task or per job? What motivation will they have to sell your

company's services to others? How will you know if they are performing the tasks in the manner you set forth? To answer these questions, you will need to be aware of the goals of your company, such as increasing the number of clients, as well as the goals of your employees, such as receiving raises, bonuses, or promotions. Armed with this knowledge, you will be able to design relevant evaluation measures and tie those measures to appropriate performance rewards so that both your goals and the goals of your employees are met. This same need—to measure the performance of a business and its employees so that each party's goals are met—is an issue that affects all businesses, regardless of size or type.

12.1 Explain the Importance of Performance Measurement

As you learned in Responsibility Accounting and Decentralization, as a company grows, it will often decentralize to better control operations and therefore improve decision-making. Remember, a decentralized organization is one in which the decision-making is spread among various managers throughout the organization and does not solely rest with the chief executive officer (CEO). However, with this dispersion of decision-making comes an even greater need to monitor the results of the decisions made by the many managers at the various levels of the organization to ensure that the overall goals of the organization are still being met.

ETHICAL CONSIDERATIONS

Ethical Evaluation of Performance Measures

To evaluate whether decisions made by management are both effective and ethical, performance is measured through responsibility accounting. This is a double-layer ethical analysis that requires some thought to establish and implement, as the evaluation system must also operate in an ethical fashion, just as the decision-making process itself does. In most organizations, the overall results of choices made by management, not just the resulting profit, need to be examined to determine whether or not the decisions are ethical.

When an organization's customers and other stakeholders are happy, and the corporate assets are in good condition, these are indicators that the customers, stakeholders, and assets are being treated ethically. Evaluation of customer and stakeholder satisfaction should come directly from the customer, such as through surveys or other direct questionnaires. Proper treatment of organizational assets can be determined by viewing the physical condition of such assets, or the loss rates and productivity of equipment. Customer satisfaction and positive results in the utilization of corporate assets typically indicate ethical decision-making and behavior, while negative results typically indicate the opposite. An organization with a satisfied group of stakeholders and customers, as well as assets that operate efficiently, is often more profitable in the long term.

Managerial accountants therefore must design a framework of **responsibility accounting** in which the evaluation system is based on criteria for which a manager is responsible. The framework should be structured to encourage managers to make decisions that will meet the goals of the company as well as their own professional goals. In your study of managerial accounting, you have learned about company goals such as increasing market share, increasing revenues, decreasing costs, and decreasing defects. Managers and employees have their own goals. These goals can be work related such as promotions or awards, or they can be more personal such as receiving raises, receiving bonuses, the privilege of telecommuting, or shares of

company stock. This aligning of goals between a corporation's strategy and a manager's personal goals is known as **goal congruence**. Managers should make the best decisions for the benefit of the corporation, and the best way to motivate a manager to make those decisions is to link a reward system to performance results. To accomplish this, a business establishes performance evaluation measures that align the decisions made by management with the goals of the corporation and the professional goals of the manager.

Fundamentals of Performance Measurement

Performance measurement is used to motivate managers to make decisions that benefit the corporation and themselves. Therefore, the key to good performance measurement techniques is to set goals that are realistic and that incorporate decisions over which the manager has control. Then, the company can evaluate the manager based on **controllable factors**, which are the components of the organization for which the manager is responsible and that the manager can control, such as revenues, costs and procurement of long-term assets, and other possible factors. Recall that in Responsibility Accounting and Decentralization, you learned about responsibility centers, which are a means by which an organization can be divided based on factors that the manager can control. This makes it easier to align the goals of the manager with those of the organization and to design effective performance measures. The four types of responsibility centers are revenue centers, cost centers, profit centers, and investment centers.

In a **revenue center**, the manager has control over the revenues that are generated for the corporation but not over the costs of the organization. For example, the reservations department of an airline is a revenue center because the reservationists can control revenues by selling customers upgrades such as meals or first-class seating, by selling trip insurance, or by trying to keep customers from going to another airline. However, reservationists cannot control the costs of the flights the airline is offering and reserving because the reservation department cannot control the cost of the planes, airport space rental, or jet fuel. Therefore, the manager of the reservation department should have performance evaluations measures closely related to revenue generation.

In a **cost center**, the manager has control over costs but not over revenues. An example of a cost center would be the accounting department of a grocery store chain. The manager can control the types of people hired, the wages that are paid, and the hours that are worked within that department, and each of these costs contributes to the total cost of the department. However, the manager of the accounting department has no control over the generation of revenues.

In a **profit center**, the manager has control over both revenues and costs. An example would be a single location of Best Buy. The manager at that store has control over both revenues and costs; therefore, one component of evaluation for that manager will be store profits.

An **investment center** is a component of a business for which the manager has control over revenues, costs, and capital assets. This means the manager not only can make decisions regarding generating revenues and controlling costs but also has authority to make decisions regarding assets, such as buying new machines, expanding facilities, or selling old assets. With each of these types of centers, designing the appropriate performance measures begins with evaluating management based on which business areas they oversee.

Using the previous revenue center example, the manager of the reservation department should be evaluated on how well his team generates revenues. The proper incentives will motivate the team to perform better at their jobs. Evaluating a manager on the outcome of decisions over which he or she has no control, or **uncontrollable factors**, will be demotivating and does not promote goal congruence between the organization and the manager. The reservations manager has no control over fuel costs, plane maintenance

costs, or pilot salaries. Thus, it would not be logical to evaluate the manager on flight costs.

A good **performance measurement system** is one that utilizes appropriate **performance measures**, which are performance metrics used to evaluate a specific attribute of a manager's role, to evaluate management in a way that will link the goals of the corporation with those of the manager. A **metric** is simply a means to measure something. For example, high school grade point average is a metric used by colleges when considering admission of prospective students, as it is considered a measure of prior academic success. In the business environment, individuals who design the performance measurement system must have extensive knowledge of the corporate strategic plan and the overall goals set by the organization, and a clear understanding of the job descriptions, responsibilities of each manager, and trends in rewards and compensation.

THINK IT THROUGH

Motivating Dental Industry Employees

As a dentist and owner of your own practice, you are considering ways to both reward and motivate your staff. The obvious choice is to simply give each employee a raise. However, you have heard that many businesses are compensating their employees for meeting various goals that are beneficial to the business. What types of goals might the dental practice have? What are several ideas for ways to motivate the staff, which consists of a receptionist, dental assistants, and dental hygienists? What are possible rewards for meeting goals?

Advantages Derived from Performance Measurement

Every business has a **strategic plan**, or a broad vision of how it will be in the future. This plan leads to goals that must be achieved to fulfill that vision. As shown in Figure 12.2, a business will use the strategic plan to determine the goals needed to achieve the strategic vision. Once goals are determined, the business will decide on the appropriate actions necessary to meet the goals. Then, the business will implement, review, and adjust the goals as needed. Properly designed performance measures will help move the company toward meeting the goals of its strategic plan. Advantages of a good performance management system include increased employee retention and loyalty, better communication between the various levels of management, increased productivity, and increased efficiencies. In addition, a well-designed performance plan should lead to improved job satisfaction for the manager and increased personal wealth if the rewards are monetarily based. In summary, a company needs to first identify and create a strategy and then set the necessary goals, which will lead to actions, and finally to an applicable evaluation process.

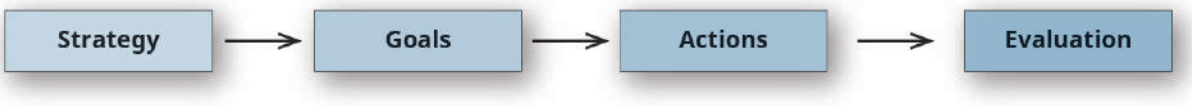


Figure 12.2 Strategy-to-Action Sequence. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

YOUR TURN

Measuring Employee Performance

All companies need ways to measure the performance of employees. These measures should be designed in a way that the rewards for performance will motivate the employees to make decisions that are good for the business. Reflecting on the Why It Matters scenario, if this were your company, what are five goals you would have for your business? What are some measures you could use to see if you are meeting those goals? What types of incentives could you offer to motivate your employees to help meet these goals? Use Table 12.1 for your answers.

Motivating Employees toward Business Goals

Five Business Goals	Measures to Meet Goals	Incentives to Motivate Employees toward Goals

Table 12.1

Solution

Answers will vary. Sample answer:

Motivating Employees toward Business Goals

Five Business Goals	Measures to Meet Goals	Incentives to Motivate Employees toward Goals
Grow customer base	Number of new customers	Give a gift card to employees for each new customer they get
Increase company name recognition	Number of “likes” on Facebook, number of reviews on Google	Host a party or take employees to dinner after certain number of likes or positive reviews occur
Grow revenue each quarter	Percent change in revenue from prior quarter	Have a bonus pool that is shared after a targeted percentage increase in revenue is reached

Motivating Employees toward Business Goals

Five Business Goals	Measures to Meet Goals	Incentives to Motivate Employees toward Goals
Lower cost of supplies used per job	Compare supplies used to a standard for each type of job	Provide a paid day off for suggestions that successfully reduce cost of supplies per job by 5%
Decrease time at each job/ increase efficiency	Measure time on job using a call-in system of entering and leaving the job	Pay a flat additional amount for each time the employee performs a job within the allotted time and that customer satisfaction is a 5/5

Potential Limitations of Traditional Performance Measurement

What types of measures are used to evaluate management performance? Historically, performance measurement systems have been based on accounting or other quantitative numbers. One reason for this is that most accounting-based measures are easy to use due to their availability, since many accounting measures can be found in or generated from a company's financial statements. Although this type of information is readily available, it does not mean the use of accounting numbers as performance measures is the best or only way to measure performance. One issue is that some accounting numbers can be affected by the actions of managers, and this may result in distorted performance results.

For example, as shown in Figure 12.3, if a retail company uses a last-in, first-out (LIFO) inventory system and the manager of the retail store is evaluated based on either cost containment or profit, the manager can postpone a decision to purchase inventory at the end of the year until the beginning of the next fiscal year if prices of the inventory have risen. This decision will postpone the effect of that purchase and, in turn, the higher costs associated with that inventory, until the next accounting cycle. As you can see, in either scenario, the company ordered 500,000 units of inventory but the timing of those orders, given the changing prices of the inventory, has a significant effect on income from operations. This scenario is an example of the possibility of an unintended conflict of interests between procurement and production decisions by an individual manager or department and the overall best interests of the company. A well-designed performance measurement system should eliminate these potential conflicts, as much as possible.

	Number of Units		(A) Decision to Avoid Purchase of Inventory at End of Accounting Period	(B) Decision to Purchase Inventory at End of Accounting Period	*Difference*
	(A)	(B)			
Sales ($20.00 per unit)	500,000	500,000	$10,000,000	$10,000,000	$ 0
Orders Placed for Inventory					
Aug. 1 ($ 9.00 per unit)	100,000				
Sep. 1 ($10.00 per unit)	100,000	100,000	$ 900,000	$ 0	
Oct. 1 ($12.00 per unit)	200,000	200,000	$ 1,000,000	$ 1,000,000	
Nov. 1 ($11.00 per unit)	50,000	50,000	$ 2,400,000	$ 2,400,000	
Dec. 1 ($12.00 per unit)	50,000	50,000	$ 550,000	$ 550,000	
Dec. 31 ($14.00 per unit)		100,000	$ 600,000	$ 600,000	
Total units ordered	**500,000**	**500,000**	$ 0	$ 1,400,000	
Cost of goods sold (LIFO)			$ (5,450,000)	$ (5,950,000)	$ 500,000 *increase*
Gross profit			$ 4,550,000	$ 4,050,000	$(500,000) *decrease*
Selling and administrative expenses			$ (2,000,000)	$ (2,000,000)	$ 0
Income from operations			$ 2,550,000	$ 2,050,000	$(500,000) *decrease*

Figure 12.3 Effects on Income of Delaying Inventory Order. If LIFO is being used and inventory prices are rising, when inventory is ordered has an impact on income. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Accounting numbers are often affected by economic conditions, but these economic effects are beyond the control of the manager. For example, if the parts used in a manufacturing process are ordered from another country, the manager cannot control the exchange rate that occurs between the two currencies, yet this can impact the cost of the components to the manager and thus affect the cost of the product the company is producing.

Some management decisions affect multiple periods, or the decision being made will have the greatest impact in a future period. For example, capital budgeting decisions affect not only the current but future periods as well. This may compel a manager to have a short-term focus, because increasing his immediate remuneration, or compensation, is often his goal. Many long-term decisions, such as capital budgeting decisions, maintenance on equipment, or advertising campaigns, may most significantly affect future accounting numbers and, in turn, the compensation of the manager in future periods. If a manager cannot see himself reaping the rewards of that decision in future years, the decision becomes less attractive. If a performance measurement system is not designed properly, it can lead to managers having a short-term focus or making decisions that have the greatest impact on their individual goals (such as reaching a bonus goal), even if these decisions are not in the best long-term interest of the corporation. Last, a manager focused solely on accounting numbers may miss opportunities for future benefits because making the decision will have a negative impact on accounting measures in the current period. For example, spending money to build a potential customer database may decrease income in the current year. If the manager's performance is measured based on the profitability of his division, he may avoid spending the money to create the customer database. However, that database may result in a significant increase in profitability in future years if the potential customers become actual customers.

Is there a way to prevent these issues associated with using accounting measures as performance measures? The use of nonaccounting measures in conjunction with accounting-based measures can help mitigate the problems of using accounting-based measures alone. Therefore, most performance measurement systems today use a combination of accounting-based measures and non-accounting-based measures, short-term or long-term indicators, or quantitative and qualitative components. Let's first look at the use of accounting-based measures, and then we'll consider a methodology that also incorporates non-accounting-based measures.

THINK IT THROUGH

Balancing Customer Needs with Company Needs

Noah Barnes just graduated from college and took a position as production supervisor for Morgensen Machines, who manufactures sewing machine and vacuum cleaner parts. On his first day at work, one of Morgensen's sales managers asked Noah if it would be OK to rearrange his manufacturing job schedule so that a special order from a new customer could be pushed to the front of the line. This new customer requires fast turnarounds; unfortunately, this also means running the production equipment for all three shifts at maximum output for at least one week, possibly more. This would completely prohibit the schedule that management told Noah to implement. Noah does not want to make the sales manager angry at him, but he also does not want to lose his job in the first month out of college. He knows that the manager is focused on landing this new customer, who could reward the company with a needed increase in overall sales and plant output. The problems, as Noah sees them, are that (1) current jobs will be delayed; (2) there will be greater demand on the machines during all three shifts, increasing the possibility that they will fail; (3) there will not be time for needed maintenance; and (4) eventually all of these factors will snowball into significant delays for the new customer, as well as extensive delays for the previously scheduled orders.

How should Noah handle this problem? What managerial principles would you advise him to use from his college studies to help him develop better policies for future events like this?

12.2 Identify the Characteristics of an Effective Performance Measure

It is important to identify the characteristics that make a performance measure a good assessment of goal congruence. A good performance measurement system will align the goals of management with the goals of the corporation, and both parties will benefit. A lack of goal congruence in a performance measurement system can be detrimental to a business in many ways. Without proper performance measures, goal congruence is almost impossible to achieve and will likely lead to lost profits and dissatisfied employees,

A good performance measurement system should have the following characteristics:

- It should be based on activities over which managers have control or influence.
- It should be measurable.
- It should be timely.
- It should be consistent in its application.
- When appropriate, the actual results should be compared with the budgeted results, standards, or past

performance.

- The measurements must not favor the manager over the goals of the entire organization. Often, managers have the ability to make decisions that favor their individual units but that may be detrimental to the overall performance of the organization.

As you've learned, it is important that the activities on which managers are evaluated are within that manager's control. In addition, it is very important for the information that is used in the performance measurement system be gathered, evaluated, and presented in a timely manner. Performance measurement systems provide an indication of how well the evaluated managers are doing their jobs. Remember, the organization wants managers to make decisions that are in the best interest of the organization as a whole, and hence the need for the performance management system. If managers do not receive appropriate feedback in a timely manner, they will not know which decisions they should continue to make in the same manner and which are less effective. The same is true from the corporation's perspective. Timely information allows the evaluation team to determine the effects of individual management decisions on the corporation as a whole.

In addition to being timely, performance measures need to be applied or measured consistently. The accounting variables or other measures that are used to evaluate a manager should be measured the same way from period to period. For example, if a performance measure includes some form of income, such as operating income, then that measure should be used each time and not replaced with another income measure for the current measurement cycle (usually one year). If, upon further analysis, it seems that net income is a better measure to use in the evaluation of a manager, then the new measure can be implemented during the next measurement cycle. When measures are changed, it is imperative that the manager being evaluated is aware of the measurement change, as this may affect his or her decision-making. The idea is to keep the targets stable for a period. Otherwise, the measurements might be inconsistent, and thus misleading. A good performance measurement plan would include the manager's input in the design discussion. Not only does this help to ensure that the plan is clear to all parties involved in the process, it also helps to motivate managers. Rather than being told what goals are to be met, managers will be more motivated to achieve the goals if they have input into the process, the goals to be reached, and the measurements or metrics being used.

Performance measures are only useful if there is a baseline against which to compare the measured results. For example, students often evaluate how well they performed on a test by comparing their grade to the average for the test. If a student scored 65 out of 100 on a test, the initial response may be that this is a less than stellar grade unless that score is compared to the average. Suppose the average on that particular test was a 50. Obviously, in this example, the student performed above average on this test, but this could not be interpreted correctly until the score was compared to a baseline. In evaluating performance measures, a standard, baseline, or threshold is typically used as a basis against which to compare the actual results of the manager.

A company has both short- and long-term goals. Short-term goals include reducing costs of production by a certain percentage for the current year or increasing year-over-year sales by a certain percentage. Long-term goals may include expanding into new territories or adding new products. Employees also have short- and long-term goals. Short-term goals can include a beach vacation, and long-term goals can include saving for retirement or college. A good performance measurement system will include both short- and long-term measures in order to motivate managers to make decisions that will fulfill both the corporations and their own short- and long-term goals.

You've learned about the human factor that causes managers to make what is typically the best decision for themselves rather than the best decision for the overall good of the corporation, especially if the decision that

benefits the corporation is not beneficial to the manager. Again, this means the performance measurement system must attempt to prevent the manager from benefitting without the corporation also benefitting. This is one of the trickiest parts of performance measurement system design.

For example, suppose the manager of the used car department at an automobile dealership is responsible for the profit he makes selling used cars that were taken as trade-ins on new car sales. Some of these used cars need a few repairs to prepare them for sale. The manager has the option of getting the cars fixed using the service department at the dealership or outsourcing the repairs to another company. If the manager can get the repairs completed at a lower cost at another repair shop, and if he is evaluated and receives a bonus based on his profit, then he is likely to use the outside repair shop. Is this a good thing to do? Obviously, it is good for the manager of the used car department who will have fewer costs getting the used car ready to sell and therefore will make more of a profit from the sale of that car. Higher profits for the used car department mean a higher bonus for the manager. But what about for the dealership? Was outsourcing the repairs the right decision?

It depends on several factors, but here are points to ponder. What if the dealership's service department is more expensive because it provides higher-quality parts and the mechanics are certified? Does the reputation of the quality of the used cars sold by the dealership affect more than just the used car department? What if the service department could have completed the work at cost? As you can tell by these questions, without further information, we do not know whether or not the used car manager should outsource the repairs. But we do know that his decision was based on his bonus being tied to his profitability and not linked to other factors such as dealership profitability or dealership reputation (customer satisfaction). Therefore, it is important that the performance management system not promote decisions that only benefit the manager to the detriment of the corporation.

CONCEPTS IN PRACTICE

Performance Measures at NASA[1]

Nearly twenty years ago, the National Aeronautics and Space Administration (NASA) along with five NASA contractors undertook a project to derive performance measures. As a result, they developed a series of five models for measures. These measures included effectiveness, quantity, quality, value, and change, and are as follows:

- Effectiveness was measured as projected/actual. An example was number of tests completed/number of tests planned.
- Quantity was measured as process or product unit/sources of cost. An example was total number of wind tunnel tests run/facilities management cost.
- Quality was measured as indicators of error or loss/process or product unit. An example of quality measures is mistakes in work packages issued/work packages issued in total.
- Value was measured as desirability/source of cost. An example of value measures is savings from suggestion program/man hours to review suggestions.
- Change was measured as the information provided by the indexes that are developed by tracking the same performance measures over time. An example would be the improvement measures, like
    - Reduction by X percent in downtime of facilities/tests accomplished or attempted or
    - Increase by X percent of documents prepared/procurement clerk

These measures have some distinct advantages but also may be met with some resistance from

employees and contractors. Advantages likely included a better understanding of their processes as well as an understanding of the amount of time wasted and value emulating from these processes. Development and implementation become an opportunity to discover what may be wrong with processes, to start a dialogue concerning ongoing change and improvement, and to communicate and brainstorm about organizational inefficiencies. Networking involved in development of the performance measures can become an equalizer among processes that break down silos and complexity.

Resistance would likely come from the measurements being too time consuming and the processes too complex to be charted for these measurement objectives. How can upper management judge the complex progress on projects if they have little to no involvement? If these measures were so important, then NASA would have already developed them in an organization that was started around 1960. Resistance like this develops as one where the prior absence of these measures becomes the primary resistance toward developing them.

LINK TO LEARNING

General Electric is changing their performance measurement practices to more closely align with the goals of millennials. Read the Impraise blog on GE Performance Reviews (https://openstax.org/l/50GE_perform) for more details.

12.3 Evaluate an Operating Segment or a Project Using Return on Investment, Residual Income, and Economic Value Added

There are three performance measures commonly used when a manager has control over investments, such as the buying and selling of inventory and equipment: return on investment, residual income, and economic value added. These measures use financial accounting data to evaluate how well a manager is meeting certain goals.

Introduction to Return on Investment, Residual Income, and Economic Value Added as Evaluative Tools

One of the primary goals of a company is to be profitable. There are many ways a company can use profits. For example, companies can retain profits for future use, they can distribute them to shareholders in the form of dividends, or they can use the profits to pay off debts. However, none of these options actually contributes to the growth of the company. In order to stay profitable, a company must continuously evolve. A fourth option for the use of company profits is to reinvest the profits into the company in order to help it grow. For example, a company can buy new assets such as equipment, buildings, or patents; finance research and development; acquire other companies; or implement a vigorous advertising campaign. There are many options that will help the company to grow and to continue to be profitable.

One way to measure how effective a company is at using its invested profits to be profitable is by measuring

1 D. Kinlaw. "Developing Performance Measures with Aerospace Managers." *National Productivity Review*. December 1, 1986.

its **return on investment (ROI)**, which shows the percentage of income generated by profits that were invested in capital assets. It is calculated using the following formula:

$$\text{ROI} = \frac{\text{Income}}{\text{Average Capital Assets}}$$

Capital assets are those tangible and intangible assets that have lives longer than one year; they are also called *fixed assets*. ROI in its basic form is useful; however, there are really two components of ROI: sales margin and asset turnover. This is known as the *DuPont Model*. It originated in the 1920s when the DuPont company implemented it for internal measurement purposes. The DuPont model can be expressed using this formula:

$$\text{ROI} = \text{Sales Margin} \times \text{Asset Turnover}$$

Sales margin indicates how much profit is generated by each dollar of sales and is computed as shown:

$$\text{Sales Margin} = \frac{\text{Income}}{\text{Sales Revenue}}$$

Asset turnover indicates the number of sales dollars produced by every dollar invested in capital assets—in other words, how efficiently the company is using its capital assets to generate sales. It is computed as:

$$\text{Asset Turnover} = \frac{\text{Sales Revenue}}{\text{Average Capital Assets}}$$

Using ROI represented as Sales Margin × Asset Turnover, we can get another formula for ROI. Substituting the formulas for each of these individual ratios, ROI can be expressed as:

$$\text{ROI} = \left(\frac{\text{Operating Income}}{\text{Sales Revenue}}\right) \times \left(\frac{\text{Sales Revenue}}{\text{Average Capital Assets}}\right)$$

To visualize this ROI formula in another way, we can deconstruct it into its components, as in Figure 12.4.

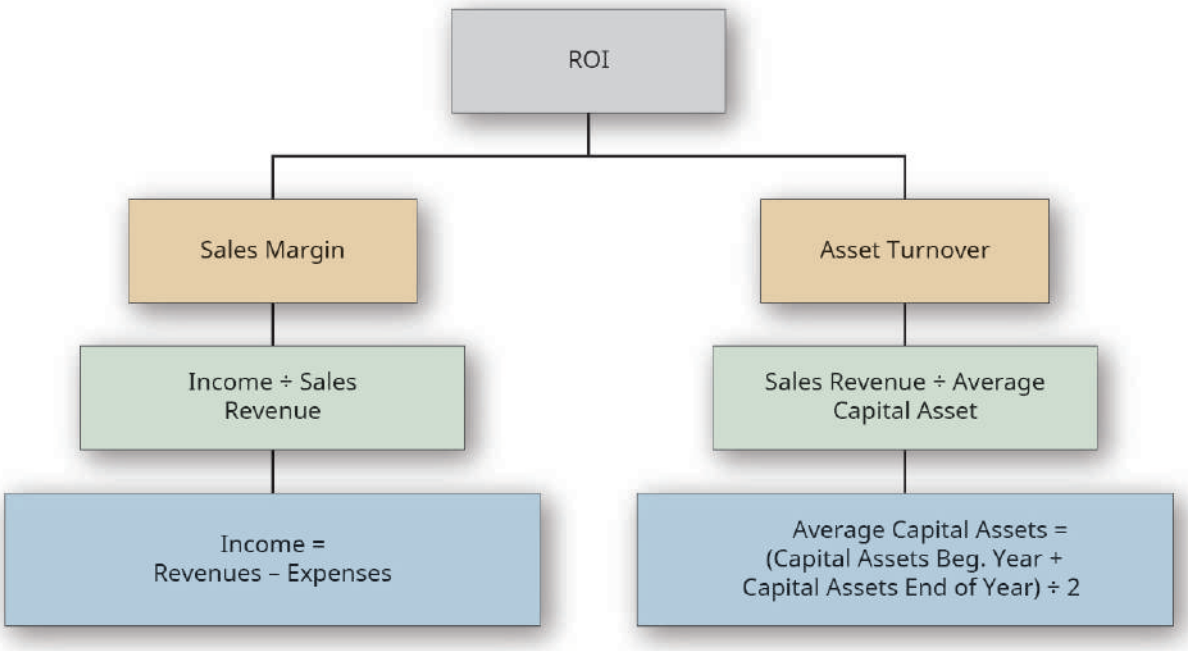


Figure 12.4 Decomposition of ROI into the Components Sales Margin and Asset Turnover. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

When sales margin and asset turnover are multiplied by each other, the sales components of each measure will cancel out, leaving

$$\text{ROI} = \frac{\text{Income}}{\text{Average Capital Assets}}$$

ROI captures the nuances of both elements. A good sales margin and a proper asset turnover are both needed for a successful operation. As an example, a jewelry store typically has a very low turnover but is profitable because of its high sales margin. A grocery store has a much lower sales margin but is successful because of high turnover. You can see it is important to understand each of these individual components of ROI.

Calculation and Interpretation of the Return on Investment

To put these concepts in context, consider a bakery called Scrumptious Sweets, Inc., that has three divisions and evaluates the managers of each of these decisions based on ROI. The following information is available for these divisions:

	Donut Division	Bagel Division	Brownie Division
Income	$1,000,000	$2,500,000	$1,300,000
Sales Revenue	5,000,000	8,500,000	5,500,000
Assets Jan. 1	2,800,000	5,950,000	4,850,000
Assets Dec. 31	2,900,000	5,950,000	4,820,000

This information can be used to find the sales margin, asset turnover, and ROI for each division:

	Donut Division	Bagel Division	Brownie Division
Sales Margin	$\frac{\$1,000,000}{\$5,000,000} = 20\%$	$\frac{\$2,500,000}{\$8,500,000} = 29\%$	$\frac{\$1,300,000}{\$5,500,000} = 24\%$
Asset Turnover	$\frac{\$5,000,000}{\$2,850,000^*} = 1.75$ times	$\frac{\$8,500,000}{\$5,950,000^{**}} = 1.43$ times	$\frac{\$5,500,000}{\$4,835,000^{***}} = 1.14$ times
ROI	$\frac{\$1,000,000}{\$2,850,000^*} = 35\%$	$\frac{\$2,500,000}{\$5,950,000^{**}} = 42\%$	$\frac{\$1,300,000}{\$4,835,000^{***}} = 27\%$

*The average capital assets for donuts are $\frac{(2,800,000 + 2,900,000)}{2} = 2,850,000$.

**The average capital assets for bagels are $\frac{(5,950,000 + 5,950,000)}{2} = 5,950,000$.

***The average capital assets for brownies are $\frac{(4,850,000 + 4,820,000)}{2} = 4,835,000$.

Alternatively, ROI could have been calculated by multiplying Sales Margin × Asset Turnover:

	Donut Division	Bagel Division	Brownie Division
ROI	20% × 1.75 times = 35%	29% × 1.43 times = 42%	24% × 1.14 times = 27%

ROI measures the return in a percentage form rather than in absolute dollars, which is helpful when comparing projects, divisions, or departments of different sizes. How do we interpret the ROIs for Scrumptious Sweets? Suppose Scrumptious has set a target ROI for each division at 30% in order to share in the bonus pool. In this case, both the donut division and the bagel division would participate in the company bonus pool. What does the analysis regarding the brownie division show? By looking at the breakdown of ROI into its component parts of sales margin and asset turnover, it is apparent that the brownie division has a higher sales margin than the donut division, but it has a lower asset turnover than the other divisions, and this is affecting the brownie division's ROI. This would provide direction for management of the brownie division to investigate why their asset turnover is significantly lower than the other two divisions. Again, ROI is useful if there is a benchmark against which to compare, but it cannot be judged as a stand-alone measure without that comparison.

Managers want a high ROI, so they strive to increase it. Looking at its components, there are certain decisions managers can make to increase their ROI. For example, the sales margin component can be increased by increasing income, which can be done by either increasing sales revenue or decreasing expenses. Sales revenue can be increased by increasing sales price per unit without losing volume, or by maintaining current sales price but increasing the volume of sales. Asset turnover can be increased by increasing sales revenue or decreasing the amount of capital assets. Capital assets can be decreased by selling off assets such as equipment.

For example, suppose the manager of the brownie division has been running a new advertising campaign and is estimating that his sales volume will increase by 5% over the next year due to this ad campaign. This increase in sales volume will lead to an increase in income of $140,000. What does this do to his ROI? Division income will increase from $1,300,000 to $1,440,000, and the division average assets will stay the same, at $4,835,000. This will lead to an ROI of 30%, which is the ROI that must be achieved to participate in the bonus pool.

Another factor to consider is the effect of depreciation on ROI. Assets are depreciated over time, and this will reduce the value of the capital assets. A reduction in the capital assets results in an increase in ROI. Looking at

the bagel division, suppose the assets in that division depreciated $500,000 from the beginning of the year to the end of the year and that no capital assets were sold and none were purchased. Look at the effect on ROI:

Bagel Division	Original ROI	ROI with Increased Depreciation
	$\frac{\$2,500,000}{\$5,950,000*} = 42\%$	$\frac{\$2,500,000}{\$5,700,000**} = 44\%$

*The original average capital assets for bagels are $\frac{(5,950,000 + 5,950,000)}{2} = 5,950,000.$

**The new average capital assets for bagels are $\frac{(5,950,000 + 5,450,000)}{2} = 5,700,000.$

Notice that depreciation helped to improve the division's ROI even though management made no new decisions. Some companies will calculate ROI based on historical cost, while others keep the calculation based on depreciated assets with the idea that the manager is efficiently using the assets as they age. However, if depreciated values are used in the calculation of ROI, as assets are replaced, the ROI will drop from the prior period.

One drawback to using ROI is the potential of decreased goal congruence. For example, assume that one of the goals of a corporation is to have ROI of at least 15% (the cost of capital) on all new projects. Suppose one of the divisions within this corporation currently has a ROI of 20%, and the manager is evaluating the production of a new product in his division. If analysis shows that the new project is predicted to have a ROI of 18%, would the manager move forward with the project? Top management would opt to accept the production of the new product. However, since the project would decrease the division's current ROI, the division manager may reject the project to avoid decreasing his overall performance and possibly his overall compensation. The division manager is making an intentional choice based on his division's ROI relative to corporate ROI.

In other situations, the use of ROI can unintentionally lead to improper decision-making. For example, look at the ROI for the following investment opportunities faced by a manager:

	Income	Average Capital Assets	ROI
Investment Opportunity 1	$ 500	$ 1,000	50%
Investment Opportunity 2	20,000	75,000	27%

In this example, though investment opportunity 1 has a higher ROI, it does not generate any significant income. Therefore, it is important to look at ROI among other factors in order to make an informed decision.

Calculation and Interpretation of the Residual Income

Another performance measure is **residual income (RI)**, which shows the amount of income a given division (or project) is expected to earn in excess of a firm's minimum return goal. Every company sets a **minimum required rate of return** on projects and investments, representing the minimum return, usually in percentage form, that a project or investment must produce in order for the company to be willing to undertake it. This return is used as a basis for evaluating investments so that the firm may meet its targets and goals, and ensures that only profitable projects will be accepted. (You will learn the theory and mechanics behind establishing a minimum required rate of return in advanced accounting courses.)

Think about this concept in your own life. If you plan to invest in stocks, bonds, a work of art, precious stones, a graduate degree, or a business, you would want to know what your expected return would be before you

made that investment. Most people shy away from investing time or money in things that do not provide a certain return, whether that return is money, happiness, or satisfaction. A company has to make similar decisions and decide where to spend its money and does not want to spend it in areas that will not return a minimum profit to the company and its shareholders. Companies will determine a minimum required rate of return as a basis against which to compare investment opportunities to aid in the decision of whether or not to accept a project. This minimum required rate of return is used to calculate residual income, which uses this formula:

$$\text{RI} = \text{Project Profit} - (\text{Project Invested Capital} \times \text{Minimum Required Rate of Return})$$

Suppose the donut division of Scrumptious Sweets is considering acquiring new machinery to speed up the production of donuts and make the donuts more uniform in shape and size. The cost of the machine is $1,500,000, and it is expected to generate a profit of $250,000. Scrumptious has a corporate policy of a required minimum rate of return on projects of 18%. Based on residual income, should the donut division move forward on this project?

$$\text{RI} = \$250{,}000 - (\$1{,}500{,}000 \times 0.18)$$
$$\text{RI} = -\$20{,}000$$

A project will be accepted as long as the RI is a positive number, because that implies the project is earning more than the minimum required by the company. Therefore, the manager of the donut division would not accept this project based on RI alone. Note that RI is measured in absolute dollars. This makes it almost impossible to compare firms of different sizes or projects of different sizes to one another. Both ROI and RI are useful, but as shown, both tools have drawbacks. Therefore, many companies will use a combination of ROI and RI (as well as other measures) to evaluate performance.

Calculation and Interpretation of Economic Value Added

Economic value added (EVA) is similar to RI but is a measure of shareholder wealth that is being created by a project, segment, or division. Companies want to maximize shareholder wealth, and to do that, they have to generate enough income to cover their cost of debt and their cost of equity, but also to have income available to shareholders. Just as in residual income, the goal is a positive EVA. A positive EVA indicates management has effectively used its capital assets to increase the value of the firm and thus the wealth of shareholders. EVA is computed as shown:

$$\text{EVA} = \text{After-Tax Income} - (\text{Invested Capital} \times \text{Weighted Average Cost of Capital})$$

After-tax income is the income reduced by tax expenses. The **weighted average cost of capital (WACC)** is the cost that the company expects to pay on average to finance assets and growth using either debt or equity. WACC is based on the proportion of debt and equity held by a company and the costs of each of those. For example, if a company has a total of $1,000,000 in debt and equity, consisting of $400,000 in debt and $600,000 in stock, then the proportion of the company's capital structure that is debt is 40% ($400,000/$1,000,000), and the proportion that is equity is 60% ($600,000/$1,000,000).

What about the cost component for each? A company raises capital (money) in three primary ways: borrowing (debt), issuing stock (equity), or earning it (income). The cost of debt is the after-tax interest rate associated with borrowing money. The cost of equity is the rate associated with what the shareholders expect the corporation to earn in order for that shareholder to maintain ownership in the company. For example, shareholders of Apple stock may on average expect the company to earn a return of 10% per year; otherwise,

they will sell their stock.

Sometimes the weighted average cost of capital and the required rate of return are the same for some companies, but often they will differ. Suppose Scrumptious Sweets, for example, has both debt capital and equity capital. Table 12.2 lists the cost of each type of capital as well as what proportion of the capital is made up of each of the two types. Notice that debt makes up 45% of the capital of Scrumptious Sweets and that the cost of debt is 8%. Equity makes up the other 55% of the capital structure of Scrumptious and the cost of equity is 9.8%. The weighted average cost of capital is the sum of each of the weighted cost of each type of capital. Thus, the weighted cost of debt is 0.08 × 0.45 = 0.036 or 3.6% and the weighted cost of equity is 0.098 × 0.55 = 0.054 or 5.4%. This results in a weighted average cost of capital of 3.6% plus 5.4%, or 9%.

Scrumptious Sweets' Weighted Average Cost of Capital

Type of Capital	A Cost of Capital	B Proportion of Total Capital	A × B Weighted Cost
Debt	8%	45%	3.6%
Equity	9.8%	55%	5.4%
Weighted Average Cost of Capital			9%

Table 12.2

Reconsidering the new machine the donut division wants to buy, and using EVA to evaluate the project decision, would the decision change? Remember, the cost of the machine is $1,500,000, and it is expected to generate a profit of $250,000. Assume the tax rate for Scrumptious is 40%. To calculate EVA for the project, we need the following:

1. After-Tax income	
Project income	$ 250,000
Less taxes at 40% ($250,000 × 0.40)	($ 100,000)
After-Tax income	$ 150,000
2. Invested capital	$1,500,000
3. Weighted average cost of capital	9%

EVA = After-Tax Income – (Invested Capital × Weighted Average Cost of Capital)
EVA = $150,000 – ($1,500,000 × 9%)
EVA = $150,000 – $135,000
EVA = $15,000

The positive EVA of $15,000 indicates that the project is generating income for the shareholders and should be accepted.

As you can see, though RI and EVA look similar, they can lead to different decisions. This difference stems from two sources. First, RI is calculated based on management's choice for the required rate of return, which can be determined from many different variables, whereas the weighted average cost of capital is based on the actual cost of debt and the estimated cost of equity, weighted by the actual percentages of both components. Second, when used to evaluate unit managers, RI often is based on pretax income, whereas EVA is based on after-tax income to the company itself. EVA and RI do not always lead to different decisions, but it is important that managers understand the components of both measures to ensure they make the best decision for the company.

Considerations in Using the Three Evaluative Tools

One of the most challenging aspects of using ROI, RI, and EVA lies in the determination of the variables used to calculate these measures. Income and invested capital are factors in the ROI, RI, and EVA performance models, and each can be defined in several ways. **Invested capital** can be defined as fixed assets, productive assets, or operating assets. **Fixed assets** typically include only tangible long-term assets. **Productive assets** typically include inventory plus the fixed assets. **Operating assets** include productive assets plus intangible assets, and current assets. One problem is determining which assets the manager can control with his or her decision-making authority. Each definition of invested capital will have a different impact on the performance measure, whether that measure is ROI, RI, or EVA. Deciding how to define invested capital is further complicated when combined with the additional decision of whether to use net book value (depreciated value) or gross book value (nondepreciated value) of long-lived assets. Net book value is the historical cost of an asset minus any accumulated depreciation, whereas gross book value is merely the historical cost of the asset. Obviously at the time of acquisition of an asset, these two numbers are the same, but over time, net book value will decrease for any given asset, while gross book value will stay the same for that asset. Using gross book value will result in a higher value for invested capital than using net book value. Remember, net book value will vary based on the depreciation method employed—straight line versus double declining balance, for example. Thus, gross book value removes the effect of choosing different depreciation methods. Despite this, most companies use net book value in the computation of ROI since net book value aligns with their financial reporting of capital assets on the balance sheet at their net value. Assets can also be measured at fair value, also known as market value. This is the value at which the assets could be sold. Fair value is only used in special cases of computing ROI such as in computing ROI for a real estate investment. The reason fair value is not typically used for ROI is that the fair or market value is rarely known or determinable with certainty and is often very subjective, whereas both gross and book value are readily known and determinable.

The second major component of these performance measures involves which income measure to use. First and foremost, no matter how a company measures income, the most important point is that the income the company uses as a measure should be controllable income if the performance model is to be a motivator and if the company uses responsibility accounting. Income, sometimes referred to as earnings, can be measured in many ways, and there are often common acronyms given for some of the these measures. Common ways to measure income are **operating income** (income before taxes); earnings before interest and taxes (EBIT); earnings before interest, taxes, and depreciation (EBITDA); net income (income after taxes); or return on funds employed (ROFE), which adds working capital to any of the other income measures. Companies must decide which income measure they want to use in their determination of these various performance metrics. They must consider how the metric is being used, who they are evaluating by that metric, and whether the income and capital asset chosen capture the decision-making authority of the individual or division whose performance is being evaluated.

YOUR TURN

SkyHigh Superball Decisions

The manager of the SkyHigh division of Superball Corp. is faced with a decision on whether or not to buy a new machine that will mix the ingredients used in the SkyHigh superball produced by the SkyHigh division. This ball bounces as high as a two-story building upon first bounce and is so popular that the

SkyHigh division barely keeps up with demand. The manager is hoping the new machine will allow the balls to be produced more quickly and therefore increase the volume of production within the same time currently being used in production. The manager wants to evaluate the effect of the purchase of the machine on his compensation. He receives a base salary plus a 25% bonus of his salary if he meets certain income goals. The information he has available for the analysis is shown here:

Cost of the machine	$2,000,000
Income to be generated by the machine	$1,000,000
Income without the new machine	$7,000,000
Beginning of the year capital assets (without the machine)	$8,000,000
End of the year capital assets (without the machine)	$8,400,000
Tax rate	30%
Minimum required rate of return	15%
Weighted average cost of capital	9%
Sales revenue without the machine	$18,000,000
Sales revenue with the machine	$19,400,000

The manager is looking at several different measures to evaluate this decision. Answer the following questions:

1. What is the sales margin without the new machine?
2. What is the asset turnover without the new machine?
3. What is ROI without the new machine?
4. What is RI without the new machine?
5. What is EVA without the new machine?
6. What is the sales margin with the new machine?
7. What is the asset turnover with the new machine?
8. What is ROI with the new machine?
9. What is RI with the new machine?
10. What is EVA with the new machine?
11. Should the manager buy the new machine? Why or why not?
12. How would ROI be affected if the invested capital were measured at gross book value, and the gross book values of the beginning and end of the year assets without the new machine were $11,000,000 and $11,800,000, respectively?

Solution

1. Income/Sales: $7,000,000/$18,000,000 = 39%
2. Sales/Average Assets: $18,000,000/[($12,000,000 + $12,400,000)/2] = 1.48 times
3. Income/Average Assets: $7,000,000/[($12,000,000 + $12,400,000)/2] = 58%
   Or #1 × #2: 39% × 1.48 = 58%
4. Income – (Invested Capital × Minimum Required Rate of Return)
   $7,000,000 – ($12,200,000 × 0.15) = $5,170,000
5. After-Tax Income – (Invested Capital × Weighted Average Cost of Capital)
   [$7,000,000 × (1 – 0.30)] × ($12,200,000 × 0.09) = $3,802,000
6. Income/Sales: $8,000,000/$19,400,000 = 41%
7. Sales/Average Assets: $19,400,000/[($12,000,000 + $12,400,000)/2] = 1.59 times
8. Income/Average Assets: $8,000,000/[($12,000,000 + $12,400,000)/2] = 66%

Or #7 × #8: 41% × 1.59 = 66%

9. Income – (Invested Capital × Minimum Required Rate of Return)
   $8,000,000 – (12,200,000 × 0.15) = $6,170,000
10. After-Tax Income – (Invested Capital × Weighted Average Cost of Capital)
    [$8,000,000 × (1 – 0.30)] – ($12,200,000 × 0.09) = $4,502,000
11. The manager of the SkyHigh division of Superball Corp. should accept the project, as the project improves all of his performance measures.
12. Income/Average Assets: $8,000,000/[($13,000,000 + $13,800,000)/2] = 60% This shows that the choice used as the measure of assets can affect the analysis.

12.4 Describe the Balanced Scorecard and Explain How It Is Used

The performance measures considered up to this point have relied only on financial accounting measures as the means to evaluate performance. Over time, the trend has become to incorporate both quantitative and qualitative measures and short- and long-term goals when evaluating the performance of managers as well as the company as a whole. One approach to evaluating both financial and nonfinancial measures is to use a balanced scorecard.

History and Function of the Balanced Scorecard

Suppose you work in retail and your compensation consists of an hourly wage plus a bonus based on your sales. You have excellent interpersonal skills, and customers appreciate your help and often seek you out when they come to the store. Some of your customers will return on a different day, even making an extra trip to the store to make sure you are the employee who helps them. Sometimes these customers buy items and other times they do not, but they always come back. Your compensation does not include any acknowledgment of your attention to customers and your ability to keep them returning to the store, but consider how much more you could earn if this were the case. However, in order for compensation to include nonfinancial, or qualitative, factors, the store would need to track nonfinancial information, in addition to the financial, or quantitative, information already tracked in the accounting system. One way to track both qualitative and quantitative measures is to use a **balanced scorecard**.

The idea for using a balanced scorecard to evaluate employees was first suggested by Art Schneiderman of Analog Devices in 1987 as a means to improve corporate performance by using metrics to measure improvements in areas in which Analog Devices was struggling, such as in a high number of defects. Schneiderman went through different iterations of a balanced scorecard design over several years, but the final design chosen measured three different categories: financial, customer, and internal. The financial category included measures such as return on assets and revenue growth, the customer category included measures such as customer satisfaction and on-time delivery, and the internal category included measures such as reduced defects and improved throughput time. Eventually, Robert Kaplan and David Norton, both Harvard University faculty, expanded upon Schneiderman's ideas to create the current concept of the balanced scorecard and four general categories for evaluation: financial perspective, customer perspective, internal perspective, and learning and growth. These categories are sometimes modified for particular industries.

Therefore, a balanced scorecard evaluates employees on an assortment of **quantitative factors**, or metrics

based on financial information, and **qualitative factors**, or those based on nonfinancial information, in several significant areas. The quantitative or financial measurements tend to emphasize past results, often based on their financial statements, while the qualitative or nonfinancial measurements center on current results or activities, with the intent to evaluate activities that will influence future financial performance.

ETHICAL CONSIDERATIONS

Use of a Balanced Scorecard Leads to Ethical Decision-Making

Managers and employees generally strive to create and work in an ethical environment. In order to develop such an environment, employees need to be informed of the organization's ethical standards and values and have an understanding of the laws and regulations under which the organization operates. If employees do not know the standards by which they will be measured, they might not be aware if their behavior is ethical. A balanced scorecard allows employees to understand their organization's obligations, and to evaluate their own obligations in the workplace.

To evaluate their ethical environment, organizations can hold meetings that use ethical analysis metrics. Kaplan and Norton, leaders in balanced scorecard use, explain the use of the balanced scorecard in the context of strategy review meetings: Companies conduct strategy review meetings to discuss the indicators and initiatives from the unit's Balanced Scorecard and assess the progress of and barriers to strategy execution.[2] In such meetings, the metrics analyzed should include, but not be limited to, the availability of a hotline; employee participation in ethics training; satisfaction of customers, employees, and other stakeholders; employee turnover rate; regulation compliance; community involvement; environmental awareness; diversity; legal expenses; efficient asset usage; condition of assets; and social responsibility.[3] Metrics should be tailored to an organization's values and desired operational results. The use of a balanced scorecard helps lead to an ethical environment for employees and managers.

Four Components of a Balanced Scorecard

To create a balanced scorecard, a company will start with its strategic goals and organize them into key areas. The four key areas used by Kaplan and Norton were financial perspective, internal operations perspective, customer perspective, and learning and growth (Figure 12.5).

2 Alistair Craven. *An Interview with Robert Kaplan & David Norton* (Emerald Publishing, 2008). http://www.emeraldgrouppublishing.com/learning/management_thinking/interviews/kaplan_norton.htm

3 Paul Arveson. *The Ethics Perspective* (Balanced Scorecard Institute, Strategy Management Group, 2002). https://www.balancedscorecard.org/The-Ethics-Perspective

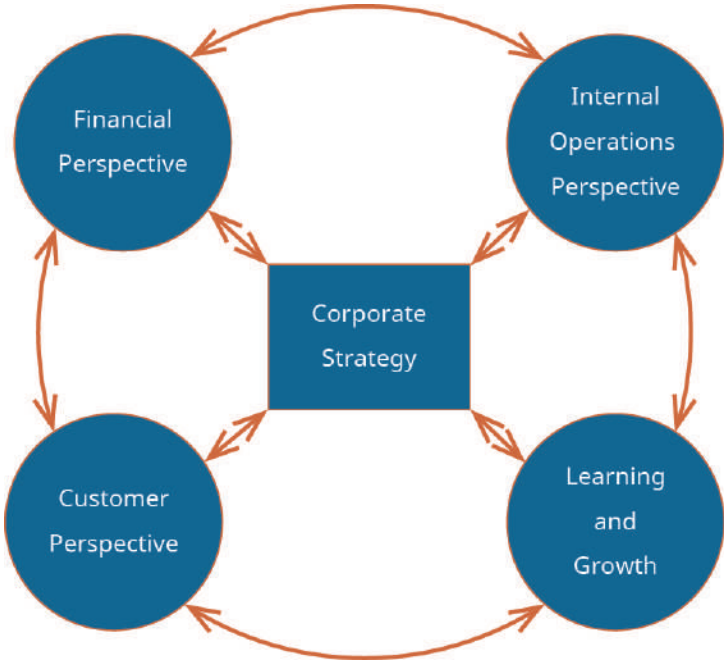


Figure 12.5 Four Key Areas of a Balanced Scorecard. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

These areas were chosen by Kaplan and Norton because the success of a company is dependent on how it performs financially, which is directly related to the company's internal operations, how the customer perceives and interacts with the company, and the direction in which the company is headed. The use of the balanced scorecard allows the company to take a stakeholder perspective as compared to a stockholder perspective. **Stockholders** are the owners of the company stock and often are most concerned with the profitability of the company and thus focus primarily on financial results. **Stakeholders** are people who are affected by the decisions made by a company, such as investors, creditors, managers, regulators, employees, customers, suppliers, and even laypeople who are concerned about whether or not the company is a good world citizen. This is why social responsibility factors are sometimes included in balanced scorecards. To understand where these types of factors might fit in a balanced scorecard framework, let's look at the four sections or categories of a balanced scorecard.

Financial Perspective

The financial performance section of a balanced scorecard retains the types of metrics that have historically been set by companies to evaluate performance. The particular metric used in the scorecard will vary depending on the type of company involved, who is being evaluated, and what is being measured. You've learned that ROI, RI, and EVA can be used to evaluate performance. There are other financial measures that can be used as well, for example, earnings per share (EPS), revenue growth, sales growth, inventory turnover, and many others. The type of financial measures used should capture the components of the decision-making tasks of the person being evaluated. Financial measures can be very broad and general, such as sales growth, or they can be more specific, such as seat revenue. Looking back at the Scrumptious Sweets example, financial measures could include baked goods revenue growth, drink revenue growth, and product cost containment.

Internal Business Perspective

A successful company should operate like a well-tuned machine. This requires that the company monitor its internal operations and evaluate them to ensure they are meeting the strategic goals of the corporation. There are many variables that could be used as internal business measures, including number of defects produced, machine downtime, transaction efficiency, and number of products completed per day per employee, or more refined measures, such as percent of time planes are on the ground, or ensuring air tanks are well stocked for a scuba diving business. For Scrumptious Sweets, internal measures could include time between production and sale of the baked goods or amount of waste.

Customer Perspectives

All businesses have customers or clients—a business will cease to operate without them—thus, it is important for a company to measure how well it is doing with respect to customers. Examples of common variables that could be measured include customer satisfaction, number of repeat customers, number of new customers, number of new customers from customer referrals, and market share. Variables that are more specific to a particular business include factors such as being ranked first in the industry by customers and providing a safe diving environment for scuba diving. Customer measures for Scrumptious Sweets might include customer loyalty, customer satisfaction, and number of new customers.

Learning and Growth

The business environment is a very dynamic one and requires a company to constantly evolve in order to survive, let alone grow. To reach strategic targets such as increased market share, management must focus on ways to grow the company. The learning and growth measures are a means to assess how the employees and management are working together to grow the company and to help the employees grow within the company. Examples of measures in this category include the number of employee suggestions that are adopted, turnover rates, hours of employee training, scope of process improvements, and number of new products. Scrumptious Sweets may use learning and growth measures such as hours of customer service training and hours on workforce relationship training.

Combining the Four Components of a Balanced Scorecard

Balanced scorecards can be created for any type of business and can be used at any level of the organization. An effective and successful balanced scorecard will start with the strategic plan or goals of the organization. Those goals are then restated based on the level of the organization to which the balanced scorecard pertains. A balanced scorecard for an entire organization will be broader and more general in terms of goals and measures than a balanced scorecard designed for a division manager. Balanced scorecards can even be created at the individual employee level either as an evaluation mechanism or as a means for the employee to set and monitor individual goals. Once the strategic goals of the organization are stated for the appropriate level for which the balanced scorecard is being created, then the measures for each of the categories of the balanced scorecard should be defined, being sure to consider the areas over which the division or individual does or does not have control. In addition, the variables have to be obtainable and measurable. Last, the measures must be useful, meaning that what is actually being measured must be informative, and there must be a basis of comparison—either company standards or individual targets. Using both quantitative and nonquantitative performance measures, along with long- and short-term measurements, can be very beneficial, as they can serve to motivate an employee while providing a clear framework of how that employee

fits into the company's strategic plan.

As an example, let's examine several balanced scorecards for Scrumptious Sweets. First, Figure 12.6 shows an overall organizational balanced scorecard, the broadest and most general balanced scorecard.

SCRUMPTIOUS SWEETS, INC. Corporate Balanced Scorecard			
Mission: Provide customers with superior-quality traditional and innovative baked goods			
	Business Objectives	**Measures**	**Target**
Financial	Increase Revenue	Sales Revenues	Increase revenue 5%
	Lower Costs	Operating Costs	Decrease costs 3%
	Increase Profits	Net Income	Increase income 6%
Customer	Increase Customer Satisfaction	Customer satisfaction surveys	95% customer satisfaction rating
	Improve Customer Loyalty	Number of repeat customers	90% retentions of existing customers
	Grow Market Share	Number of new customers	10% increase in market share
Internal	Improve Production Processes	Reduce time from production to customer	10% decrease in production-to-customer time
	Reduce Waste on Products Produced	Units of waste per production process	10% decrease in waste generated per production process
	Reduce Carbon Footprint	Factory effluents and exhaust measured in PPM (parts per million)	5% decrease in both effluents and exhaust pollutants (PPM)
Learning & Growth	Improve Product & Service Innovation	Implemented employee suggestions	40% increase in number of employee suggestions made
	Increase Motivation and Empowerment	Management training course certificates awarded	20% incerase in number of employees completing management training courses
	Improve Employee Retention	Employee satisfaction surveys	90% rating on overall employee satisfaction

Figure 12.6 Scrumptious Sweets, Inc. Corporate Balanced Scorecard. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Notice that this scorecard starts with the overall corporate mission. It then contains very broad goals and measures in each of the four categories: financial, customer, internal, and learning and growth. In this scorecard, there are three general goals for each of these four categories. For example, the goals related to customers are to improve customer satisfaction, improve customer loyalty, and increase market share. For each of the goals, there is a general measure that will be used to assess if the goal has been met. In this

example, the goal to improve customer satisfaction will be assessed using customer satisfaction surveys. But remember, measures are only useful as a management tool if there is a target to work toward. In this case, the goal is to achieve an overall 95% customer satisfaction rating. Obviously, the goals on this scorecard and the associated measures seem almost vague due to their general nature. However, these goals match with the overall corporate strategy and provide guidance for management at lower levels to begin dissecting these goals to more specific ones that pertain to their particular area or division. This allows them to create more detailed balanced scorecards that will allow them to help meet the overall corporate goals laid out in the corporate scorecard. Figure 12.7 shows how the corporate balanced scorecard previously presented could be further detailed for the manager of the brownie division.

SCRUMPTIOUS SWEETS, INC. Brownie Division Balanced Scorecard			
Corporate Mission: Provide customers with superior-quality traditional and innovative baked goods			
	Business Objectives	**Measures**	**Target**
Financial	Increase revenues through improved sales mix	Sales mix revenues	Increase revenues 10% through better sales mix utilization
	Lower production costs	Production costs	Decrease production costs by 4% through order and production efficiencies
	Increase divisional profits	Divisional profit	Increase divisional profit by 12%
Customer	Meet customer unique needs	Number of customer suggestions or special requests	Meet 95% of customer special requests and track customer suggestions implemented
	Brand recognition	Number of repeat customers and number and variety of best selling-products	95% retention of existing customers; 10% increase in sales of best sellers
	Customer referrals	Number of customer referrals	15% increase in referral cards received
Internal	Reduce time from production to customer/storefront	Time from packaging to delivery or display	10% decrease in time from production to customer access
	Reduce product waste through improved uniformity of product and better timing of orders and production	Units of waste per production process, uniformity of product and inventory control	10% decrease in production waste; 5% improvement in inventory turnover
	Increase environmental protection efforts	Number of energy-efficient bulbs replaced; paperless efforts measure	75% use of energy-efficient bulbs; 5% decrease in water usage; 80% paperless work environment
Learning & Growth	New or improved product or process ideas	Number of new products introduced; number of improved products	10% increase in new products produced; improvements to 5% of products or processes
	Increase employee motivation and empowerment	Management training course certificates awarded	20% increase in number of employees completing management training courses
	Improve employee retention	Employee satisfaction surveys	90% rating on overall employee satisfaction; 50% increase in employees using open-door policy

Figure 12.7 Scrumptious Sweets, Inc. Brownie Division Balanced Scorecard. (attribution: Copyright Rice

As you can see from the balanced scorecard for the brownie division, the same corporate mission is included, as are the same four categories; however, the divisional goals are more specific, as are the measures and the targets. For example, related to the overall corporate goal to increase customer satisfaction, the divisional goal is to meet customers' unique needs. The division will assess how well they are accomplishing this goal by tracking the number of customer suggestions and customer special requests, such as when a customer requests a special flavor of brownie not normally produced by the brownie division. The target set by the management of the brownie division is to meet 95% of customer special requests and to track the number of customer suggestions that are implemented by the division. The idea is that if the division is meeting customer needs and requests, this will result in high customer satisfaction, which is an overriding corporate goal. The success of the division will be based on each employee doing his or her best at his or her specific job. Therefore, it is useful to see how the balanced scorecard can be used at an individual employee level. Figure 12.8 shows a balanced scorecard for the brownie division's employees who work in the front end or store portion of the division.

SCRUMPTIOUS SWEETS, INC. Brownie Division Storefront Employees Balanced Scorecard			
Corporate Mission: Provide customers with superior-quality traditional and innovative baked goods			
	Objectives	**Measures**	**Target**
Financial Initiatives	Increase Sales • Offer additional products to each customer • Promote mobile ordering	Same store sales	10% increase
		Mobile sales	20% increase in mobile orders
	Lower Costs • Follow safety rules • Reduce waste • Follow drink recipes exactly	Safety reports/claims	5% reduction in number of reports filed
		Inventory turnover	5% improvements in inventory turnover
Customer Initiatives	Improve Customer Experience • Clean and well-stocked store • Polite, friendly interaction • Offering to carry/load products	Customer satisfaction surverys	95% customer satisfaction rating
		Mystery customer reports	Average rating of A on all 10 dimensions measured
	Customer Retention and Growth • Promote frequent buyer awards • Promote referral incentives	Frequent buyer rewards redeemed	5% increase in rewards redeemed
		Customer referral cards redeemed	20% increase in rewards redeemed
Internal Initiatives	Improve Product Delivery Efficiency • Follow order queuing/filling • Order taking accuracy • Correct errors quickly	Order queuing reports	100% accuracy in order queuing
		Customer surveys and mystery customer reports	100% accuracy in order taking
	Reduce Carbon Footprint • Avoid order errors • Minimize waste • Turn off lights in unused rooms	Pounds of trash	10% reduction in trash generated
		Utility charges	5% reduction in utility costs
Learning and Growth Initiatives	Expand Employee Mentoring Program and Expand Business Improvements • Meet with mentor regularly • Take advantage of open-door policy • Making suggestions	Mentor meeting log	100% quarterly employee/mentor meetings
		Employee suggestions implemented	20% increase in number of viable suggestions by employees
	Actively Participate in Corporate Training opportunities • Management training courses • College tuition program	Training certifications	100% of employees completing quarterly training

Figure 12.8 Scrumptious Sweets, Inc. Brownie Division Store Front Employees Balanced Scorecard. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

In this balanced scorecard the same categories are used, but there is more detail about each of the business objectives, and each objective has more refined measures than the prior two scorecards. Again in the

customer category, one of the objectives of the storefront employees is to improve the customer experience. Notice that there are three initiatives listed to help drive this goal. The measures that would be used to evaluate the success of these initiatives as well as their specific targets are detailed. Again, the idea is that if the employees who work in the store portion of the brownie division make the customer experience great, this will translate into high scores on the customer satisfaction surveys and help the company meet its overriding goal to increase customer satisfaction. In order to ensure that this occurs, the specific goals and metrics are created. As previously expressed, it is best if these objectives, measures, and targets are determined by a process that includes management and the employees. Without employee input, employees may feel resentful of targets over which they had no input. But, the employees alone cannot set their own goals and targets, as there could be a tendency to set easy targets, or the employee may not be aware of how his or her efforts affect the division and overall corporation. Thus, a collaborative approach is best in creating balanced scorecards.

The three scorecards presented show that the process of creating appropriate and viable scorecards can be quite complicated and challenging. Determining the appropriate qualitative and quantitative measures can be a daunting process, but the results can be extremely beneficial. The scorecards can be useful tools at all levels of the organization if they are adequately thought out and if there is buy-in at all levels being evaluated by a scorecard. Next, we'll consider how the use of the balanced scorecard and performance measures are not mutually exclusive and can work well together.

CONTINUING APPLICATION AT WORK

Balanced Scorecard

Let's revisit Gearhead Outfitters in the context of their operating results, internal processes, growth, and customer satisfaction. Recall that the company was founded as a single store in 1997 and grew to multiple locations mainly in the southern United States. How did Gearhead get there? How did the company gather information to make expansion decisions? Now that Gearhead has expanded, should it keep all current locations open? Is the company meeting the desires of its customers?

Questions such as these are addressed through performance measures detailed in a balanced scorecard. Financial metrics such as return on investment and residual income give Gearhead information on whether or not dollars invested have translated into additional income, and if current income can support needed cash flow for current and future operations. While financial measures are important, they are only one aspect of evaluating the effectiveness of a company's strategy. Value provided to customers should also be considered, as well as the success of internal processes, and whether or not the company adequately provides growth opportunities for employees. Sales from new products, employee turnover, and customer satisfaction surveys can also provide valuable data for measuring success. The idea of a balanced scorecard is to give a business both financial and nonfinancial information to use in its strategic decisions.

The Our Story page of Gearhead's website reads: "Gearhead Outfitters exists to create a positive shopping experience for our guests. Gearhead is known for its relaxed environment, specialized inventory and customer service for those pursuing an active lifestyle. True to our local roots, we employ local residents of each city we operate in, support local organizations, and strive to build relationships

within our communities."[4]

Given how Gearhead describes itself, and the performance measures discussed previously, what other information might the company want to gather for its balanced scorecard?

Final Summary of Quantitative and Quantitative Performance Measurement Tools

As the business environment changes, one thing stays the same: businesses want to be successful, to be profitable, and to meet their strategic goals. With these changes in the business environment come more varied responsibilities placed on managers. These changes occur due to an increased use of technology along with ever-increasing globalization. It is very important that an organization can appropriately measure whether employees are meeting these various responsibilities and reward them accordingly.

You've learned about some common performance measures such as ROI, RI, EVA, and the balanced scorecard. The more accurately and efficiently a company can monitor and measure its decision-making processes at all levels, the more quickly it can respond to change or problems, and the more likely the company will be able to meet its strategic goals. Most companies will use some combination of the quantitative and nonquantitative measures described. ROI, RI, and EVA are typically used to evaluate specific projects, but ROI is sometimes used as a divisional measure. These measures are all quantitative measures. The balanced scorecard not only has quantitative measures but adds qualitative measures to address more of the goals of the organization. The combination of these different types of quantitative and qualitative measures—project-specific measures, employee-level measures, divisional measures, and corporate measures—enables an organization to more adequately assess how it is progressing toward meeting short- and long-term goals. Remember, the best performance measurement system will contain multiple measures and consist of both quantitative and qualitative factors, which allows for better assessment of managers and better results for the corporation.

THINK IT THROUGH

Nonfinancial Measurements of Success

For each of the following businesses, what are four nonfinancial measures that might be useful for helping management evaluate the success of its strategies?

- Grocery store
- Hospital
- Auto manufacturer
- Law office
- Coffee shop
- Movie theater

4 Gearhead Outfitters. "Our Story." https://www.gearheadoutfitters.com/about-us/our-story/

Key Terms

after-tax income income reduced by tax expenses
asset turnover measure of how efficiently a company is using its capital assets to generate revenues
balanced scorecard tool used to evaluate performance using qualitative and nonqualitative measures
capital asset tangible or intangible asset that has a life longer than one year
controllable factor component of the organization for which the manager is responsible and that the manager can control
cost center part of an organization in which management is evaluated based on the ability to contain costs; the manager primarily has control only over costs
economic value added (EVA) measure of shareholder wealth that is being created by a project, segment, or division
fixed asset tangible long-term asset
goal congruence integration of multiple goals, either within an organization or across multiple components or entities; congruence is achieved by aligning goals to achieve an anticipated mission
invested capital fixed assets, productive assets, or operating assets
investment center organizational segment in which a manager is accountable for profits (revenues minus expenses) and the invested capital used by the segment
metric means to measure something such as a goal or target
minimum required rate of return minimum return, usually in a percentage form, that a project or investment must produce in order for the company to be willing to undertake it
operating asset product asset plus intangible asset and current asset
operating income income before considering interest and taxes
performance measure metric used to evaluate a specific attribute of a manager's role
performance measurement system evaluates management in a way that will link the goals of the corporation with those of the manager
productive asset fixed asset plus inventory
profit center organizational segment in which a manager is responsible for and evaluted on both revenues and costs
qualitative factor component of a decision-making process that cannot be measured numerically
quantitative factor component of a decision-making process that can be measured numerically
residual income (RI) amount of income a given division (or project) is expected to earn in excess of a firm's minimum return goal
responsibility accounting method of encouraging goal congruence by setting and communicating the financial performance measures by which managers will be evaluated
return on investment (ROI) measure of the percentage of income generated by profits that were invested in capital assets
revenue center part of an organization in which management is evaluated based on the ability to generate revenues; the manager's primary control is only revenues
sales margin measure of how much profit is generated by each sales dollar
stakeholder someone affected by decisions made by a company; may include an investor, creditor, employee, manager, regulator, customer, supplier, and layperson
stockholder owner of stock, or shares, in a business
strategic plan broad vision of how a company will be in the future
uncontrollable factor decision or outcome over which a manager does not have control

weighted average cost of capital cost that the company expects to pay on average to finance assets and growth using either debt or equity

Summary

12.1 Explain the Importance of Performance Measurement

- Well-designed performance measurement systems help businesses achieve goal congruence between the company and the employees.
- Managers should be evaluated only on factors over which they have control.
- Performance measures can be based on financial measures and/or nonfinancial measures.
- Performance measurement systems should help the company meet its strategic goals while helping the employee meet his or her professional goals.

12.2 Identify the Characteristics of an Effective Performance Measure

- A good performance measurement system uses measures over which a manager has control, provides timely and consistent feedback, compares the measures to standards of some form, has both short- and long-term measures, and puts the goals of the business and the individual on an equal level.

12.3 Evaluate an Operating Segment or a Project Using Return on Investment, Residual Income, and Economic Value Added

- Three common performance measures based on financial numbers are return on investment, residual income, and economic value added.
- Return on investment measures how effectively a company generates income using its assets.
- ROI can be broken into two separate measures: sales margin and asset turnover.
- Residual income measures whether or not a project or a division is exceeding a minimum return that has been determined by management.
- Economic value added is used to measure how well a project or division is contributing to shareholder wealth.
- A big challenge with ROI, RI, and EVA is determining which value of income and assets to use in calculating these measures.

12.4 Describe the Balanced Scorecard and Explain How It Is Used

- Balanced scorecards use both financial and nonfinancial measures to evaluate employees.
- The four categories of a balanced scorecard are financial perspective, internal business perspective, customer perspective, and learning and growth perspective.
- Financial perspective measures are usually traditional measures, based on financial statement information such as EPS or ROI.
- Internal business perspective measures are those that evaluate management’s operational goals, such as quality control or on-time production.
- Customer perspective measures are those that evaluate how the customer perceives the business and how the business interacts with customers.
- Learning and growth perspective measures are those that evaluate how effectively the company is growing by innovating and creating value. This is often done through employee training.
- Well-designed balanced scorecards can be very effective at goal congruence through the utilization of both financial and nonfinancial measures.

Multiple Choice

1. LO 12.1 Components of the organization that are demotivating for purposes of performance management are known as _____.

A. business goals
B. strategic plans
C. uncontrollable factors
D. incentives

2. LO 12.1 When managerial accountants design an evaluation system that is based on criteria for which a manager is responsible, and it is structured to encourage managers to make decisions that will meet the goals of the company as well as their own personal job goals, the framework used is _____.

A. a controllable factors framework
B. an uncontrollable factors framework
C. a strategic plan framework
D. a responsibility accounting framework

3. LO 12.1 Goal congruence in well-designed performance measurement systems best explains a congruence between _____.

A. employees and the company
B. strategic plans and the future
C. decisions and outcomes
D. feedback and measurement

4. LO 12.1 Responsibility accounting holds managers responsible for _____.

A. all costs charged to their subunit
B. all costs charged to their subunit plus a share of company-wide fixed costs
C. only the costs that they can control
D. only the costs that they have personally approved

5. LO 12.1 Performance measures are only useful if _____.

A. there are both controllable and uncontrollable factors to evaluate managers
B. manager reward systems are designed by the chief financial officer prior to implementation
C. all of the measures used are accounting numbers
D. there is a baseline against which to compare the measured results

6. LO 12.2 Which of the following is *not* a characteristic of a good performance measurement system?

A. timely
B. consistent
C. based on activities over which managers have no control or influence
D. uses both long- and short-term performances and standards

7. LO 12.2 A good performance measurement system will align the goals of management with _____.

A. the goals of the city manager and the mayoral staff
B. the goals of the corporation, and both parties will benefit
C. the priorities of the stockholders as listed at the annual meeting
D. the investment department's response to the annual audit

8. LO 12.2 What should an organization do if performance measures change?

A. Make sure that the manager being evaluated is aware of the measurement change, as this may affect his or her decision-making.
B. Make sure that the manager benefits without the corporation also benefitting.
C. Make sure that there are significant overriding opportunities for each manager, if the manager is unaware of the change.
D. Obtain customer surveys on the change before communicating the change to the manager.

9. LO 12.2 A good performance measurement system will include which of the following?

A. short-term goals
B. long-term goals
C. short-term and long-term goals
D. no goals at all

10. LO 12.2 Without proper performance measures, goal congruence is almost impossible to achieve and will likely lead to _____.

A. more stable targets
B. decreased defects
C. lost profits
D. employees satisfied with the status quo

11. LO 12.3 Dixon Construction Materials has collected this information:

Net operating profit before tax	$300,000
Tax rate	30%
Invested capital	$2,500,000
Weighted average cost of capital	8%

Based on this information, what is the EVA for the project?

A. $100,000
B. $10,000
C. $450,000
D. ($110,000)

12. LO 12.3 The cost of equity is _____.

A. the interest associated with debt
B. the rate of return required by investors to incentivize them to invest in a company
C. the weighted average cost of capital
D. equal to the amount of asset turnover

13. LO 12.3 Which of the following measures the profitability of a division relative to the size of its investment in capital assets?

A. residual income (RI)
B. sales margin
C. return on investment (ROI)
D. economic value added (EVA)

14. LO 12.3 The capital structure of Ridley Enterprises is: Debt 40%, Equity 60%. The cost of debt is 13%, and the cost of equity is 16.5%. What is the weighted average cost of capital for Ridley Enterprises?

A. 14.4%
B. 15.1%
C. 16.2%
D. 13.8%

15. LO 12.3 Calculate the ROI for Gardner Chemical given the following information:

Income	$ 6,000
Revenue	$24,000
Average assets	$10,000

A. 25%
B. 24%
C. 60%
D. 40%

16. LO 12.4 Which of the following statements is *false*?

A. The four dimensions of performance that are considered in a balanced scorecard are financial, customer, internal process, and learning and growth
B. A balanced scorecard will include qualitative and quantitative measures.
C. Stakeholders cannot include stockholders.
D. A balanced scorecard is the compatibility between personal goals and the goals of the organization.

17. LO 12.4 The metrics based on nonfinancial information are known as _____.

A. quantitative factors
B. qualitative factors
C. stakeholders
D. stockholders

18. LO 12.4 The metrics based on financial numbers produced by the accounting system are _____.

A. quantitative factors
B. qualitative factors
C. stakeholders
D. stockholders

19. LO 12.4 People affected by decisions made by a company, including investors, creditors, employees, managers, regulators, customers, suppliers, and laypeople, are known as _____.

A. quantitative factors
B. qualitative factors
C. stakeholders
D. stockholders

20. LO 12.4 The owners of company stock are _____.

A. quantitative factors
B. qualitative factors
C. stakeholders
D. stockholders

Questions

1. LO 12.1 Why might a manager focused solely on accounting numbers miss opportunities for future benefits?

2. LO 12.1 Is there a way to prevent managers from focusing on accounting measures as performance measures?

3. LO 12.1 Should an organization focus on controllable or uncontrollable factors to effectively implement a successful performance measurement system? Explain your answer.

4. LO 12.1 What are the components of a strategic plan? Find one of these components for the company you work for and share (if you are not currently employed, use the college you attend).

5. LO 12.1 What are the four types of centers and their corresponding responsibilities?

6. LO 12.2 What would be wrong with using two points of data in a performance measurement system to tell a company whether the amount of variation is normal or abnormal?

7. LO 12.2 Compare and contrast short- and long-term goals for a company. Give an example of each, and explain why they are important for performance measurement systems.

8. LO 12.2 Can a short-term goal also be a long-term goal? Where is the division, and why is it important for an employee to understand whether the goal is short or long term?

9. LO 12.2 What does *goal congruence* mean? Provide an example with your explanation.

10. LO 12.2 What are the six characteristics of a good performance measurement system?

11. LO 12.3 What is EVA and why is it superior to other performance measures?

12. LO 12.3 What are the drawbacks to ROI? Give examples of each.

13. LO 12.4 Describe. the history and purpose of the balanced scorecard.

14. LO 12.4 What are the characteristics of successful balanced scorecards?

Exercise Set A

EA1. LO 12.1 For the following situations, identify whether the description is probably a centralized or decentralized organization.

A. Seaside Furniture, a small builder of side tables managed solely by its sole proprietor
B. Harbor Marketing, which wants Advertising Team Leaders to be able to respond quickly to needs of potential clients so Team Leaders have the authority to make decisions about advertising and pricing
C. Couture's Creations, with a single owner who manages the production, accounting, engineering, sales, and other administrative functions
D. British Navy
E. McDonalds franchise #3101 in Canton, Ohio
F. United States Army

EA2. LO 12.1 For the following descriptions state whether the cost is controllable or uncontrollable by responsibility center managers.

A. property tax of an existing manufacturing facility
B. research and development of a product
C. advertising of a product
D. insurance cost of the existing manufacturing facility
E. design of a product

EA3. LO 12.1 Identify the type of responsibility center (revenue center, cost center, profit center, or investment center) for each of the following situations.

A. the accounting department for Tubelite Inc.
B. the Best Buy in Traverse City, Michigan
C. the reservation department of Allegiant airlines
D. the sales department of Four Winns
E. the Kohl's store in Mount Pleasant, Michigan
F. The Hershey Company
G. Procter and Gamble
H. the shoe department in the Kohl's store in Mount Pleasant, Michigan

EA4. LO 12.2 Sara has just taken a job as the middle school assistant principal for an area school district. Prior to this, she was a teacher. She has received the following performance measurements for her first administrative job. Her first order of business is to determine if these performance measurements are short-term goals or long-term goals based on her individual situation. She has completed her administrative degree but has not yet worked as an administrator. Identify each of the following goals as short term or long term.

A. Conduct teacher walk-throughs/observations/evaluations for teachers of grades 6 and 7.
B. Assist the district's mission in seeking to educate all youth in the school district.
C. Train to become a building instructional leader. Act as building administrator in the absence of the principal.
D. Attend meetings with building principals and the administrative team when called to do so.
E. Engage all students in a meaningful way, and support teachers and staff in providing rigor and relevance. Success of school-wide discipline and attendance policies and enforcement depends on a combination of creativity and sound pedagogy while adhering to district, state, and federal law, guidelines, and regulations.
F. Facilitate and supervise all federal- and state-mandated drills (fire, lockdowns, tornado, others).
G. Dress professionally.
H. Assist the building principal in all job duties and responsibilities.

EA5. LO 12.3 During the current year, Sokowski Manufacturing earned income of $350,000 from total sales of $5,500,000 and average capital assets of $12,000,000. What is the sales margin?

EA6. LO 12.3 During the current year, Sokowski Manufacturing earned income of $350,000 from total sales of $5,500,000 and average capital assets of $12,000,000.

A. Based on this information, calculate asset turnover.
B. Using the sales margin from the previous exercise, what is the total ROI for the company during the current year?

EA7. LO 12.3 Assume Skyler Industries has debt of $4,500,000 with a cost of capital of 7.5% and equity of $5,500,000 with a cost of capital of 10.5%. What is Skyler's weighted average cost of capital?

EA8. LO 12.3 Why do managers want a high ROI, and how would they strive to increase their ROI?

EA9. LO 12.4 Classify each of the following performance measures into the balanced scorecard perspective to which it relates: financial perspective, internal operations perspective, learning and growth perspective, or customer perspective.

A. Number of improved products
B. Time from packaging to delivery or display
C. Production costs
D. Number of customer suggestions
E. Sales mix revenues
F. Number of repeat customers

Exercise Set B

EB1. LO 12.1 For the following situations identify whether the description is a centralized or decentralized organization.

A. the United States Navy
B. Farah's Domino's franchise store
C. Domino's Pizza
D. Middie's Furniture, which is divided into separate operating units, such as living room, kitchen, flooring
E. the local community college, which has a single payroll department, a single administrative headquarters, and a single human resources department since it "flattened" its organization structure
F. Conner Corporation, which promotes managers from within the organization whenever possible and which has formal training programs for lower-level managers

EB2. LO 12.1 For the following descriptions, state whether the cost is controllable or uncontrollable by responsibility center managers.

A. advertising for a merchandiser
B. corporate income taxes
C. office supplies for a merchandiser
D. donations to the Salvation Army
E. insurance for delivery vehicles

EB3. LO 12.1 Identify the type of responsibility center (revenue center, cost center, profit center, or investment center) for each of the following situations.

A. the legal department for Avon Manufacturing
B. the Macy's store in Mansfield, Ohio
C. the food and beverage division of the Best Western
D. the marketing department of the Hershey Company
E. the Walmart #5030 on Central Avenue in Toledo, Ohio
F. Apple's Braeburn Capital Inc., where most of Apple's billions of dollars are invested
G. Zappo's department store
H. the men's clothing department in the Walmart #5030 in Toledo, Ohio

EB4. LO 12.2 Padma completed her doctoral degree and has taken a position as an assistant professor at a local university. She was given the following performance measures for her new position. Identify whether these goals are long or short term.

A. Interact in a fair and impartial way with students.
B. Promote and access student academic achievement.
C. Counsel students within the norms of society and the regulations of the college.
D. Motivate students.
E. Effectively plan and organize lectures and labs in accordance with the college course outlines.
F. Report class attendance in accordance with the college policy and procedure.
G. Serve on academic committees as assigned.
H. Make progress toward tenure necessary at her university.

EB5. LO 12.3 During the current year, Plainfield Manufacturing earned income of $845,000 from total sales of $9,350,000 and average capital assets of $13,500,000. What is the sales margin?

EB6. LO 12.3 During the current year, Plainfield Manufacturing earned income of $845,000 from total sales of $9,350,000 and average capital assets of $13,500,000. Using the sales margin from the previous exercise, what is the total ROI for the company during the current year?

EB7. LO 12.3 Assume Plainfield Manufacturing has debt of $6,500,000 with a cost of capital of 9.5% and equity of $4,500,000 with a cost of capital of 11.5%. What is Tyler's weighted average cost of capital?

EB8. LO 12.3 Though a high ROI is desired, what are some reasons that might lead to a low or decreased ROI?

EB9. LO 12.4 Classify each of the following performance measures into the balanced scorecard perspective to which it relates: financial perspective, internal operations perspective, learning and growth perspective, or customer perspective.

A. Employee satisfaction surveys
B. Units of waste per production process, uniformity of products and inventory control
C. Number of energy-efficient bulbs replaced
D. Management training course certificates awarded
E. Divisional profit
F. Number of customer referrals

Problem Set A

PA1. LO 12.1 Match each of the following with its appropriate term.

A. Controllable factors	i. This is the part of an organization in which management is evaluated based on the ability to contain costs; the manager primarily has control only over costs.
B. Cost center	ii. This means to align the goals of the business with the personal goals of the manager.
C. Metric	iii. These components of the organization are components for which the manager is responsible and can control.
D. Goal congruence	iv. This is the means to measure something such as a goal or target.
E. Investment center	v. This is a system that evaluates management in a way that will link the goals of the corporation with those of the manager.
F. Performance measurement system	vi. For this center, management is responsible for revenues, costs, and assets and is evaluated based on these three components.

PA2. LO 12.1 Florentino Allers is the production manager of Electronics Manufacturer. Due to limited capacity, the company can only produce one of two possible products:

- An industrial motherboard with a 75% probability of making a profit of $1 million and a 25% probability of making a profit of $150,000
- A regular motherboard with a 100% chance of making a profit of $710,000

Florentino will get a 20% bonus from his department. Florentino has the responsibility to choose between the two products and is more of a risk-taker, more so than most of the top management at Electronics Manufacturer.

A. Which option is Florentino more likely to choose and why?
B. Which option would the company be more likely to choose and why?
C. What changes should the company make to Florentino's compensation to avoid unnecessary risks?

PA3. LO 12.3 Macon Mills is a division of Bolin Products, Inc. During the most recent year, Macon had a net income of $40 million. Included in the income was interest expense of $2,800,000. The company's tax rate was 40%. Total assets were $470 million, current liabilities were $104,000,000, and $72,000,000 of the current liabilities are noninterest bearing. What are the invested capital and ROI for Macon?

PA4. LO 12.3 Jefferson Memorial Hospital is an investment center as a division of Hospitals United. During the past year, Jefferson reported an after-tax income of $7 million. Total interest expense was $3,200,000, and the hospital tax rate was 30%. Total assets totaled $70 million, and non-interest-bearing current liabilities were $22,800,000. The required rate of return established by Jefferson is equal to 18% of invested capital. What is the residual income of Jefferson Memorial Hospital?

PA5. LO 12.4 Crawford's Books and Things has a traditional bookstore housed downtown Charlotte. The store has been there forty years, and many customers love the fact that they can hold the books in their hands and browse the offerings. Crawford's just started an online book division for people who like to order books online.

EVA for the Charlotte store is about $13 million, while EVA for the online division shows a value of –$2.2 million.

A. Explain why it might be better to evaluate the online division using a balanced scorecard.
B. Suggest two measures for the customer dimension that would be appropriate for the online division and two measures for the internal processes dimension of the balanced scorecard that would be appropriate for the online division.

PA6. LO 12.4 Coral Creations has strategic plans that call for rapid growth, a limited number of units for each design to enhance exclusivity, designs for the perfect fit, on-time delivery to customers, retention of highly trained employees with innovative skills, and excellent inventory control.

A. Suggest one performance measure for each dimension of the balanced scorecard for Coral Creations.
B. Take one of your measures and discuss the linkage it has to multiple strategies in Coral's plan.

Problem Set B

PB1. LO 12.1 Match each of the following with its appropriate term:

A. Performance measures	i. The decisions and outcomes over which a manager does not have control
B. Profit center	ii. That part of an organization in which management is evaluated based on the ability to generate revenues; the manager primarily has control only over revenues
C. Responsibility accounting	iii. The part of an organization in which management is evaluated based on the ability to generate profits because the manager has control over both revenues and costs
D. Revenue center	iv. A broad vision of how a company will be in the future
E. Strategic plan	v. A system that collects and reports data for which a manager has responsibility
F. Uncontrollable factors	vi. The metrics used to evaluate a specific attribute of a manager's role

PB2. LO 12.1 Oleg Markov is the production manager of NASA Solvents. Due to limited capacity, the company can only produce one of two possible products:

- an industrial concentrated solvent with a 15% probability of making a profit of $1 million and an 85% probability of making a profit of $200,000
- a household diluted solvent with a 100% chance of making a profit of $310,000

Oleg will get a 20% bonus from his department. Oleg has the responsibility to choose between the two products and is more risk averse than most of the top management at NASA Solvents.

A. Which option is Oleg more likely to choose and why?
B. Which option would the company be more likely to choose and why?
C. What changes should the company make to Oleg's compensation to encourage managers to take appropriate risks

PB3. LO 12.3 Evaluate the two departments for Moxie Products.

	Department 1	Department 2
Total assets	$138,000,000	$46,000,000
Non-interest-bearing liabilities	$9,000,000	$4,600,000
Net operating income after taxes	$24,000,000	$11,800,000
Required rate of return	12%	11%

Compare the year's performance of the two departments in terms of ROI and RI. Which department has created the most wealth for Moxie shareholders in the past year?

PB4. LO 12.3 Banyan Industries has two divisions, a tax rate of 30%, and a minimum rate of return of 20%. Division A has a weighted average cost of capital of 9.5% and is looking at a new project that will generate a profit of $1,200,000 from a machine that costs $4,000,000. Division B has a weighted average cost of capital of 9.5% and is looking at a new project that will generate a profit of $1,350,000 from a machine that costs $5,000,000.

A. Calculate the EVA for each of Banyan's divisions.
B. Calculate the RI for each of Banyan's division.
C. If Banyan uses EVA to evaluate the projects, which division has the better project and by how much?
D. If Banyan uses RI, which division has the better project and by how much?
E. What are some of the reasons for the similarity or difference that you found in the use of EVA versus RI?

PB5. LO 12.4 Forty years ago, Vinfen was founded as a nonprofit company by psychiatrists and social workers at the Massachusetts Mental Health Center and Harvard Medical School to help people with psychiatric conditions transition to group homes for community living. Vinfen's strategy map for fiscal 2006 shows how it is building from its mission to accelerating organizational learning and elevating agency performance through its balanced scorecard perspectives to bring value to the customer supported by operational excellence.[5] The following are elements in the balanced scorecard and the four key perspectives. Match the elements with the correct perspectives.

A. Improve organizational trust and teamwork	i. Financial perspective
B. Strengthen government engagement	ii. Learning and growth perspective
C. Deliver quality services to special populations	iii. Internal perspective
D. Achieve financial stability	iv. Customer perspective
E. Increase public awareness and visibility	
F. Contribute to human services research and innovation	
G. Improve efficiency and effectiveness of contracting process	
H. Build professional competencies that support strategy	
I. Develop and implement an integrated information system	
J. Deliver services consistent in value and quality	

Thought Provokers

TP1. LO 12.1 What combination of quantitative factors and qualitative factors would you like your potential employer to use as a performance management system? Explain your answer.

TP2. LO 12.2 Josh O'Shea is the manager of the Cardiovascular/Respiratory Laboratory. This department is responsible for measuring blood gases, performing respiratory treatments, and distributing automated IV equipment. As a manager, Josh hires and trains personnel, prepares his departmental budget, and maintains the personnel schedule. Josh recommends equipment needs for the department, but he may be overruled in the acquisition process. Josh and his departmental personnel are paid for the professional credentials they hold, earn, and maintain and are reimbursed by the hospital for any approved training or professional credentials they acquire. Josh must use the equipment, reagents, and supplies provided to him from central purchasing. Based on this information, what incentives do you see as those that will motivate Josh as part of the hospital team, and why? Which incentives will be demotivating, and why?

5 https://www.vinfen.org

TP3. LO 12.2 Kanye Achebe just became the operations manager of Weston Transportation. Weston transports large crates for online companies and transports containers overseas.

Kanye would like to evaluate each divisional manager on a basis similar to segmental reporting required by generally accepted accounting principles (GAAP) financial statements contained in annual reports. These data include a presentation of net sales, operating profit and loss before and after taxes, total identifiable assets, and depreciation for segment reported. Kanye thinks that evaluating business division managers by the same criteria as the total company is appropriate.

A. Explain why you think the chief financial officer (CFO) disagrees and tells Kanye that publicly reporting information might demotivate managers.
B. For better evaluation of the managers, what type of information should Kanye propose that the CFO might accept?

TP4. LO 12.3 Which of the performance measures—ROI, RI, or EVA—is best, and why? Explain your answer thoroughly.

13

Sustainability Reporting

Figure 13.1 Choices. Choices about where to invest and even where to work can be difficult if you can only evaluate options on the financial information they provide. (credit: modification of "Girl Crossroads Choice" by "Pixource"/Pixabay, CC0)

Chapter Outline

Why It Matters

Gina studies supply chain management at a local university. Last summer, she worked at a manufacturing plant for a major auto manufacturer. She enjoyed her experience and learned quite a bit about the manufacturing and supply chain process, and she spent a significant amount of time on the production floor learning how the supply chain process affects the assembly of the vehicles. Gina felt she was well paid and she liked her colleagues. This summer, she has a comparable position and compensation with a different auto manufacturer. She is curious to see how the two companies compare.

One of the first things Gina notices is the number of reminders posted around the plant to save and conserve energy. There are procedures in place to save energy when machines are idle, and sensors that turn off lights when no one is in the offices or break room. Gina also heard fellow employees talking about taking paid time off to volunteer at local charities. Her supervisor has asked her to be one of the speakers at presentations given throughout the year at local schools as part of a project to promote school-age girls entering technical fields. She also visited the company's research and development symposium and learned how the company is trying to improve fuel efficiency and move away from cars that use fossil fuels.

Gina never noticed initiatives like these at her position the prior summer. And though she enjoyed that job, she feels better about the current manufacturer because she realizes the company is trying to accomplish goals in addition to making money for its shareholders. Her current employer takes steps to promote the well-being of its employees, the community, and the environment. When Gina asks one of her professors about the difference, she learns that her current employer is more involved in corporate social responsibility and the company's sustainability reports will provide more information. Gina decides to learn more about sustainability reporting.

13.1 Describe Sustainability and the Way It Creates Business Value

A primary goal of any business is to maximize shareholder or owner wealth and thus continue operating into the future. However, in making decisions to be profitable and to remain in business into the future, companies must think beyond their own organization and consider other stakeholders. This approach is a major goal of **sustainability**, which is meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.[1] Another concept that is sometimes associated with sustainability is **corporate social responsibility** (CSR), which is the set of actions that firms take to assume responsibility for their impact on the environment and social well-being. CSR can be used to describe the actions of an individual company or in comparing the actions of multiple corporations.

Just as individuals often make conscious decisions to recycle, reuse items and reduce their individual negative effect on the environment, so too do most businesses. Corporations affect the world on many different levels—economic, environmental and social—and many corporations have realized that being good stewards of the world can add value to their business. Companies increase their value, both financial and nonfinancial, in the eyes of consumers and shareholders by heralding their efforts to be good citizens of the globe and the results of those efforts. It is important to note that a corporation's social and environmental influence is often affected by government policy, both local and federal, and sometimes even internationally through agreements and treaties. The global effort to limit climate change is an example of this influence.

In December 2015, 196 nations adopted the **Paris Climate Agreement**, a historic plan to work together to limit the increase of global temperatures to 1.5 °C. The Agreement aims to help delay or avoid some of the worst consequences of climate change within a system of transparency and accountability in which each nation can evaluate the progress of the others.

In June 2017, President Trump announced his intention that the United States withdraw from the Agreement. Five months later, Syria ratified the Agreement, leaving the United States as the only non-participating country in the world.

By November 2017, however, a coalition of 20 U.S. states and 50 cities, led by California governor Jerry Brown and former New York City Mayor Michael Bloomberg, had formed (Figure 13.2). During the 23rd UN Climate Change Conference in Germany, the members of this coalition pledged to continue supporting the Agreement. They aim to do this by reducing their **carbon output**, which is a measure of their carbon dioxide and other greenhouse gas emissions into the atmosphere.

In addition to these commitments at the local, state and national level, many U.S. companies have also committed to reducing their carbon output**,** including Walmart, Apple, Disney, Tesla, and Facebook.

1 Brundtland Commission. *Our Common Future*. 1987.

Figure 13.2 Governor Jerry Brown on Climate Change. California Governor Jerry Brown speaks at the UN Climate Change Conference in Paris, France in 2015. (credit: modification of "Jerry Brown, Gouverneur de Californie sur le Pavillon France" by COP PARIS/Wikimedia Commons, CC0)

The fact that these companies and others are run by CEOs whose primary objective is to make a profit does not mean they live in a vacuum, unaware of their effects on the larger world. As mentioned, responsible companies today are concerned not only about their economic performance, but also about their effects on the environment and society. Recall, corporate social responsibility (CSR) is the set of steps that firms take to bear responsibility for their impact on the environment and social well-being. Even if some managers are not personally guided by these motivations, good corporate citizenship makes good business sense.

Historically, companies disclosed financial information in their annual reports to allow investors and creditors to assess how well managers have allocated their economic resources. The public usually learned little about a company's hiring practices, environmental impact, or safety record unless a violation occurred that was serious enough to make the news. Companies that did not make the news were simply assumed to be doing the right thing.

Today, however, as a consequence of social media platforms such as Facebook and Twitter, the public is more aware of corporate behavior, both good and bad. Investors and consumers alike can make financial decisions about firms that align with their own values and beliefs. Management decisions perceived to be detrimental to society can quickly put companies in a bad light and affect sales and profitability for many years. Thus, users of financial reports increasingly want to know whether businesses are making appropriate decisions not only to increase shareholder wealth, but also to sustain the business, and minimize any future negative effects on the environment and the citizens of the world. This management goal is called **business sustainability**. The number of companies reporting sustainability outcomes has grown over the last two decades. This growth has made this non-financial component of reporting increasingly important to accountants.

Sustainability Reporting

A **sustainability report** presents the economic, environmental and social effects that a corporation or

organization was responsible for during the course of everyday business. Sustainability reporting aims to respond to the idea that companies can be held accountable for sustainability. In 1987, the former Norwegian Prime Minister, Gro Harlem Brundtland, chaired a World Commission on Environment and Development to both formulate proposals and increase understanding of and commitment to environment and development. The resulting **Brundtland Commission Report** laid the groundwork for the concept of **sustainable development** (Figure 13.3). This was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[2]

Figure 13.3 Sustainable Energy. Sustainable development means meeting the needs of the present without compromising the ability of future generations to meet their own needs. (credit: modification of "Shepherds Flat Wind Farm 2011" by Steve Wilson/Wikimedia Commons, CC BY 2.0)

With that in mind, the early adopters of sustainability reporting attempted to construct a framework that could convey the good stewardship of companies, primarily their social and environmental effects. Since then, sustainability reporting has evolved to include the ways in which sustainability practices of the company benefit its profitability and longevity.

Indeed, adopting sustainable business practices may benefit business in many ways. Companies can:

- save money by using less water and energy and reducing or recycling business waste
- reduce insurance costs by limiting their exposure to environmental risks
- attract investors who prefer to work with businesses that are environmentally and socially responsible
- reduce social risks, such as racial or gender discrimination
- improve customer sales and loyalty by enhancing reputation and brand value
- reduce the possibility of potentially costly regulation by proactively undertaking sustainability initiatives
- attract and retain employees who share similar values
- strengthen their relationship with the community
- contribute to improving environmental sustainability

In short, sustainability reporting has evolved to describe both how the company's practices contribute to the social good and how they add value to the company, which ultimately provides better returns to its investors.

The need for improved reporting by corporations on sustainability developed over time. The Union Carbide,

2 NGO Committee on Education. "Report of the World Commission on Environment and Development: Our Common Future." *UN Documents: Gathering a Body of Global Agreements*. August 4, 1987. http://www.un-documents.net/wced-ocf.htm

Nestlé, and Johnson and Johnson cases are examples of corporate crises that contributed to the development of better sustainability reporting. And though each of these cases involved a negative public response toward the company, this led to a broader shift in business practices, changing how other corporations handle similar challenges.

Historical Drivers of Contemporary Sustainability Reporting

Much of the drive to adopt sustainability reporting has resulted from the publicity surrounding corporate responses to specific crises. The three featured cases, on Union Carbide, Nestlé, and Johnson & Johnson, look at events that had such an impact on communities and the social conscience that they have contributed to shaping modern sustainability reporting and what society's expectations of corporations are today. We first look at Union Carbide, whose actions, or lack of action, resulted in the deaths of thousands of impoverished Indians who lived in the shanty communities next to a facility of the U.S.-owned conglomerate. This case highlighted the power disparity between corporations and poor individuals and became a stark emblem of corporate disregard for the human toll of the quest for profit. We then consider the long running campaign against Nestlé Corporation, ongoing since the early 1980s. We will examine what Nestlé has attempted to do to mitigate the perception of exploitation which, some activists argue, is still a superficial response. Finally, we look at the reaction by Johnson & Johnson to the Tylenol poisoning crisis, which, while not of their making, is seen as a rapid and responsible response to ensure the well-being of the community, even if it initially came at considerable financial cost to the company.

Union Carbide

A few hours before midnight on December 2, 1984, at the Union Carbide pesticide plant in Bhopal India, pressure and heat built up in a tank that stored methyl isocyanate (MIC). Within two hours, approximately 27 tons[3],[4] of MIC had escaped into the surrounding community, exposing more than 600,000[5] people to the deadly gas cloud. By the next day, 1,700 people were dead. The official toll eventually rose to 3,598 dead[6] and another 42,000 injured, although some accounts estimate that the incident was responsible for 16,000–20,000 deaths.[7]

Though the plant had ceased production a couple of years earlier, the plant still contained vast quantities of dangerous chemicals. There was still 60 tons of deadly MIC in tanks at the plant, and proper maintenance of the tanks and the containment systems was necessary. It was later discovered that all the safety systems put into place failed due to lack of maintenance after the plant closed.[8]

Within days of the explosion, Warren Anderson, the CEO of Union Carbide, arrived in India, was arrested and released, and then immediately flew out of the country. Although he was subsequently charged with manslaughter, he never returned to India to face trial.[9] Some of the criticisms of Union Carbide's handling of

3 The Bhopal Medical Appeal. "Union Carbide's Disaster." n.d. http://bhopal.org/what-happened/union-carbides-disaster/

4 Paul Cullinan. "Case Study of the Bhopal Incident." *Environmental Toxicology and Human Health, Vol. I. Encyclopedia of Life Support Systems*. n.d. https://www.eolss.net/sample-chapters/C09/E4-12-02-04.pdf

5 Alan Taylor. "Bhopal: The World's Worst Industrial Disaster, 30 Years Later." *The Atlantic*. December 2, 2014. https://www.theatlantic.com/photo/2014/12/bhopal-the-worlds-worst-industrial-disaster-30-years-later/100864/

6 Paul Cullinan. "Case Study of the Bhopal Incident." *Environmental Toxicology and Human Health, Vol. I. Encyclopedia of Life Support Systems*. n.d. https://www.eolss.net/sample-chapters/C09/E4-12-02-04.pdf

7 The Bhopal Medical Appeal. "Basic Facts & Figures, Numbers of Dead and Injured, Bhopal Disaster." n.d. http http://bhopal.org/basic-facts-figures-numbers-of-dead-and-injured-bhopal-disaster/

8 The Bhopal Medical Appeal. "Union Carbide's Disaster." n.d. http://bhopal.org/what-happened/union-carbides-disaster/

matters, both before and after the disaster, are:

- A safety audit two years before had noted numerous problems at the plant, including several implicated in the accident.[10]
- Before the incident, staff were routinely ordered to deviate from safety regulations and fined if they refused to do so.[11]
- Employees discovered the leak around 11:30pm on December 2. However, they then decided to take a tea break and did not deal with the leak until two hours later.[12]
- Two of the plant's main safety systems were out of action at the time of the accident; one of them had been inoperable for several weeks.[13]
- Staffing had been cut from 12 operators a shift to six. Kamal K. Pareek, a chemical engineer employed by the plant later argued that it was not possible to safely run the closed plant with only six people.[14]
- There were no public education programs to inform the surrounding community about what to do in an emergency,[15] and on the night of the leak, there was no public warning of the disaster. An external alarm was turned on at 12:50am but ran for only a minute before it was turned off.
- Beginning at 1:15am, workers denied to local police that they were aware of any problems. They restarted the public warning siren at 2:15am and then contacted police to report the leak.[16]

Union Carbide asserts that a disgruntled employee sabotaged the plant by mixing water with the methyl isocyanate to create a reaction. Some employees claimed that a worker lacking proper training was ordered by a novice supervisor to wash out a pipe that had not been properly sealed. Although it was against plant rules, this action may have started the reaction.[17]

Union Carbide's disgruntled-employee theory appeared to many to be an effort to deflect blame and deny responsibility. Ultimately, the company agreed to pay the Indian Government $470 million in compensation to be distributed to Bhopal residents,[18] and seven former employees were jailed for two years. In 2001, the company was bought by Dow Chemical Company. Though Dow Chemical obtained the financial liabilities of Union Carbide, Dow maintains that it did not assume legal responsibility for the prior actions of Union Carbide.[19] More than thirty years later, many victims are still awaiting the compensation they were promised, after having paid doctors and lawyers to prove their injuries. "In a way, they were fighting their own government for adequate compensation, whereas the state should have fought with them against Union

9 Douglas Martin. "Warren Anderson, 92, Dies; Faced India Plant Disaster." *New York Times*. October 30, 2014. https://www.nytimes.com/2014/10/31/business/w-m-anderson-92-dies-led-union-carbide-in-80s-.html

10 Juanita Stuart. "Union Carbide Bhopal Chemical Plant Explosion." *Worksafe*. 2015. https://worksafe.govt.nz/data-and-research/research/role-of-information-management-disaster-prevention/#lf-doc-34129

11 Juanita Stuart. "Union Carbide Bhopal Chemical Plant Explosion." *Worksafe*. 2015. https://worksafe.govt.nz/data-and-research/research/role-of-information-management-disaster-prevention/#lf-doc-34129

12 Stuart Diamond. "The Bhopal Disaster: How It Happened." *New York Times*. January 28, 1985. http://www.nytimes.com/1985/01/28/world/the-bhopal-disaster-how-it-happened.html?pagewanted=all

13 Stuart Diamond. "The Bhopal Disaster: How It Happened." *New York Times*. January 28, 1985. http://www.nytimes.com/1985/01/28/world/the-bhopal-disaster-how-it-happened.html?pagewanted=all

14 Stuart Diamond. "The Bhopal Disaster: How It Happened." *New York Times*. January 28, 1985. http://www.nytimes.com/1985/01/28/world/the-bhopal-disaster-how-it-happened.html?pagewanted=all

15 Stuart Diamond. "The Bhopal Disaster: How It Happened." *New York Times*. January 28, 1985. http://www.nytimes.com/1985/01/28/world/the-bhopal-disaster-how-it-happened.html?pagewanted=all

16 "The Bhopal Disaster." Chapter 8 in *Health*. n.d. http://cseindia.org/userfiles/THE%20BHOPAL%20DISASTER.pdf

17 Stuart Diamond. "The Bhopal Disaster: How It Happened." *New York Times*. January 28, 1985. http://www.nytimes.com/1985/01/28/world/the-bhopal-disaster-how-it-happened.html?pagewanted=all

18 Business and Human Rights Resources Centre. "Union Carbide/Dow Lawsuit (re Bhopal)." n.d. https://business-humanrights.org/en/union-carbidedow-lawsuit-re-bhopal

19 Dow. "Dow and the Bhopal Tragedy." n.d. https://www.dow.com/en-us/about-dow/issues-and-challenges/bhopal/dow-and-bhopal

Carbide," says a representative of the one of the groups fighting for the victims' rights.[20]

Nestlé

Nestlé is the target of one of the longest-running consumer boycotts in modern history. Founded and headquartered in Switzerland, the company recently became the largest food company in the world. While there have been boycotts against a number of its products over the years, none has lasted as long as the baby formula boycott.

The origins of the boycott go back to the mid-1970s, when consumer concerns arose about Nestlé's use of aggressive marketing tactics to sell its baby formula in developing countries in Asia, Africa, and Latin America. Initially new mothers were provided with free samples of formula to feed their babies, a common practice in many hospitals throughout the world. But in developing countries, this led to two negative consequences for mothers and their babies. First, once bottle feeding begins, the demand on the mother's body is reduced and breast milk begins to dry up. Mothers in developing countries were often living in poverty and unable to afford the cost of artificial infant food. Action groups argued that, in Nigeria, the cost of bottle feeding a three-month-old infant was approximately 30% of the minimum wage, and by the time the child reached six months old, the cost was 47%.[21]

A second consequence arose from the fact that preparation of infant formula required sterilized equipment and clean water. Both clean water and sterilization were difficult to guarantee in developing nations where mothers may not have understood the requirements for sterilization or may have lacked the fuel or electricity to boil water. Lapses in preparing the formula led to increased risks of infections, including vomiting and diarrhea that, in some cases, proved fatal. UNICEF estimated that formula-fed infants were 14 times more likely[22] to die of diarrhea and four times more likely to die of pneumonia than breast-fed children. Advocacy groups also argued that dehydration could result if mothers used too much formula and malnutrition could occur if they used too little in an effort to save money.[23]

An active campaign against Nestlé ensued, and the company endures a backlash even today. One group distributed a report, *Nestlé Toten Babies* ("Nestlé Kills Babies"), which a Swiss court found to be libelous. Nonetheless, the judge warned Nestlé that perhaps it should change the way it did business if it did not want to face such accusations.[24]

The boycott and negative publicity precipitated a long-running campaign by Nestlé to improve its image. The company now explicitly states on its packaging that breastfeeding is best for babies and supports the World Health Organization's recommendation that babies should be breastfed exclusively for at least the first six months of life. It distributes educational materials for healthcare professionals and parents on the benefits of breastfeeding and holds seminars on breastfeeding for the medical community. Nestlé established a global Maternity Protection Policy that provides its own employees with extended maternity leave (up to six months) and flexible work arrangements. It opened 945 breastfeeding rooms in India and another 1,500 in China in a partnership with several public and private organizations, and it developed a breastfeeding room locator app

20 Nita Bhalla. "Victims Call for Justice 30 Years after Bhopal Disaster." *Reuters*. December 3, 2014. https://www.reuters.com/article/us-india-bhopal-anniversary/victims-call-for-justice-30-years-after-bhopal-disaster-idUSKCN0JH1L620141203

21 Mike Muller. "The Baby Killer." *War on Want*. March 1974. http://archive.babymilkaction.org/pdfs/babykiller.pdf

22 Unicef. "Improving Breastfeeding, Complementary Foods, and Feeding Practices." May 1, 2018. https://www.unicef.org/nutrition/index_breastfeeding.html

23 E. Ziegler. "Adverse Effects of Cow's Milk in Infants." Nestlé Nutrition Workshop Senior Pediatric Program. 2007 (60): 185–199. https://www.ncbi.nlm.nih.gov/pubmed/17664905

24 Mike Muller. "Nestlé Baby Milk Scandal Has Grown Up but Not Gone Away." *The Guardian*. February 13, 2013. https://www.theguardian.com/sustainable-business/nestle-baby-milk-scandal-food-industry-standards

for mothers.[25] In those countries considered to be at higher risk for infant mortality and malnutrition, Nestlé applies its own stringent policies, which they believe are stricter than national code and which were derived from the World Health Organization's International Code of Marketing of Breast-Milk Substitutes.[26] Meanwhile, debate about whether Nestlé is a good corporate citizen continues.

Johnson & Johnson

At 6:30 in the morning on Wednesday, September 29, 1982, twelve-year-old Mary Kellerman woke up feeling sick. Her parents gave her some Tylenol and decided to keep her home from school. Within an hour Mary had collapsed, and she was pronounced dead at 9:24. Within 24 hours another six people were dead, poisoned, like Mary, by cyanide capsules in Tylenol bottles.

In the early 1980s, Tylenol was the leader in over-the-counter pain relief, and during the first three quarters of 1982 the product was responsible for 19% of Johnson & Johnson's profits. Then an unknown person replaced Tylenol Extra-Strength capsules with cyanide-laced capsules and deposited the bottles on the shelves of at least a half-dozen stores across Chicago.

On learning of the deaths, Johnson & Johnson reacted swiftly. CEO James Burke formed a seven-member strategy team charged with answering two questions: "How do we protect the people?" and "How do we save the product?" The first step was to immediately warn consumers through a national announcement not to consume any type of Tylenol product until the extent of the tampering could be determined. All Tylenol capsules in Chicago were withdrawn, and upon discovering two more compromised bottles, Johnson & Johnson ordered a nationwide withdrawal of all Tylenol products. Less than a week had passed.

At the same time, the company established a toll-free number for consumers and another one for news organizations that provided daily recorded updates about the crisis. Within two months, Tylenol was re-launched with three-way tamper-proof packaging (Figure 13.4). The carton was securely glued, the cap was wrapped with a plastic seal, and the bottle carried a foil seal. The company also began an extensive media campaign emphasizing trust. In addition, other companies, not only in the pharmaceutical industry but in other industries such as food production and packaging, began to implement the use of tamper proof or double sealed packaging after the Tylenol incident.

25 Nestlé. "Supporting Breastfeeding." n.d. https://www.nestle.com/csv/impact/healthier-lives/baby-milk

26 Nestlé. "The Nestlé Policy and Procedures for Implementation of the WHO International Code of Marketing and Breast Milk Substitutes." September 2017. https://www.nestle.com/asset-library/documents/creating%20shared%20value/nutrition/nestle_policy_who_code_en.pdf

Figure 13.4 Tamper-Proof Packaging. Johnson & Johnson introduced tamper-proof packaging in an effort to mitigate the impact of problems from the cyanide-laced pills scare of fall 1982. To date, the killer has not been caught. (credit: "14418" by Debora Cartagena/CDC, Public Domain)

Since the crisis, the company's response has been lauded in business case studies and has formed the basis of crisis communications strategies developed by researchers.[27] Ultimately, Johnson & Johnson spent more than $100 million on the recall, an amount that might cripple some companies. Yet its share price returned to its previous high within six weeks.[28] In fact, if you had invested $1,000 in Johnson & Johnson in September 1982, it would have been worth almost $50,000 by late 2017. Today, the company ranks 35th in the Fortune 500, with revenues of almost $76 million.[29]

These are three early examples of the impact on businesses of decisions made by management that had unintended consequences or circumstances brought about by others that the company did not foresee happening. Each of these instances weakened the sustainability of the corporation, at least temporarily. These examples, as well as others, helped contribute to the CSR movement. Companies are concerned about the effects of their products and practices on all stakeholders from a moral and ethical standpoint and want to be socially responsible in addition to maintaining sustainability of their business. Certainly, there have been many more examples of company responses to social and environmental impacts that have been either positively or negatively received by **stakeholders** or those who have an interest or concern in the business. Nonetheless, the cases examined demonstrate a range of the types of events and company responses that can affect both the company's reputation and the society in which they operate in, sometimes for decades.

Initial Sustainability Reports

Following the Brundtland Report, financial statement preparers began to ask how they might communicate not just the financial status of a company's operations but the social and environmental status as well. The

27 Department of Defense. "Case Study: The Johnson & Johnson Tylenol Crisis." n.d. https://www.ou.edu/deptcomm/dodjcc/groups/02C2/Johnson%20&%20Johnson.htm

28 Judith Rehak. "Tylenol Made a Hero of Johnson & Johnson: The Recall That Started Them All." *New York Times*. March 23, 2002. http://www.nytimes.com/2002/03/23/your-money/tylenol-made-a-hero-of-johnson-johnson-the-recall-that-started.html

29 Fortune. "Fortune 500 Full List." n.d. http://fortune.com/fortune500/list/

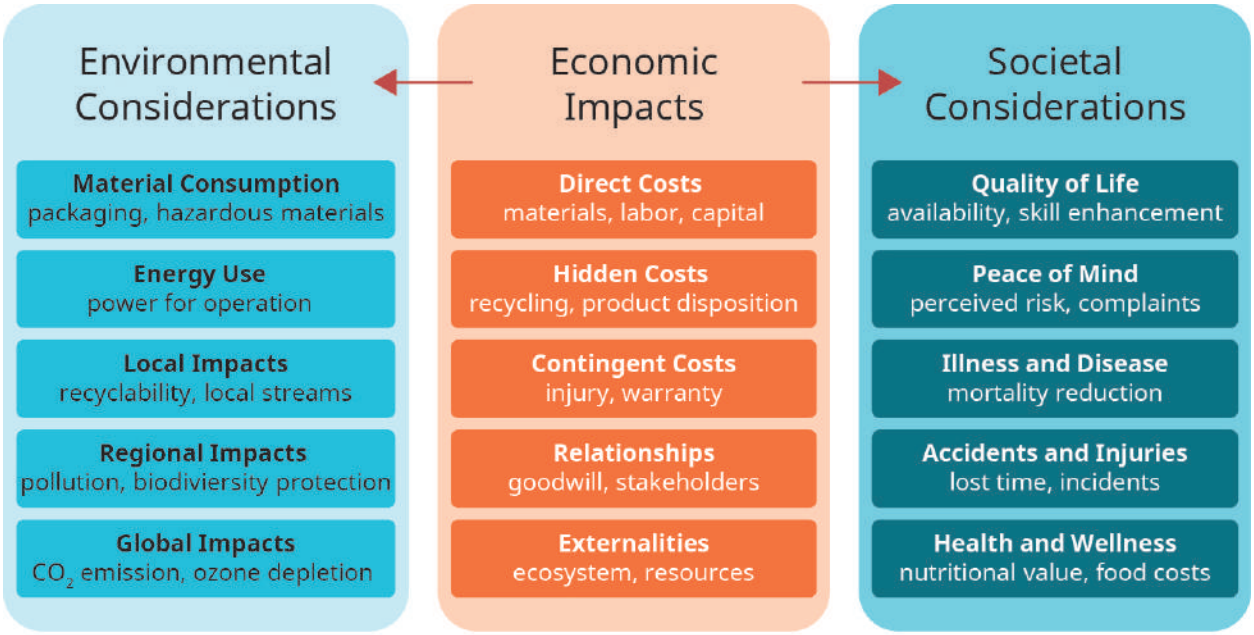
concept of a **triple bottom line**, also known as TBL or 3BL, was first proposed in 1997 by John Elkington to expand the traditional financial reporting framework so as to capture a firm's social and environmental performance. Elkington also used the phrase *People, Planet, Profit* to explain the three focuses of triple bottom line reporting. By the late 1990s, companies were becoming more aware of triple bottom line reporting and were preparing sustainability reports on their own social, environmental, and economic impact. Another innovation was **life-cycle** or **full-cost accounting**. This reporting method took a "cradle to grave" approach to costing that put a price on the disposal of products at the end of their lives and then considered ways to minimize these costs by making adjustments in the design phase. This method also incorporated potential social, environmental, and economic costs (*externalities* in the language of economics) to attempt to identify all of the costs involved in production. For example, one early adopter of life-cycle accounting, Chrysler Corporation, considered all costs associated with each design phase and then made adjustments to the design. When its engineers developed an oil filter for a new vehicle, they estimated the material costs and hidden manufacturing expenses and also looked at liabilities associated with disposal of the filter. They found that the option with the lowest direct costs had hidden disposal costs that meant it was not the cheapest alternative.[30]

Much of the early sustainability reporting movement was driven by stakeholder concerns and protests. For example, throughout the 1990s, Nike drew accusations from consumers that its employees and subcontractors' employees in developing countries were being subjected to inhumane working conditions. The "sweatshop" charge has since been made against many companies that use off-shore manufacturing, and some now pre-emptively respond by producing sustainability reports to assure stakeholders that they are maintaining a good track record in human rights.

One of the earliest adopters of social reporting was The Body Shop, which released its first social report in 1995 based on surveys of stakeholders. BP (formerly British Petroleum) took a different approach, with a series of case studies in social impact assessment and releasing its social report in 1997.

Early study into the *hows* of sustainability reporting led researchers[31] to suggest that some performance indicators could be quantified. Figure 13.5 shows the sustainable product indicators identified by Fiskel and colleagues with suggestions on how each element of economic output might also be measured from an environmental or societal stance.

30 J. Fiksel, J. McDaniel, and D. Spitzley. "Measuring Product Sustainability." *The Journal of Sustainable Product Design* July, no. 6 (1998): 7–18.
31 J. Fiksel, J. McDaniel, and D. Spitzley. "Measuring Product Sustainability." *The Journal of Sustainable Product Design* July, no. 6 (1998): 7–18.



Source: Fiksel, J., J. McDaniel, and D. Spitzley. "Measuring Product Sustainability." The Journal of Sustainable Product Design. July 1998 (6): 7–18.

Figure 13.5 Sustainable Product Indicators. There are a number of approaches to dealing with economic costs from an environmental and/or social impact perspective. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Fiskel's research suggests that different elements can be categorized as *economic*, *environmental,* or *societal*. The study demonstrates how each element may have quantifiable costs or indicators that can be measured and reported so that users will be able to consider how those inputs and outputs contribute to the entire life cycle of a product. Although Fiskel's model is rarely reported today, the creation of quantifiable and measurable social and environmental standards is the basis of the Sustainability Accounting Standards Board, which uses an approach similar to Fiskel's model.

Current Examples of Sustainability in Business

The environment, human rights, employee relations, and philanthropy are all examples of topics on which corporations often report. When you think of sustainability in business, environmental sustainability might be the first area that comes to mind. **Environmental sustainability** is defined as rates of resource exploitation can be continued indefinitely without permanently depleting those resources. If these resources cannot be exploited indefinitely at the current rate, then the rate is not considered sustainable. A recent focus of environmental sustainability is **climate change** impacts. This focus has developed over the past three decades (although some contributors to climate change, such as pollution, have been a concern for much longer.). Climate change, in the context of sustainability, is a change in climate patterns caused by the increased levels of carbon dioxide (CO_2) in the atmosphere attributed mainly to use of fossil fuels. Companies are increasingly expected to measure and reduce their **carbon footprint**, the amount of CO_2 and other greenhouse gases they generate, in addition to adopting policies that are more environmentally friendly. For example, according to the sustainability report for Coca-Cola, in 2016 the company reduced the amount of CO_2 embedded in the containers that hold their beverages by 14%.[32] Such corporate policies to reduce their carbon footprint can include reducing waste, especially of resources like water; switching to paperless record-keeping systems;

designing environmentally friendly packaging; installing low-energy lighting, heating, and cooling in offices; recycling; and offering flexible working hours to minimize the time employees sit in traffic adding auto emissions to the environment. Industries that use or produce **non-renewable resources** as sources of energy, such as coal and oil, are significantly challenged to stay relevant in an era of new energy technologies like solar and wind power.

YOUR TURN

Mars Inc.

Read this article (https://openstax.org/l/11caa) by Stephen Badger, chair of Mars Inc. Then visit the Mars Inc. website (https://openstax.org/l/50global) and review the sustainability discussion under "Sustainable in a Generation Plan." Discuss four examples of sustainability that Mars is implementing. What type of cost outlays might a company expend for each of these examples? Can you explain what type of savings the company might have, now or in the future, by these investments and outlays?

Solution

Mars is implementing a number of endeavors. In their "Healthy Planet" category, they identify climate action, water stewardship, land use, and waste reduction. In "Thriving People," they identify endeavors toward increasing income, respecting human rights, and increasing opportunities for women. In their "Nourishing Wellbeing" category, they identify product improvement, responsible marketing, and food safety and security. The company might make significant expenses or investments into each of the sustainability measures in the short term. Responses should provide examples of the type of programs that the company implements. For example, under Climate Plans, Mars discusses GHG emissions reductions targets of 67% by 2050 from 2015 levels. In reducing emissions, the company also explains that by improving raw material production practices, they can increase their efficiencies which should eventually lower costs. The company may make substantial savings by investments into energy reduction or water management.

The concept of sustainability in business also applies to a company's human rights and employee relations records. From an employee relations perspective, businesses that are willing to demonstrate that they are good corporate citizens endeavor to maintain sound working conditions to ensure their workplaces are safe, ergonomically appropriate, and healthy even if this means going above and beyond the rules and regulations set by local authorities. For example, good corporate citizens choose not to use child labor even in countries where it is accepted and choose to provide a working environment that exceeds local minimum standards for safety and cleanliness. Also, issues such as pay and job promotion fairness across genders, race and religion, otherwise known as **equity issues**, are also examined to ensure there are no inequities. For example, gender equity would exist when women are paid the same as men if they are performing the same duties. By other equity measures, a person would not be denied employment or equal pay simply because of their race or religion.

Firms may also implement parental leave policies and flexible or remote work hours to improve the morale and productivity of employees with families. A number of organizations also offer health and wellness groups

32 The Coca-Cola Company. "Infographic: 2016 Sustainability Highlights." n.d. https://www.coca-colacompany.com/stories/2016-sustainability-highlights-infographic

and healthy vending and cafeteria options for employees.

Companies may also promote sustainability through philanthropic endeavors, or charitable giving. While charitable giving is responsible, it is only sustainable if the money given improves or alleviates the underlying issue for which the money is being given. Otherwise, the money is not being spent productively, and that goes against sustainable business practices. To enhance the amount given to charities, many companies offer matching programs wherein they will match charitable contributions made by employees. Some companies also offer from two to five paid work days per year for employees to perform volunteer work. Many companies also go further and contribute a portion of company earnings to charitable causes. Investors may not always approve of the manner in which charitable funds are spent as they may prefer either that (1) the money be given to different charitable causes than the ones chosen by the company or (2) may feel the money could be more effective if applied to expansion and growth of the company. However, as most shareholders realize, corporations take a significant role in funding charitable organizations, and many of these not-for-profit organizations could not perform the services they provide without corporate funding. Table 13.1 provides an example of philanthropic contributions by several public corporations. Table 13.2 shows a few of the best places to work if you are looking for an employer that gives back to the community.

Examples of Corporate Charitable Giving

Corporation	Amount Donated	Primary Causes Supported
Gilead Sciences	$446.7 million	HIV/AIDS, liver diseases
Walmart	$301 million	Worker economic mobility, Feed America – anti-hunger campaign
Wells Fargo	$281.3 million	Part to local charities and part to national charities such as Neighborworks
Goldman Sachs	$276.4 million	Their own projects called 10,000 Women and 10,000 Small Businesses
Exxon Mobil	$268 million	Education, malaria prevention, and economic opportunity for women

Table 13.1 These companies were the top five charitable giving corporations in 2015.[33]

Top Places to Work That Give Back

Company	Amount Given	Matches Employee Giving	Gives Paid Days to Do Charitable Work
Salesforce	$137 million	Yes	56 hours

Table 13.2 These companies are considered the top five to work for if an employee is interested in community involvement and charitable contributions.[34]

33 Caroline Preston. "The 20 Most Generous Companies of the Fortune 500." *Fortune*. June 22, 2016. http://fortune.com/2016/06/22/fortune-500-most-charitable-companies/

34 Fortune. "The 50 Best Workplaces for Giving Back." February 9, 2017. http://fortune.com/2017/02/09/best-workplaces-giving-back/

Top Places to Work That Give Back

Company	Amount Given	Matches Employee Giving	Gives Paid Days to Do Charitable Work
NuStar Energy	$8.5 million	Yes	50 hours
Veterans United Home Loan	$7.1 million	Yes	40 hours
Intuit	$42 million	Yes	32 hours
Autodesk	$20.4 million	Yes	48 hours

Table 13.2 These companies are considered the top five to work for if an employee is interested in community involvement and charitable contributions.

Coca-Cola Corporation has a program designed to empower female entrepreneurs through e-learning programs. The company launched the 5by20 initiative that aims to empower 5 million women entrepreneurs across the company's value chain of producers, distributors, recyclers, and retailers around the world by 2020. By the end of 2016, the program had enabled 1.75 million women through the program in 64 countries globally.

Many corporations offer corporate giving programs by which employees are encouraged to participate in volunteerism or match with in-kind donations. Companies such as Intel, Pacific Gas and Electric Company, GE, General Mills, Intuit, Autodesk, and Salesforce have corporate giving programs that match dollar for dollar the amounts contributed by their employees. For example, if an employee wishes to support their local school, it is a registered tax exempt 501(c) (3) charity, and the employee donates $200, then the employer will match their contribution. Additionally, companies may give their employees paid volunteer time. For example, Intuit gives each of its employees 32 paid hours to help out at local organizations.

These volunteer hours can be used for many things, such as going to work in the local food bank for a few hours, volunteering for a fundraiser they believe in, or even something as simple as allowing an employee to participate in their child's school. These programs tend to be most effective when employees have input into where they will donate, or how they will dedicate their time.

Business decisions that affect the environment, human rights, employee relations, and philanthropic activities represent actions that are, hopefully, responsible and, at the same time, contribute to business sustainability, which in turn adds value to the business.

Creating Business Value

In the past, firms increased business value by increasing revenue or reducing expenses. However, managers now are realizing that some consumers are willing to pay more to support a company whose philosophy aligns with their own values. If they believe a company is making a greater effort to reduce its carbon emissions than its competitors are or that it looks after its workers and their communities, consumers will pay more for the product or invest in the company because they believe the company is doing the right thing by the environment or society. Many investors demonstrate these same principles. Companies have many ways to inform investors and customers of their efforts to improve the three P's—planet, people and profit—as you

learned about in the discussion about the triple bottom line in the Initial Sustainability Reports section. While not every company officially reports a triple bottom line, many companies report their efforts to improve their impact on the planet and on people through various avenues such as in a formal corporate social responsibility report, on their website, or even through their advertising. It is often difficult to translate the effects of these efforts on the profits of the corporation; nonetheless, a company can often quantify the effects of their actions to help the planet, employees, and communities in other ways. Next, let's examine efforts by a few such companies and the results they have achieved.

Patagonia

For more than 30 years, the outdoor-clothing maker Patagonia has donated 1% of its annual sales or 10% of its pre-tax profits, whichever is greater, to environmental organizations. In 2010, the company helped found the Sustainable Apparel Coalition, whose members measure and score their environmental impact and then report the results in the Higgs Index. The Higgs Index is a social and environmental performance index that clothing industry executives use to make more sustainable decisions when sourcing materials and to protect the well-being of factory workers, local communities, and the environment.[35]

In 2012, Patagonia became one of California's first B corporations. A B corporation is a benefit corporation, which, although profit motivated, aims to make a positive impact on society, workers, the community, and the environment.

LINK TO LEARNING

This website on B Corporations (https://openstax.org/l/50Bcorp) will help you learn more.

In 2013, Patagonia's founder, Yvon Chouinard, launched the $20 Million and Change fund, now called Tin Shed Ventures,[36] which aimed to help start-up companies bring about positive benefit to the environment.[37] In late 2017, Patagonia sued the U.S. government and President Donald Trump for the decision to undo federal protections of public lands in Utah's Bears Ears and Grand Staircase-Escalante national monuments. The company temporarily turned its homepage into a single graphic reading, "The President Stole Your Land."

Patagonia claims that it holds itself to a single cause: "Using business to help solve the environmental crisis." The company has encountered some criticism from animal rights groups over its use of live-plucked feathers and mulesing (a controversial surgical process to help prevent parasitic infection) of sheep, but it appears to have taken action quickly to source down and wool according to strict animal welfare and land use standards.[38]

Walmart's Greenhouse Gas Reduction Goals

In February 2010, Walmart announced its aim to eliminate 20 million metric tons of greenhouse gas (GHG) emissions from its global supply chain within five years. Environmentally, this would be equal to taking more

35 Sustainable Apparel Coalition. "The Higg Index." n.d. https://apparelcoalition.org/the-higg-index/

36 Tin Shed Adventures. "About." n.d. http://www.tinshedventures.com/about/

37 Yvon Chouinard. "Introducing Patagonia Works, A New Kind of Holding Company." *Patagonia*. May 6, 2013. http://www.patagoniaworks.com/#index

38 Patagonia "Our Wool Restart." July 26, 2018. https://www.patagonia.com/blog/2016/07/our-wool-restart/; Patagonia. "Patagonia Traceable Down." n.d. https://www.patagonia.com/traceable-down.html

than 3.8 million cars off the road for a year.[39] By 2015 the company announced that they had surpassed that goal and had achieved a 28-million-ton reduction.

In April 2017, the company went several steps further and launched Project Gigaton, inviting their suppliers to commit to reducing GHG emissions by a billion tons by 2030. This would be the equivalent of taking more than 211 million passenger vehicles off the roads for a year.[40] To do this, the company has initiated a number of endeavors to achieve reduced GHG emissions. These include sourcing 25% of their total energy for operations from **renewable energy** sources (energy that is not depleted when used) and aiming to increase this to 50% by 2025.

The company also aims to achieve zero waste to landfill in key markets by 2025; by 2015, 75% of their global waste was already diverted from landfills.[41]

Walmart has gone to great lengths to measure the environmental implications of its supply chains, which has also saved the company money. One very simple example is the company's focus on selling more concentrated detergents so that they can reduce the number of ships bringing the detergent from China to the United States.[42]

Gravity Payments

Productivity, or the amount of output or income generated by an average hour of work, has improved 22% from 2000 to 2014 in the US. Yet, during the same time, median wages rose only 1.8%, adjusted for inflation.[43] CEOs have reaped more of the benefits of productivity gains and now earn about 271 times more than typical workers (up from 59 times more in 1989).[44] CEO pay has been a controversial topic for many years. As leaders of their organizations, CEOs affect not only the culture of the company but the direction as well. For example, unethical CEOs can result in significant loss of shareholder wealth, which happened to Enron, Hewlett-Packard, and Merrill Lynch.[45] Ethical CEOs can help guide the company to greater wealth by being cognizant of the role they play within their corporation as well as in the world.

In April 2015, Dan Price, the co-founder and CEO of Seattle-based credit-card processing firm Gravity Payments, decided to take a different path from other CEOs. Price announced he was slashing his own million-dollar salary to $70,000 and raising the minimum salary for all his 120 employees, in stages, to $70,000 a year.[46] After a few minor bumps in the road, mostly resulting from the attendant publicity, in the year after his announcement, profits doubled, the firm's employee turnover reached a record low, and another 50 employees were added to deal with the increased business. Team members were able to afford to move closer

39 Walmart. "Walmart Announces Goal to Eliminate 20 Million Metric Tons of Greenhouse Gas Emissions from Global Supply Chain." February 25, 2010. https://corporate.walmart.com/_news_/news-archive/2010/02/25/walmart-announces-goal-to-eliminate-20-million-metric-tons-of-greenhouse-gas-emissions-from-global-supply-chain

40 Walmart. "Walmart Launches Project Gigaton to Reduce Emissions in Company's Supply Chain." April 19, 2017. https://news.walmart.com/2017/04/19/walmart-launches-project-gigaton-to-reduce-emissions-in-companys-supply-chain

41 Walmart. "Walmart Offers New Vision for the Company's Role in Society." November 4, 2016. https://news.walmart.com/2016/11/04/walmart-offers-new-vision-for-the-companys-role-in-society

42 M.P. Vandenbergh and J.M. Gilligan. *Beyond Politics: The Private Governance Response to Climate Change*. (Cambridge, 2017), 198; Walmart. "Walmart Completes Goal to Sell Only Concentrated Liquid Laundry Detergent." May 29, 2008. https://corporate.walmart.com/_news_/news-archive/2008/05/29/wal-mart-completes-goal-to-sell-only-concentrated-liquid-laundry-detergent

43 Josh Bivens and Lawrence Mishel. "Understanding the Historic Divergence between Productivity and a Typical Worker's Pay." *Economic Policy Institute*. September 2, 2015. http://www.epi.org/publication/understanding-the-historic-divergence-between-productivity-and-a-typical-workers-pay-why-it-matters-and-why-its-real/

44 Economic Policy Institute. "Top CEOs Took Home 271 Times More Than the Typical Worker in 2016." July 20, 2017. https://www.epi.org/press/top-ceos-took-home-271-times-more-than-the-typical-worker-in-2016/

45 Tomas Chamorro-Premuzic. "Are CEOs Overhyped and Overpaid?" *Harvard Business Review*. November 1, 2016. https://hbr.org/2016/11/are-ceos-overhyped-and-overpaid

46 Gravity Payments. "$70K Minimum Wage Initial Results." n.d. https://gravitypayments.com/thegravityof70k/

to their workplace, reducing commute time and the stress associated with it.[47]

Part of Price's motivation was a conversation with a friend who was worried about a $200 rent increase. He remembered reading a 2010 study by Princeton behavioral economist Daniel Kahneman noting that people were decidedly unhappier the less they earned below $75,000.[48] After the pay increase, Gravity saw employee happiness, in terms of overall work place satisfaction levels increase significantly, although this tapered off somewhat to average levels in the year after (Figure 13.6). Almost three years on, the company is still going strong. Time will tell whether the "Price of Gravity" is a continued success.

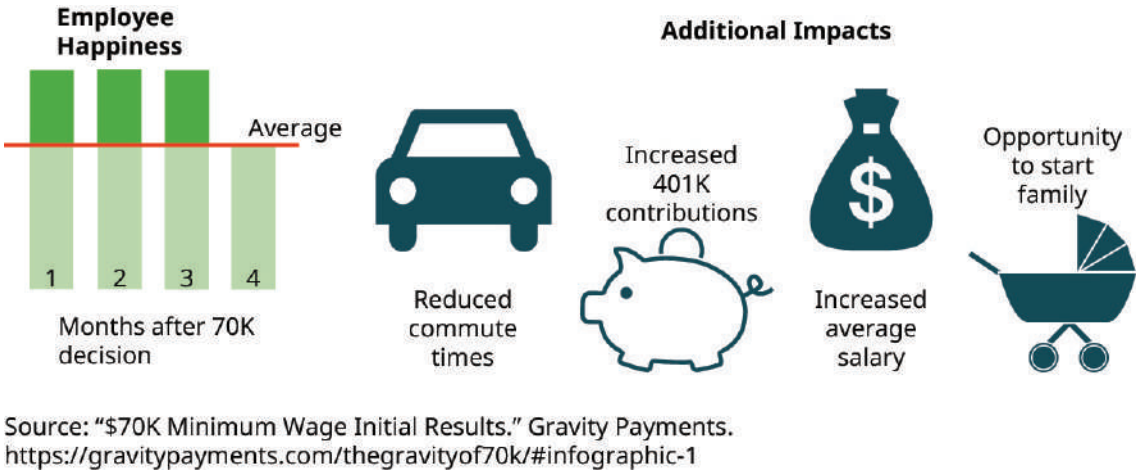


Figure 13.6 Employee Happiness. Gravity Payments noticed an immediate spike in employee happiness after employees' salaries were raised to at least $70,000 in 2015. Happiness settled at "average" levels in the months afterward. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Grameen Bank

In 1974, Muhammad Yunus, then an Economics Professor in Bangladesh, began to lend small sums of money at minimal or no interest to a few dozen local women who were basket weavers. Eliminating the high interest charged by traditional lenders allowed the women to make enough profit to enlarge their businesses into income-generating activities and lift themselves out of poverty.

Yunus continued helping poor entrepreneurs, usually women, and ultimately formalized his simple micro-lending system by forming Grameen Bank in 1983. The bank now has 8.9 million borrowers, most often women, across 81,399 villages[49] and has distributed more than US$19.6 billion in loans since its inception; more than $17.9 billion has been repaid. The bank claims a rate of recovery of 99.25%.[50] Its profits are loaned to other borrowers or go to fund local development to enrich the lives of the community (Figure 13.7).

47 Gravity Payments. "$70K Minimum Wage Initial Results." n.d. https://gravitypayments.com/thegravityof70k/

48 Paul Keegan. "Here's What Really Happened at That Company That Set a $70,000 Minimum Wage." *Inc.* November 2015. https://www.inc.com/magazine/201511/paul-keegan/does-more-pay-mean-more-growth.html

49 Grameen Bank. "Introduction." January 2018. http://www.grameen.com/introduction/

50 Grameen Bank. "Monthly Report: 2017-11 Issue 455 in BDT." December 5, 2017. http://www.grameen.com/data-and-report/monthly-report-2017-11-issue-455-in-bdt/

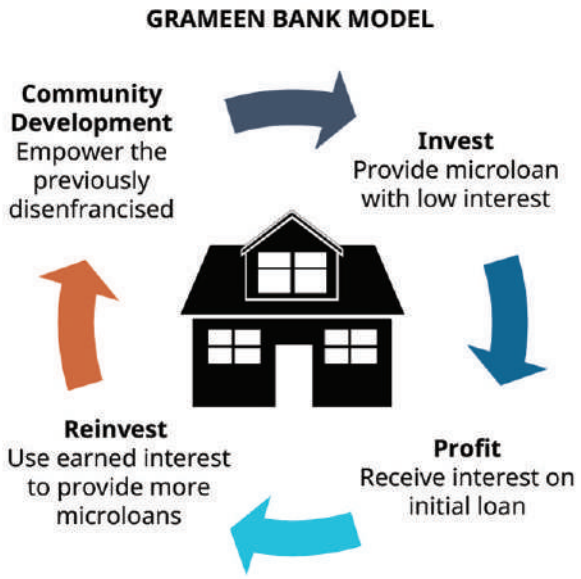


Figure 13.7 Grameen Bank Model. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The average household income of Grameen's members is about 50% higher than that of a target group in a control village, and 25% higher than that of non-members. While 56% of non-Grameen members live below the poverty line, the bank's micro-financing efforts have meant that only 20% of members now live below that line.[51]

Although it has not avoided controversy, the bank has won many awards, including the World Habitat Award of 1997 and the 2006 Nobel Peace Prize (awarded jointly to the bank and to Yunus) for efforts to create economic and social development through microcredit so that small entrepreneurs could break from the cycle of poverty.

LINK TO LEARNING

You can learn more about the corporate social reporting of these companies online:

- Patagonia corporate social reporting (https://openstax.org/l/50PatagoniaCSR)
- Walmart corporate social reporting (https://openstax.org/l/50WalmartCSR)
- Gravity Payments corporate social reporting (https://openstax.org/l/50GravityPayCSR)
- Grameen Bank corporate social reporting (https://openstax.org/l/50GrameenCSR)

51 Arjun Bhaskar. "Microfinance in South India: A Case Study." *Wharton Research Scholars, Scholarly Commons, Penn Libraries*. April 2015 https://repository.upenn.edu/wharton_research_scholars/122/

THINK IT THROUGH

Do Friedman's Ideas Stand the Test of Time?

In a 1970 New York Times Magazine (https://openstax.org/l/50business) article, economist Milton Friedman argued that for a manager acting as an agent of the business owner (principal), "there is one and only one social responsibility of business—to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud."

Given what we have learned about Earth's environment since this article was published, do you think Friedman's statement that the "sole purpose of business is to make profits" is valid? Explain your answer.

13.2 Identify User Needs for Information

The concept of the triple bottom line expanded the role of reporting beyond shareholders and investors to a broader range of stakeholders – that is, anyone directly or indirectly affected by the organization, including employees, customers, government entities, regulators, creditors, and the local community. Naturally, companies may feel their first obligation is to their present and potential investors. But it also makes good business sense to consider other stakeholders who can affect the company's livelihood. Let's examine the various users of sustainability reports and their particular information needs. Primary users would be considered shareholders and investors, whereas secondary users would be customers, suppliers, the community and regulators.

Shareholders

Many consider the company's shareholders to be its primary information user group. These equity investors may be small single investors or they may be part of an institutional investment fund charged with investing on behalf of its members. As shareholders they concern themselves with the future viability of the company and want profits to be sustained or increased over the long term. Shareholders often use financial ratios, such as earnings per share (EPS), return on investment (ROI), and the price/earnings ratio to evaluate the financial health and the sustainability of financial growth of the company. Shareholders not only evaluate whether there is current value in owning stock of the company but also whether there will continue to be value in owning that company's stock. Otherwise the shareholder is likely to divest of their ownership interest.

One ratio that shareholders often use to measure the value of the company's stock relative to the company's earnings is the price-earnings ratio, or **P/E ratio**. In the P/E ratio, the market price of the stock is divided by the earnings per share of the company's stock. This ratio indicates the amount an investor is willing to pay for one dollar of the company's earnings. For example, if a stock is trading at a P/E of 30, then this indicates investors are willing to pay $30 for $1 of current earnings. A high P/E ratio indicates investors expect high future earnings. A low P/E ratio has several interpretations but could indicate a company is undervalued. Many investors use the P/E ratio as a measure of whether or not a stock should be purchased, but no single metric

should be used alone. In addition, the P/E ratio is only useful when comparing changes across time for a single company to see trends or lack of trends. The P/E ratio is most useful if compared across companies within a given industry sector. Most often, growth will vary widely between different sectors but will be more similar within a particular sector. Investors buy and sell stock for many reasons, both financial and non-financial. They can sell a stock due to lack of current growth in value or an expected drop in future earnings. They can also buy a stock because the company participates in activities that the shareholder values, such as fair wages and greenhouse emission reductions even if the company has a low P/E ratio. Let's look at an example of an investment driven by more than just the company's current financial situation.

In 2008, Warren Buffett's MidAmerican Energy Company, a subsidiary of Berkshire Hathaway, bought a $230m stake in BYD, a Chinese battery maker about to begin auto production.[52] Although the auto industry initially ridiculed Buffet's investment in such a little- known company, he may well have the last laugh. Since 2008, the company has evolved into the world's leading producer of electric cars, and its shares now trade at almost 10 times what MidAmerican paid for them. This increase in value reflects the market's optimism about the future of the company based on the Chinese government's commitment to speeding up the phasing out of fossil fuels.

The new ethical investing movement focuses on eliminating investments that conflict with shareholders' values, such as dependence on environmentally damaging fossil fuels. The movement is growing each year. In 2016, ethical investments topped $8.7 trillion, up 33% from 2014, and they now account for 20% of all investment under professional management.[53] Ethical investors are increasingly avoiding polluters, weapon manufacturers, and tobacco companies as well as companies with a poor track record on human rights or philosophies that do not align with a fund's religious tenets. Pension funds, such as the New York City Pension Fund[54] have announced a move away from investing in companies in the fossil fuel industry, a move that will put substantial pressure on these companies to seek out alternatives to the non-renewables business model. On the opposite side of the country, the California Public Employees' Retirement System announced that it had divested from most of its holdings in thermal coal stock.[55]

Investors are also increasingly looking to the future to evaluate whether a firm's stock price is sustainable. Consider that, as the cost of renewable energy alternatives become cheaper, non-renewable resources become less able to compete. That is, the price of the non-renewable commodity falls to a point where the costs of extraction become greater than the price that can be obtained for the asset, and so the non-renewable resource remains in the ground.[56] At this point, the value of the asset, the mine, is impaired, which leads to a reduced share price.

For example, in mid-2017, Coal India, the largest coal-mining company in the world, announced that it would close 96[57] of its 394 mines[58] by March 2018 because they would be no longer economically viable after the

52 Keith Bradsher. "Buffet Buys Stake in Chinese Battery Manufacturer." *New York Times*. September 29, 2008. https://www.nytimes.com/2008/09/30/business/worldbusiness/30battery.html

53 Matt Whittaker. "Ethical Investing Continues to Grow." *U.S. News and World Report*. January 27, 2017. https://money.usnews.com/investing/articles/2017-01-27/ethical-investing-continues-to-grow

54 William Neuman. "To Fight Climate Change, New York City Takes on Oil Companies." *New York Times*. January 10, 2018. https://www.nytimes.com/2018/01/10/nyregion/new-york-city-fossil-fuel-divestment.html?

55 Randy Diamond. "CalPERS Reveals It Divested from Most Thermal Coal Companies." *Pensions & Investments*. August 7, 2017. http://www.pionline.com/article/20170807/ONLINE/170809876/calpers-reveals-it-divested-from-most-thermal-coal-companies

56 M.K. Linnenluecke, J. Birt, J. Lyon, and B.K. Sidhu. "Planetary Boundaries: Implications for Asset Impairment." *Accounting & Finance* 55, no. 4 (2015).

57 IANS. "Coal India Could Close 53 Underground Mines This Fiscal." *The Economic Times*. September 12, 2018. https://economictimes.indiatimes.com/industry/indl-goods/svs/metals-mining/coal-india-could-close-53-underground-mines-this-fiscal/articleshow/65783526.cms

Indian Government announced it would cut its commitments to purchase coal after 2022.[59]

Investors, including ethical investors, must look to the future of their investments, buying shares that are sustainable for the long term to provide better returns. A recent Harvard Business Review study showed that socially responsible companies post higher profits and stock performance than those that were not focused on social responsibility.[60] This result is supported by a Deutsche Bank analysis of more than 2,000 studies dating back to the 1970's, 90% of which suggested that socially responsible investing gives better returns than passive investing.[61]

ETHICAL CONSIDERATIONS

Millennials Are Demanding Sustainable Investments

According to the Forum for Sustainable and Responsible Investment, a U.S.-based membership organization, "sustainable, responsible and impact investing is an investment discipline that considers environmental, social and corporate governance criteria to generate long-term competitive financial returns and positive societal impact."[62] Demand for this type of sustainable investments is being driven in a large part by millennials who prefer that their investments align with their personal beliefs and values. Ethical companies are seeing value in the millennial investors because "millennials are poised to receive more than $30 trillion of inheritable wealth."[63] Forward-looking companies need to develop an awareness of millennial values.

Forward-looking companies and investment advisor companies also need to adapt to a sustainable investment environment. This changes the perspective of accounting because managers will need to look to other factors besides profits to guide management's business decisions. Management and accountants will need to look beyond just numbers, and this will require a change in culture, technology, and operational and financial reporting to investors, potential investors and stakeholders.

Lenders

Sustainability reports provide useful information for lenders. Lenders want to know that the company borrowing from them does not have any going-concern risks that could affect its ability to repay the loan (Figure 13.8). They want to know the company will not be sued for human rights violations at home or abroad,

58 Coal India. *Annual Report and Accounts 2016–2017*. n.d. https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2016_17_Deluxe_English_07112017.pdf

59 Harriet Agerholm. "World's Biggest Coal Company Closes 37 Mines as Solar Power's Influence Grows." *Independent*. June 21, 2017. http://www.independent.co.uk/news/world/asia/coal-india-closes-37-mines-solar-power-sustainable-energy-market-influence-pollution-a7800631.html

60 MoneyShow. "Socially-Responsible Investing: Earn Better Returns from Good Companies." *Forbes*. August 16, 2017. https://www.forbes.com/sites/moneyshow/2017/08/16/socially-responsible-investing-earn-better-returns-from-good-companies/#7f73a8a1623d

61 MoneyShow. "Socially-Responsible Investing: Earn Better Returns from Good Companies." *Forbes*. August 16, 2017. https://www.forbes.com/sites/moneyshow/2017/08/16/socially-responsible-investing-earn-better-returns-from-good-companies/#7f73a8a1623d

62 US SIF. "SRI Basics." n.d. https://www.ussif.org/sribasics

63 Ernst & Young. *Sustainable Investing: The Millennial Investor*. 2017. https://www.ey.com/Publication/vwLUAssets/ey-sustainable-investing-the-millennial-investor-gl/$FILE/ey-sustainable-investing-the-millennial-investor.pdf

be unable to repay its loans because consumer boycotts have hurt its cash flow, or that they maintain valuable property assets in high-risk areas. For example, after the 2017 Houston floods, a number of Houston-based banks were examined to find that they had a high level of exposure in commercial real estate in Houston.[64] This type of investment concentration in a single geographic area can be risky for lenders as a single disaster can have a more damaging effect than on a portfolio spread over a broader geographical area.

Figure 13.8 Sustainable Investment. Lenders appreciate sustainable investment because it gives them assurance that their loans will be repaid. (credit: modification of "Money Coin Investment" by "nattanan23"/Pixabay, CC0)

Employees

Employees and potential employees want to know that the company they work for is concerned about their safety and is an ethical organization. They want assurance that they will be fairly compensated and that all employees have equal rights and opportunities, regardless of gender, race, religion, or sexual orientation.

Recent studies show that employees increasingly want to work for companies that align with their own values and will be more loyal to those organizations. In 2016, 76% of millennials said that a company's social and environmental commitments were considerations in employment, with 64% of millennials indicating that they would not work for a company that did not have strong corporate social responsibility practices.[65]

Employees also report higher levels of satisfaction when their employers engage in corporate giving programs that are aligned with employee values or are chosen by employees.[66] For example, Intel will donate $10 to an educational institution, environmental program, or other community organization for every hour an employee volunteers there. More than 40% of Intel's U.S. employees have donated time that totals hundreds of

64 Ely Razin. "As Harvey Leaves Houston Reeling, These Banks Are More Exposed Than Others." *Forbes*. August 31, 2017. https://www.forbes.com/sites/elyrazin/2017/08/31/as-harvey-leaves-houston-reeling-these-banks-are-more-exposed-than-others/#423dcb5e6355

65 Cone Communications (Whitney Dailey). "Three-Quarters of Millennials Would Take a Pay Cut to Work for a Socially Responsible Company, According to the Research from Cone Communications." November 2, 2016. http://www.conecomm.com/news-blog/2016-cone-communications-millennial-employee-engagement-study-press-release

66 America's Charities. "Facts and Statistics on Workplace Giving, Matching Gifts, and Volunteer Programs." n.d. https://www.charities.org/facts-statistics-workplace-giving-matching-gifts-and-volunteer-programs

thousands of volunteer hours.[67] Other firms have corporate giving programs that match employee's charitable donations dollar for dollar.

Customers

Customers often have many choices about where to spend their hard-earned dollars. They want to know the companies to which they give that money reflect their own values and beliefs. If a company is seen to be uncaring about an issue, then customers may arrange campaigns to boycott the company (see the Nestlé story for an example of such consumer activism).

A 2016 study by Unilever showed that 33% of consumers buy from brands they believe are doing social or environmental good and that this presents a €966 billion (over 1.1 trillion $USD) opportunity for brands. As such, it is important for a company to demonstrate their commitment to CSR, and sustainability reporting offers a medium to do this.[68]

Governments and Regulators

Governments and regulators want to be able to see that a company is behaving responsibly. If they are confident that it is, there is less need to design laws and regulations that might restrict the company even more than if it undertook best-practice measures on its own. Many companies form industry alliance groups that aim to implement best practices in trade, social responsibility, or environmental initiatives.

Community

The community at large also wants to know that the organization is behaving at the level of society's expectations. This reflects the existence of a **social contract**, the expectation that companies will hold to an unwritten contract with society as a whole. If a firm is undertaking actions that might harm society or that reject its general values, community backlash may cost the firm dearly.

In summary, a company's accountability to a wider group of users is an element of stakeholder theory. This theory presents a view that asserts a corporation has an obligation to groups beyond just its shareholders.

YOUR TURN

Identifying Stakeholders

Locate the sustainability report of a Fortune 500 company and read the management discussion in it. Explain who you think the company considers its primary and secondary users. What information about itself and its operations does the company attempt to convey to each audience? Do you think its choices meet the information needs of these two groups of stakeholders? Why or why not?

Solution

67 Intel. "Giving Back: How Our Employees Make a Difference." n.d. https://www.intel.com/content/www/us/en/jobs/life-at-intel/usa/giving-back.html

68 Unilever. "Report Shows a Third of Consumers Prefer Sustainable Brands." May 5, 2017. https://www.unilever.com/news/Press-releases/2017/report-shows-a-third-of-consumers-prefer-sustainable-brands.html

Invariably, the primary users will be shareholders and creditors. Secondary users would be customers, employees, environmental groups, the community and regulators. The strength or relevance of each user will be dependent on the type of business discussed in the response.

ETHICAL CONSIDERATIONS

Public Benefit Corporations

Traditionally, standard American corporations consider their ultimate purpose as maximizing the profits of the shareholders. In the United States, directors of for-profit corporations recognize that one of their major goals is to maximize shareholder value. While corporations generally have the ability to engage in any legal activities, including those that are socially responsible, corporate decision-making must be justified in terms of creating shareholder value. Mission driven and other socially conscious businesses, impact investors, and social entrepreneurs are constrained by this inflexible legal framework that does not accommodate for-profit entities whose mission and impact is central to their business model.

In response, the benefit corporation model has emerged, which "broadens the perspective of traditional corporate law by incorporating concepts of purpose, accountability and transparency with respect to all corporate stakeholders, not just stockholders."[69] Public benefit corporations expand the obligations of boards, requiring them to consider environmental and social factors, as well as the financial interests of shareholders. This gives directors and managers the legal protection to pursue a mission other than maximizing profit and consider the impact their business has on society and the environment.

13.3 Discuss Examples of Major Sustainability Initiatives

In 2017, a KPMG report noted that 93% of the world's 250 largest companies by revenue produced corporate responsibility reports. When looking at the top 100 companies in each of 49 countries, the report found an underlying trend of 75% of companies that reported corporate responsibility and this was up from 18% only 15 years ago.[70] Given these figures, sustainability reporting is clearly responding to a need by investors, lenders and other stakeholders to provide information beyond what financial reports can produce.

However, for these reports to be comparable and useful, there needs to be a standard that users can rely on. Just as financial statements are produced using GAAP or IFRS, there is a need for some type of uniformity within corporate social responsibility reporting. The non-mandatory nature of CSR reporting has made the emergence of a single set of standards a challenge.

Three of the most well-known reporting frameworks are the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and Integrated Framework. Each framework relies on **materiality** (how significant an event or issue is to warrant its inclusion or discussion) as its basis of reporting, but each describes it slightly differently.

69 Morris, Nicols, Arsht & Tunnel. "Understanding Delaware's Benefit Corporation Governance Mode." *The Public Benefit Corporation Guidebook*. May 2016. http://news.mnat.com/rv/ff00272e4c8b3699806e25d24c48a286df5bf926

70 KPMG. *The Road Ahead: The KPMG Survey of Corporate Responsibility Reporting 2017*. 2017. https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/10/kpmg-survey-of-corporate-responsibility-reporting-2017.pdf

Global Reporting Initiative (GRI)

In 1997, a not-for-profit organization called the Global Reporting Initiative (GRI) was formed with the goal of increasing the number of companies that create sustainability reports as well as to provide those companies with guidance about how to report and establish some consistency in reporting (such as identifying common themes and components for reports). The idea is that as companies begin to create these reports, they become more aware of their impact on the sustainability of our world and are more likely to make positive changes to improve that impact. According to GRI, 92% of the Global 250 produced sustainability reports in 2016.

Although businesses have been preparing reports using GRI standards for some time, in 2016, the GRI produced its first set of global reporting standards,[71] which have been designed as modular, interrelated standards. Every organization that produces a GRI sustainability report uses three universal standards: foundation, general disclosures, and management approach (Figure 13.9). The foundation standard (GRI 101) is the starting point and introduces the 10 reporting principles and explains how to prepare a report in accordance with the standards. General Disclosures (GRI 102) is for reporting contextual information about the organization and its reporting practices. Management Approach (GRI 103) is used to report how a firm manages each of its material topics. Applying the materiality principle, the organization identifies its material topics, explains why each is material, and then shows where the impacts occur. Then, it selects topic-specific standards most significant to its own stakeholders.

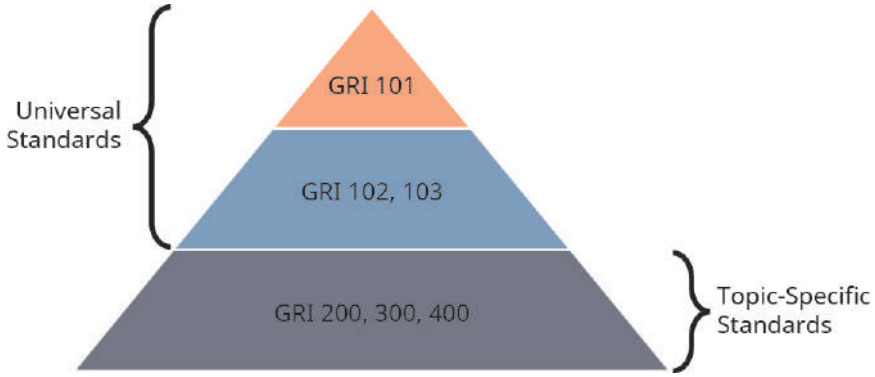


Figure 13.9 Global Reporting Initiative (GRI). Every entity reporting under GRI must use three universal standards, covering foundations, general disclosures, and the firm's management approach. Then topic-specific standards are chosen. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Though the GRI has provided a framework, a firm's decision about what to report rests on its definition of materiality. GRI defines materiality in the context of a sustainability report as follows: "The report should cover Aspects that: Reflect the organization's significant economic, environmental and social impacts; or substantively influence the assessments and decisions of stakeholders."[72] In its 2016 report, Coca-Cola listed these areas as its primary sustainability goals:

- Agriculture
- Human and Workplace Rights
- Climate Protection

71 Global Reporting Initiative (GRI). "GRI Standards." n.d. https://www.globalreporting.org/standards

72 Global Reporting Initiative (GRI). "G4 Sustainability Reporting Guidelines. *Reporting Principles and Standard Disclosures*. 2013.

- Giving Back
- Water Stewardship
- Packaging and Recycling
- Women's Economic Development[73]

Dow Chemical issues a different type of report and lists these categories:

- Who We Are—Strategy and Profile
- Why We Do It—Global Challenges
- What We Do—Our Products and Solutions
- How We Do It—Our People and Operations
- Awards and Recognitions[74]

Sustainability reporting is not confined to manufacturing or merchandising. Service organizations report as well. For example, Bank of America states in its 2016 sustainability report: "At Bank of America, we are guided by a common purpose to help make financial lives better through the power of every connection. We deliver on this through a focus on responsible growth and environmental, social and governance leadership. Through these efforts, we are driving growth—investing in the success of our employees, helping to create jobs, develop communities, foster economic mobility and address society's biggest challenges—while managing risk and providing a return to our clients and our business."[75] For more information about the GRI (https://openstax.org/l/50GRI2) can be found on the web.

CONCEPTS IN PRACTICE

Sustainability in Mobile Telecommunications

With more than 460,000 employees, China Mobile Limited is the largest mobile telecommunications company in the world. The company published their first GRI report in 2006, and, since then, the company has been able to review and disclose key sustainability performance indicators. Wen Xuelian, responsible for CSR reporting and management told GRI that sustainability reporting has helped the company to keep track of material sustainability issues and to improve overall performance each year. Xuelian notes that "at China Mobile we have built our CSR management systems by combining elements of the GRI framework with the operational infrastructure that we already had in place."[76]

Another challenge, Xuelian explains, was quantifying costs and benefits of the company's sustainability efforts. "Over the years of reporting, we have gradually built up relevant systems and incorporated social and environmental impact assessments into the early stage of business development and introduced external assessment methods for better evaluation."[77]

The company addressed material issues such as network connectivity, information security, using information to benefit society, energy conservation, GHG emissions, reduction of poverty, employee development and anti-corruption efforts and sustainability reporting helped them to be more

73 Coca-Cola Company. "2016 Sustainability Report: Women's Economic Empowerment." August 17, 2017. https://www.coca-colacompany.com/stories/2016-womens-economic-empowerment

74 Dow Chemical Company. *Redefining the Role of Business in Society: 2016 Sustainability Report*. 2017. http://storage.dow.com.edgesuite.net/dow.com/sustainability/highlights/Dow_2016_Sustainability_Report.pdf

75 Bank of America. "Responsible Growth." n.d. https://about.bankofamerica.com/en-us/what-guides-us/driving-responsible-growth.html

transparent in their operations. In the 10 years since implementation, they have reduced their electricity consumption per unit of business volume by 94%, built over 13,000 new energy base stations, reduced timber usage in packaging by over 600,000 cubic meters and introduced smart digital solutions for community emissions reductions.[78]

LINK TO LEARNING

Visit the GRI website (https://openstax.org/l/50GRI) and select one of the companies in the featured reports. Locate the company's sustainability report on their website and then locate their oldest sustainability report publication available. How has the company improved their corporate social responsibility performance since they implemented GRI reporting?

Sustainability Accounting Standards Board (SASB)

GRI standards were targeted at a variety of stakeholders, from the community at large to investors and lenders. This meant that the scope of disclosure encouraged by the GRI standards was perhaps too broad for companies that were primarily focused on reporting to investors in routine terms. Investors have their own unique needs related to sustainability information. Their concerns are related to the price and value of the organization, whereas other stakeholders are interested in how the company might affect them specifically. This effect may not even be financial; it could be whether the company pollutes in its local community, or it could be how a firm treats its workers.

For this reason, the Sustainability Accounting Standards Board (SASB) was established in 2011. SASB's mission is to help businesses around the world identify, manage and report on the sustainability topics that matter most to their investors. The SASB develops standards for disclosure of material sustainability information to investors, which can meet the disclosure requirements for known trends and uncertainties in the Management Discussion and Analysis section filed with the Securities Exchange Commission. SASB's version of materiality differs somewhat from the GRI's version.

Whereas the GRI viewed materiality as the inclusion of information that reflects an organization's significant economic, environmental, and social impacts or its substantial influence on the assessments and decisions of stakeholders, SASB adopted the US Supreme Court's view that information is material if there is "a substantial likelihood that the disclosure of the omitted fact would have been viewed by the reasonable investor as having significantly altered the 'total mix' of information made available".[79] It is up to the firms to determine

76 Xuelian, Wen. "China Mobile: Helping Build a Robust Sustainability Reporting Community in China." GRI. Nov. 7, 2017. https://www.globalreporting.org/information/news-and-press-center/Pages/China-Mobile-Helping-build-a-robust-sustainability-reporting-community-in-China.aspx

77 Xuelian, Wen. "China Mobile: Helping Build a Robust Sustainability Reporting Community in China." GRI. Nov. 7, 2017. https://www.globalreporting.org/information/news-and-press-center/Pages/China-Mobile-Helping-build-a-robust-sustainability-reporting-community-in-China.aspx

78 Xuelian, Wen. "China Mobile: Helping Build a Robust Sustainability Reporting Community in China." GRI. Nov. 7, 2017. https://www.globalreporting.org/information/news-and-press-center/Pages/China-Mobile-Helping-build-a-robust-sustainability-reporting-community-in-China.aspx

whether something is material and needs reporting, and this determination would begin with the initial questions "Is the topic important to the total mix of information?" and "Would it be of interest to the reasonable investor.[80]

The SASB standards, available for 79 industries across 10 sectors, help firms disclose material sustainability factors that are likely to affect financial performance. For example, a company that has operations in a developing nation may need to disclose its employment practices in that country to inform users of the risks to which the company is exposed because of its operations. SASB Standards and Framework (http://openstaxcollege.org/l/50SASBFramework) to see the current SASB conceptual framework.

Integrated Reporting

Even though companies were reporting through a range of mechanisms—sustainability reports, triple bottom line, and CSR reports—these methods of reporting were seen as fragmented and not integrating the financial and non-financial information into one report (Figure 13.10).[81] Also, the methods "failed to make the connection between the organization's strategy, its financial performance and its performance on environmental, social and governance issues."[82]

In response to these criticisms, the International Integrated Reporting Council (IIRC) was formed in 2010, touting Integrated Reporting as a solution to the shortfalls of financial reporting. Its intent is to act as a catalyst for behavioral change and long-term thinking,[83] bringing together financial, social, environmental and governance information in a clear, concise, consistent and comparable format.[84]

The goals of Integrated Reporting are to:

- improve the quality of information provided to investors and lenders
- communicate the full range of factors that materially affect the ability of an organization to create value over time by using a more cohesive and efficient approach to corporate reporting which draws on different reporting strands.
- enhance accountability and stewardship for the broad base of six capitals (financial, manufactured, intellectual, human, social and relationship, natural) and promote understanding of their interdependencies.
- support integrated thinking, decision-making and actions so as to create value[85].

As outlined, the Integrated Reporting framework identifies six broad categories of capital used by organizations which are: financial, manufactured, intellectual, human, social and relationship, and natural.

Whether information should be prepared and presented, that is, whether it is material in its inclusion is

79 *TSC Indus. v. Northway, Inc*. (426 U.S. 438, 449 (1976)).

80 The explanation of SASB's interpretation of "total mix" can be viewed on their website. Sustainability Accounting Standards Board (SASB). *SASB's Approach to Materiality for the Purpose of Standards Development* (Staff Bulletin No. SB002-07062017). July 6, 2017. http://library.sasb.org/wp-content/uploads/2017/01/ApproachMateriality-Staff-Bulletin-01192017.pdf?hsCtaTracking=9280788c-d775-4b34-8bc8-5447a06a6d38%7C2e22652a-5486-4854-b68f-73fea01a2414—Ed.

81 Wendy Stubbs, Colin Higgins, and Markus Milne. "Why Do Companies Not Produce Sustainability Reports?" November 12, 2012. *Business Strategy and the Environment* 22(7): 456–470.

82 Harold P. Roth. "Is Integrated Reporting in the Future?" April 22, 2014. *CPA Journal* 84(3): 62-67. https://insurancenewsnet.com/oarticle/Is-Integrated-Reporting-in-the-Future-a-493109#.XC6i GGm1vpw

83 Stathis Gould. "Integrated Reporting <IR> Longs for Finance Professionals." *International Federation of Accountants (IFAC)*. February 2, 2017. https://www.ifac.org/global-knowledge-gateway/business-reporting/discussion/integrated-reporting-longs-finance

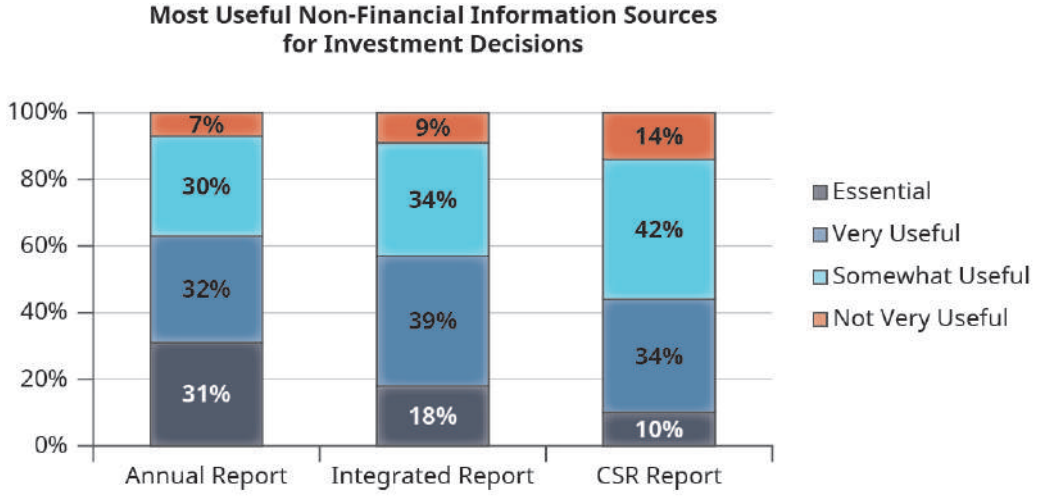
84 International Federation of Accountants. "A4S and GRI Announce Formation of the IIRC." August 2, 2010. https://www.ifac.org/news-events/a4s-and-gri-announces-formation-iirc-0

85 International Integrated Reporting Council (IIRC). *The International Integrated Reporting Framework*. 2013. http://integratedreporting.org/wp-content/uploads/2013/12/13-12-08-THE-INTERNATIONAL-IR-FRAMEWORK-2-1.pdf

determined by:

- Identifying relevant matters based on their ability to affect value creation—that is how it increases, decreases or transforms the capitals caused by the organization's activities. This may be value created for the organization itself or for stakeholders, including society itself.
- Evaluating the importance of relevant matters in terms of their known or potential effect on value creation. This includes evaluating the magnitude of a occurrence's effect and its likelihood of occurrence.
- Prioritizing those matters based on their relative importance so as to focus on the most important matters when determining how they should be reported.
- Determining what information to disclose about material matters. This may require some judgment and discussion with stakeholders to ensure that the report meets its primary purpose.[86]

Integrated Reporting has been adopted by a number of companies throughout the world and is mandatory for listed companies in South Africa and Brazil. So far, it has been slow to take hold in the U.S., however, a number of companies have implemented Integrated Reporting, including Clorox, Entergy, General Electric, Jones Lang LaSalle, PepsiCo, Prudential Financial, and Southwest Airlines.



Source: Nelson, Matthew. "The Importance of Nonfinancial Information to Investors." Harvard Law School Forum on Corporate Governance and Financial Regulation. Apr. 25, 2017. https://corpgov.law.harvard.edu/2017/04/25/the-importance-of-nonfinancial-performance-to-investors/

Figure 13.10 Most Useful Non-Financial Information Sources for Investment Decisions. Although Integrated Reporting does not have mandatory status in many countries, an Ernst & Young survey of Global Investors found that integrated reports ranked second after annual reports in importance for decision-making. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

You can find out more information about the IR framework by visiting the Integrated Reporting (https://openstax.org/l/50Reporting) website.

13.4 Future Issues in Sustainability

Sustainability reporting is still relatively new and its use is not yet mandatory. But from the standpoint of materiality, companies should disclose information if it has become important enough to influence the

86 International Integrated Reporting Council (IIRC). *The International Integrated Reporting Framework*. 2013. http://integratedreporting.org/wp-content/uploads/2013/12/13-12-08-THE-INTERNATIONAL-IR-FRAMEWORK-2-1.pdf

decisions of users of financial information.

The focus on sustainability has led to some notable innovation. For example, Tesla Corporation has become the United States' premier electric car manufacturer and is planning an electric semi-trailer to compete with diesel semi-trailers. The company has also made huge strides in the development of economically viable battery and solar technologies, and developing affordable attractive glass solar tiles that can provide all the electricity necessary for the typical home. The Tesla Gigafactory, located in Sparks, Nevada, expects to be able to produce more lithium ion batteries in one year than were produced in globally in 2013.

If industries reduce carbon emissions and improve social responsibility, what issues remain to guide the quest for sustainability in the future? One possibility is the need for security against cyberattacks, which not only harm the company's functioning but also dent consumer confidence. Another issue will be whether companies can continue to become or remain global in their operations, as political winds shift and the potential arises for backlash against the resulting economic changes in industrialized nations.

A third issue is the role of artificial intelligence (AI). As AI gains prominence and robots become more capable of undertaking complex tasks, white-collar workers of the 21st century may find themselves losing jobs like their 20th-century manufacturing counterparts did. This result will raise a number of ethical questions, such as whether corporations have a greater responsibility to society than to shareholders, and whether the use of robots should be taxed in order for governments to provide retraining to displaced workers and a universal basic income[87].

AI can herald positive change as well. It is expected, for instance, that 10 million self-driving cars will be on the road by 2020,[88] most of them electric and rechargeable using wind or solar power. In fact, you may not even need to own a vehicle at all! Instead, you can be taken to work in a driverless car that will drop you off and then collect other passengers.

These changes are examples of what some call the technological revolution.[89] To maintain relevance, today's worker must learn to be multi-skilled, more innovative, and have a good analytical mind that is able to think critically and creatively. These types of shifts can increase stress for employees and means that the business will be subject to high degrees of scrutiny by stakeholders. As a result, stakeholders will demand that companies be more accountable than simply providing financial reports.

THINK IT THROUGH

Robot Tax

In 2017, Microsoft founder, Bill Gates called for a "robot tax" to be introduced to offset the inequality expected to result from automation.[90] He called for the robot tax to finance a Universal Basic Income (UBI). A universal basic income is the concept by which citizens would receive a regular and unconditional amount of money from the government that is sufficient to meet basic needs. Another similar concept is that of a Universal Basic Dividend (UBD) by which a portion of the initial public offerings (IPOs) of a company would go into a public trust that generates an income stream to pay the UBD.[91]

87 Catherine Clifford. "Automation Could Kill 2× More Jobs Than the Great Depression—so San Francisco Lawmaker Pushes for Bill Gates' 'Robot Tax.'" *CNBC*. August 24, 2017. https://www.cnbc.com/2017/08/24/san-francisco-lawmaker-pushes-forward-bill-gates-robot-tax.html

88 Business Insider Intelligence. "10 Million Self-Driving Cars Will Be on the Road by 2020." *Business Insider*. June 15, 2016. http://www.businessinsider.com/report-10-million-self-driving-cars-will-be-on-the-road-by-2020-2015-5-6

89 Klaus Schwab. "Are You Ready for the Technological Revolution?" *World Economic Forum*. February 19, 2015. https://www.weforum.org/agenda/2015/02/are-you-ready-for-the-technological-revolution/

- What are the costs to society of increased automation?
- How might a robot tax be calculated and implemented?

The discussion of the environmental and social responsibility in this chapter only touched on some of the issues that affect our world. Sustainability reporting allows companies to not only report what they are doing to be good global citizens, it also makes them more aware of areas in which they need to improve. Awareness of the areas that need improvement allows companies to create a plan to continually improve their role in society. In addition, as more and more companies assess their own social responsibility and move to improve their sustainability, it draws attention to unreported sustainability issues as well as to companies that are not being socially aware. Social responsibility reporting has moved us a long way from merely reporting the financial results of businesses. It provides a foundation that links all businesses to all citizens, whether they are shareholders or not, and it helps bind us all in a way that says we are all truly part of a single, global environment that is determined by the actions of both businesses and citizens.

90 Yanis Varoufakis. "Robot Taxes and Universal Basic Income." *Acuity*. June 16, 2017. https://www.acuitymag.com/technology/robot-taxes-and-universal-basic-income

91 Yanis Varoufakis. "Robot Taxes and Universal Basic Income." *Acuity*. June 16, 2017. https://www.acuitymag.com/technology/robot-taxes-and-universal-basic-income

Key Terms

Brundtland Commission Report report issued after the 1987 World Commission on Environment and Development that laid the groundwork for the concept of sustainable development

business sustainability actions taken to sustain the business so that it survives and thrives well into the future

carbon footprint measure of the amount of CO_2 generated by an individual, group or organization

carbon output measure of carbon dioxide emissions into the atmosphere

climate change change in climate patterns due to the increased levels of carbon dioxide in the atmosphere which is attributed mainly to the usage of fossil fuels

corporate social responsibility (CSR) actions that firms take to assume responsibility for their impact on the environment and social well-being

environmental sustainability situation in which rates of resource use can be continued indefinitely without permanently depleting those resources

equity issues related to the fairness of pay and job promotions, regardless of gender, sexual orientation, race or religion

full-cost accounting accounting that recognizes all costs related to the provision of a product or service; this includes all economic, environmental and social costs

life-cycle accounting similar to full-cost accounting, this assesses all costs related to the production of a product from the extraction of raw materials used to the final disposal of the product at the end of its life

materiality how significant an event or issue is to warrant its inclusion or discussion

non-renewable resources resources that, once used, are depleted, and not able to be used again

P/E ratio company's stock price divided by the company's earnings per share and indicates the amount investors are willing to pay for one dollar of earnings

Paris Climate Agreement 2015 agreement between 196 nations to strive to limit the increase of global temperatures to 1.5 degrees Celsius

renewable energy energy that is not depleted once used, for example, tidal energy, wind energy or solar power

social contract expectation that companies will hold to an unwritten contract with society as a whole

stakeholder person or group with an interest or concern in some aspect of the organization

sustainability meeting the needs of the present generation without compromising the ability of future generations to meet their own needs by being aware of current economic, social, and environmental impacts

sustainability report report that presents the economic, environmental or social impacts that a corporation or organization was responsible for

sustainable development development that meets the needs of the present without compromising the ability of future generations to meet their own needs

triple bottom line (TBL) expansion of traditional reporting that is focused on economic performance, to include social and environmental performance

Summary

13.1 Describe Sustainability and the Way It Creates Business Value

- Users of financial reports want to know whether businesses are making appropriate decisions not only to increase shareholder wealth, but also to sustain the business, and the world around it, into the future.

This management goal is called business sustainability.
- Although the U.S. has pulled out of the Paris Climate Agreement, many companies have announced their own commitment to maintain the spirit of the Agreement.
- Early ventures into sustainability practices and reporting often arose in response to negative events and even tragedies as communities demanded more accountability by companies that operated within those communities.
- Many businesses have chosen to develop sustainable business practices because they realize doing so can provide positive benefits, not just to society and the environment, but also to the long-term viability of their own business.

13.2 Identify User Needs for Information

- Users of sustainability reporting information are not just primary users such as shareholders and lenders but can also be secondary users such as employees, customers, the community, governments, and regulators.
- Shareholders concern themselves with the future viability of the company and want profits to be sustained or increased over the long term.
- Lenders want to know the company borrowing from them does not have any going-concern risks that could affect its ability to repay the loan.
- Employees and potential employees want assurance that they will be fairly compensated, that the workplace is safe and the employer ethical, and that all employees have equal rights and opportunities, regardless of gender, race, religion, or sexual orientation.
- Customers want to know the companies to which they give their money reflect their own values and beliefs.
- Governments and regulators want to be able to see that a company is behaving responsibly.
- Communities want to know the organization is behaving at the level of society's expectations. This information need reflects the existence of a social contract, the expectation that companies will hold to an unwritten contract with society as a whole.

13.3 Discuss Examples of Major Sustainability Initiatives

- Materiality describes how significant an event or issue is to warrant its inclusion or discussion.
- The not-for-profit Global Reporting Initiative (GRI) provides companies with guidance about how to report sustainability and identifies common themes and components for reports and in 2016 produced its first set of global reporting standards. According to GRI, 92% of the Global 250 produced sustainability reports in 2016.
- The Sustainability Accounting Standards Board (SASB) was established in 2011 to develop standards for disclosure of material sustainability information to investors. SASB adopted the view of materiality taken by the US Supreme Court, that information is material if there is "a substantial likelihood that the disclosure of the omitted fact would have been viewed by the reasonable investor as having significantly altered the 'total mix' of information made available."[92] SASB standards are available for 79 industries across 10 sectors.
- The International Integrated Reporting Council (IIRC) was formed in 2010 to improve the quality of information provided to investors and lenders, promote a more cohesive and efficient approach to corporate reporting which draws on different reporting strands, enhance accountability and stewardship for six types of capital (financial, manufactured, intellectual, human, social and relationship, and natural), and support integrated thinking, decision-making and actions so as to create value.

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92 Sustainability Accounting Standards Board (SASB). *Hardware: Sustainability Accounting Standard*. Aprril 2014. https://www.sasb.org/wp-content/uploads/2014/04/SASB_Standard_Hardware_Provisional.pdf

13.4 Future Issues in Sustainability

- Innovation, security risks, and globalization mean that businesses must adapt quickly or risk becoming obsolete.
- Artificial intelligence is predicted to significantly change our lives in the future. Some of those changes may threaten the stability of employment for white collar workers. Workers must learn to be multi-skilled, more innovative and possess a good analytical mind.

Multiple Choice

1. LO 13.1 Which agreement did 196 nations adopt in December 2015?

A. Oslo Accord
B. Paris Climate Agreement
C. Kyoto Agreement
D. Copenhagen Accord

2. LO 13.1 The 2015 Paris Agreement on Climate Change aimed to limit the increase of global temperatures to _____.

A. 0.5 °C
B. 1.0 °C
C. 1.5 °C
D. 2.0 °C

3. LO 13.1 Good corporate citizenship _____.

A. is expensive to implement and does not guarantee returns
B. must have management's sincere convictions behind it in order to succeed
C. is more relevant in countries with less regulation.
D. makes good business sense

4. LO 13.1 According to the World Commission on Environment and Development, how is sustainable development defined?

A. It meets the needs of the future without compromising the ability of the present generations to meet their own needs.
B. It applies the fairness doctrine that no generation, present or future, will be disadvantaged in their ability to meet their own needs.
C. It meets the needs of the present without compromising the ability of future generations to meet their own needs.
D. none of the above

5. LO 13.1 Sustainability reporting can incorporate which of the following?

A. environmental reporting
B. social reporting
C. business viability reporting
D. all of the above

6. LO 13.1 What caused Union Carbide's deadly gas leak in Bhopal, India, which killed 3,000 and injured 42,000?

A. a combination of low staff levels, corruption, pay-offs to employees to keep quiet, and the manager going on vacation the day before the leak
B. diversion of funds and resources to a Northern India project that also took staff from the Bhopal plant, plus many safety issues, including fines imposed on community members who camped too close to the plant
C. employees' deciding to have lunch before dealing with the pressure buildup inside the tank and bribes paid to the government employees who inspected the plant
D. a combination of low staff levels, numerous safety issues, and a lack of immediate employee attention to the problem as pressure built up inside the tank

7. LO 13.1 Nestlé's reputation was damaged when the company was accused of which of the following?
A. forcing mothers to buy baby formula within days of delivering their babies
B. promoting inadequate nutrition in developing countries
C. providing cheap formula to mothers in developing countries, but more expensive to mothers in developed countries
D. selling poor quality bottled water to developing countries

8. LO 13.1 Which form of energy is renewable?
A. solar
B. oil
C. coal
D. nuclear

9. LO 13.1 Which of the following types of reporting does the Triple Bottom Line *not* incorporate?
A. management
B. social
C. environmental
D. economic

10. LO 13.2 Which of the following best defines *stakeholders*?
A. investors and lenders
B. environmental groups
C. anyone directly or indirectly affected by the organization
D. groups or individuals financially impacted by the organization

11. LO 13.2 Which of the following statements is most often the case?
A. Socially responsible businesses tend to post higher profits than those not focused on social responsibility.
B. Companies that are not socially responsible will have better profits, but have a moral obligation to society.
C. Socially responsible investing gives poorer returns than non-socially responsible investing.
D. Investors are more short termed focus and so socially responsible investing should not be a factor in their investment portfolio.

12. LO 13.3 Which standards are considered universal under the GRI?
A. economic, environmental, social
B. foundation, general disclosures, management approach
C. foundation, economic, general disclosures
D. management approach, economic, social

13. LO 13.3 The SASB view on materiality has been adapted from which of the following?
A. the U.S. Executive branch
B. the GRI definition
C. a determination by U.S. Congress
D. the U.S. Supreme Court

14. LO 13.3 The fundamental tenets of SASB's Approach are considered _____.
A. evidence-based, industry-specific, and market-informed
B. industry-specific, interest-based, and value creating
C. consensus-based, industry-specific, and actionable
D. interest-based, value creating, and market-informed

15. LO 13.3 How many broad categories of capital are identified by the Integrated Reporting Framework?
A. 2
B. 4
C. 6
D. 8

Questions

1. LO 13.1 What is sustainability and how might corporations incorporate sustainability practices into their business?

2. LO 13.1 What is the value of triple bottom line reporting to users? What is the cost to the company to provide this extra information?

3. LO 13.1 What type of information do you think an oil company should include in their sustainability report? What about a car manufacturer? A large retailer?

4. LO 13.2 Identify four different stakeholders in need of sustainability information and show how their actions might affect a business.

5. LO 13.2 How might a business interact with each of the four different stakeholders you identified in the previous exercise?

6. LO 13.2 Contrast the investment risk potentials of an electric vehicle manufacturer whose shares have a PE ratio of 10:1 and a coal company whose stock has a PE ratio of 2.5 to 1.

7. LO 13.2 There are currently no formal mandatory environmental accounting standards firms must adhere to. Given the lack of regulation, should accountants even bother with preparing sustainability reports? Why or why not?

8. LO 13.3 Explain the role and purpose of the Global Reporting Initiative

9. LO 13.3 Explain the role and purpose of the Sustainability Accounting Standards Board.

10. LO 13.3 Explain the role and purpose of the Integrated Reporting Framework.

Thought Provokers

TP1. LO 13.2 Obtain the 2016/2017 sustainability report for Ford Motor Company. Prepare a report that addresses the following issues:

A. How do the vision and mission statement on the company's website relate to its definition of sustainability, if at all?
B. Who are Ford's stakeholders? Do you think that the company has addressed the information needs of each stakeholder group?
C. What type of governance processes are in place to ensure that the Board of Directors' values are aligned with sustainability?
D. How does Ford tie sustainability to its risk-management system? What potential risks does Ford face that could harm the company, the environment, or the community?

A Financial Statement Analysis

Financial Statement Analysis

Financial statement analysis reviews financial information found on financial statements to make informed decisions about the business. The income statement, statement of retained earnings, balance sheet, and statement of cash flows, among other financial information, can be analyzed. The information obtained from this analysis can benefit decision-making for internal and external stakeholders and can give a company valuable information on overall performance and specific areas for improvement. The analysis can help them with budgeting, deciding where to cut costs, how to increase revenues, and future capital investments opportunities.

When considering the outcomes from analysis, it is important for a company to understand that data produced needs to be compared to others within industry and close competitors. The company should also consider their past experience and how it corresponds to current and future performance expectations. Three common analysis tools are used for decision-making; horizontal analysis, vertical analysis, and financial ratios.

For our discussion of financial statement analysis, we will use Banyan Goods. Banyan Goods is a merchandising company that sells a variety of products. Figure A.1 shows the comparative income statements and balance sheets for the past two years.

BARRY'S SUPERSTORE
Comparative Year-End Income Statements

	Prior Year	Current Year
Net Sales	$100,000	$120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

BARRY'S SUPERSTORE
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Assets:		
Cash	$90,000	$110,000
Accounts Receivable	20,000	30,000
Inventory	35,000	40,000
Short-Term Investments	15,000	20,000
Total Current Asstes	160,000	200,000
Equipment	40,000	50,000
Total Assets	$200,000	$250,000
Liabilities:		
Accounts Payable	$ 60,000	$ 75,000
Unearned Revenue	10,000	25,000
Total Current Liabilities	70,000	100,000
Notes Payable	40,000	50,000
Total Liabilities	110,000	150,000
Stockholder Equity		
Common Stock	75,000	80,000
Ending Retained Earnings	15,000	20,000
Total Stockholder Equity	90,000	100,000
Total Liabilities and Stockholder Equity	$200,000	$250,000

Figure A.1 Comparative Income Statements and Balance Sheets.

Keep in mind that the comparative income statements and balance sheets for Banyan Goods are simplified for our calculations and do not fully represent all the accounts a company could maintain. Let's begin our analysis discussion by looking at horizontal analysis.

Horizontal Analysis

Horizontal analysis (also known as trend analysis) looks at trends over time on various financial statement line items. A company will look at one period (usually a year) and compare it to another period. For example, a company may compare sales from their current year to sales from the prior year. The trending of items on these financial statements can give a company valuable information on overall performance and specific areas for improvement. It is most valuable to do horizontal analysis for information over multiple periods to see how change is occurring for each line item. If multiple periods are not used, it can be difficult to identify a trend. The year being used for comparison purposes is called the base year (usually the prior period). The year of comparison for horizontal analysis is analyzed for dollar and percent changes against the base year.

The dollar change is found by taking the dollar amount in the base year and subtracting that from the year of analysis.

$$\textbf{Dollar Change} = \textbf{Year of Analysis Amount} - \textbf{Base Year Amount}$$

Using Banyan Goods as our example, if Banyan wanted to compare net sales in the current year (year of analysis) of $120,000 to the prior year (base year) of $100,000, the dollar change would be as follows:

$$\text{Dollar change} = \$120{,}000 - \$1000{,}000 = \$20{,}000 \tag{A1}$$

The percentage change is found by taking the dollar change, dividing by the base year amount, and then multiplying by 100.

$$\textbf{Percent Change} = \left(\frac{\textbf{Dollar Change}}{\textbf{Base Year Amount}}\right) \times 100$$

Let's compute the percentage change for Banyan Goods' net sales.

$$\text{Percentage change} = \left(\frac{\$20{,}000}{\$100{,}000}\right) \times 100 = 20\% \tag{A2}$$

This means Banyan Goods saw an increase of $20,000 in net sales in the current year as compared to the prior year, which was a 20% increase. The same dollar change and percentage change calculations would be used for the income statement line items as well as the balance sheet line items. Figure A.2 shows the complete horizontal analysis of the income statement and balance sheet for Banyan Goods.

BARRY'S SUPERSTORE
Comparative Year-End Income Statements
Horizontal Analysis

	Prior Year	Current Year	Dollar Change	% Change
Net Sales	$100,000	$120,000	$20,000	20%
Cost of Goods Sold	50,000	60,000	$10,000	20%
Gross Profit	50,000	60,000	$10,000	20%
Rent Expense	5,000	5,500	$ 500	10%
Depreciation Expense	2,500	3,600	$ 1,100	44%
Salaries Expense	3,000	5,400	$ 2,400	80%
Utility Expense	1,500	2,500	$ 1,000	67% *
Operating Income	38,000	43,000	$ 5,000	13% *
Interest Expense	3,000	2,000	($ 1,000)	(33%)*
Income Tax Expense	5,000	6,000	$ 1,000	20%
Net Income	$ 30,000	$ 35,000	$ 5,000	17% *

*Rounded to nearest whole percent

BARRY'S SUPERSTORE
Comparative Year-End Balance Sheets
Horizontal Analysis

	Prior Year	Current Year	Dollar Change	% Change
Assets:				
Cash	$90,000	$110,000	$20,000	22%*
Accounts Receivable	20,000	30,000	$10,000	50%
Inventory	35,000	40,000	$ 5,000	14%*
Short-Term Investments	15,000	20,000	$ 5,000	33%*
Total Current Asstes	160,000	200,000	$40,000	25%
Equipment	40,000	50,000	$10,000	25%
Total Assets	$200,000	$250,000	$50,000	25%
Liabilities:				
Accounts Payable	$ 60,000	$ 75,000	$15,000	25%
Unearned Revenue	10,000	25,000	$15,000	150%
Total Current Liabilities	70,000	100,000	$30,000	43%*
Notes Payable	40,000	50,000	$10,000	25%
Total Liabilities	110,000	150,000	$40,000	36%*
Stockholder Equity				
Common Stock	75,000	80,000	$ 5,000	7%*
Ending Retained Earnings	15,000	20,000	$ 5,000	33%*
Total Stockholder Equity	90,000	100,000	$10,000	11%*
Total Liabilities and Stockholder Equity	$200,000	$250,000	$50,000	25%

*Rounded to nearest whole percent

Figure A.2 Income Statements and Horizontal Analysis.

Depending on their expectations, Banyan Goods could make decisions to alter operations to produce expected outcomes. For example, Banyan saw a 50% accounts receivable increase from the prior year to the current year. If they were only expecting a 20% increase, they may need to explore this line item further to determine what caused this difference and how to correct it going forward. It could possibly be that they are extending credit more readily than anticipated or not collecting as rapidly on outstanding accounts receivable. The company will need to further examine this difference before deciding on a course of action. Another method of analysis Banyan might consider before making a decision is vertical analysis.

Vertical Analysis

Vertical analysis shows a comparison of a line item within a statement to another line item within that same statement. For example, a company may compare cash to total assets in the current year. This allows a company to see what percentage of cash (the comparison line item) makes up total assets (the other line item) during the period. This is different from horizontal analysis, which compares across years. Vertical analysis compares line items within a statement in the current year. This can help a business to know how much of one item is contributing to overall operations. For example, a company may want to know how much inventory contributes to total assets. They can then use this information to make business decisions such as preparing the budget, cutting costs, increasing revenues, or capital investments.

The company will need to determine which line item they are comparing all items to within that statement and then calculate the percentage makeup. These percentages are considered *common-size* because they make businesses within industry comparable by taking out fluctuations for size. It is typical for an income statement to use net sales (or sales) as the comparison line item. This means net sales will be set at 100% and all other

line items within the income statement will represent a percentage of net sales.

On the balance sheet, a company will typically look at two areas: (1) total assets, and (2) total liabilities and stockholders' equity. Total assets will be set at 100% and all assets will represent a percentage of total assets. Total liabilities and stockholders' equity will also be set at 100% and all line items within liabilities and equity will be represented as a percentage of total liabilities and stockholders' equity. The line item set at 100% is considered the base amount and the comparison line item is considered the comparison amount. The formula to determine the common-size percentage is:

$$\text{Common-Size Percentage} = \left(\frac{\text{Comparision Amount}}{\text{Base Amount}}\right) \times 100$$

For example, if Banyan Goods set total assets as the base amount and wanted to see what percentage of total assets were made up of cash in the current year, the following calculation would occur.

$$\text{Common-size percentage} = \left(\frac{\$110{,}000}{\$250{,}000}\right) \times 100 = 44\% \tag{A3}$$

Cash in the current year is $110,000 and total assets equal $250,000, giving a common-size percentage of 44%. If the company had an expected cash balance of 40% of total assets, they would be exceeding expectations. This may not be enough of a difference to make a change, but if they notice this deviates from industry standards, they may need to make adjustments, such as reducing the amount of cash on hand to reinvest in the business. Figure A.3 shows the common-size calculations on the comparative income statements and comparative balance sheets for Banyan Goods.

BARRY'S SUPERSTORE
Comparative Year-End Income Statements
Vertical Analysis

	Prior Year	Current Year	Common Size* Prior Year	Common Size* Current Year
Net Sales	$100,000	$120,000	100%	100%
Cost of Goods Sold	50,000	60,000	50%	50%
Gross Profit	50,000	60,000	50%	50%
Rent Expense	5,000	5,500	5%	5%
Depreciation Expense - Eq.	2,500	3,600	3%	3%
Salaries Expense	3,000	5,400	3%	5%
Utility Expense	1,500	2,500	2%	2%
Operating Income	38,000	43,000	38%	36%
Interest Expense	3,000	2,000	3%	2%
Income Tax Expense	5,000	6,000	5%	5%
Net Income	$ 30,000	$ 35,000	30%	29%

BARRY'S SUPERSTORE
Comparative Year-End Balance Sheets
Vertical Analysis

	Prior Year	Current Year	Common Size Prior Year	Common Size Current Year
Assets:				
Cash	$90,000	$110,000	45%	44%
Accounts Receivable	20,000	30,000	10%	12%
Inventory	35,000	40,000	17.5%	16%
Short-Term Investments	15,000	20,000	7.5%	8%
Total Current Asstes	160,000	200,000	80%	80%
Equipment	40,000	50,000	20%	20%
Total Assets	$200,000	$250,000	100%	100%
Liabilities:				
Accounts Payable	$ 60,000	$ 75,000	30%	30%
Unearned Revenue	10,000	25,000	5%	10%
Total Current Liabilities	70,000	100,000	35%	40%
Notes Payable	40,000	50,000	20%	20%
Total Liabilities	110,000	150,000	55%	60%
Stockholder Equity				
Common Stock	75,000	80,000	37.5%	32%
Ending Retained Earnings	15,000	20,000	7.5%	8%
Total Stockholder Equity	90,000	100,000	45%	40%
Total Liabilities and Stockholder Equity	$200,000	$250,000	100%	100%

*Some figures rounded to the nearest whole percent, which may alter the total percentage to +/– 1% of 100%

Figure A.3 Income Statements and Vertical Analysis.

Even though vertical analysis is a statement comparison within the same year, Banyan can use information from the prior year's vertical analysis to make sure the business is operating as expected. For example, unearned revenues increased from the prior year to the current year and made up a larger portion of total liabilities and stockholders' equity. This could be due to many factors, and Banyan Goods will need to examine this further to see why this change has occurred. Let's turn to financial statement analysis using financial ratios.

Overview of Financial Ratios

Financial ratios help both internal and external users of information make informed decisions about a company. A stakeholder could be looking to invest, become a supplier, make a loan, or alter internal operations, among other things, based in part on the outcomes of ratio analysis. The information resulting from ratio analysis can be used to examine trends in performance, establish benchmarks for success, set budget expectations, and compare industry competitors. There are four main categories of ratios: liquidity, solvency, efficiency, and profitability. Note that while there are more ideal outcomes for some ratios, the industry in which the business operates can change the influence each of these outcomes has over stakeholder decisions. (You will learn more about ratios, industry standards, and ratio interpretation in advanced accounting courses.)

Liquidity Ratios

Liquidity ratios show the ability of the company to pay short-term obligations if they came due immediately with assets that can be quickly converted to cash. This is done by comparing current assets to current liabilities. Lenders, for example, may consider the outcomes of liquidity ratios when deciding whether to extend a loan to a company. A company would like to be liquid enough to manage any currently due obligations but not too liquid where they may not be effectively investing in growth opportunities. Three common liquidity measurements are working capital, current ratio, and quick ratio.

Working Capital

Working capital measures the financial health of an organization in the short-term by finding the difference between current assets and current liabilities. A company will need enough current assets to cover current liabilities; otherwise, they may not be able to continue operations in the future. Before a lender extends credit, they will review the working capital of the company to see if the company can meet their obligations. A larger difference signals that a company can cover their short-term debts and a lender may be more willing to extend the loan. On the other hand, too large of a difference may indicate that the company may not be correctly using their assets to grow the business. The formula for working capital is:

Working Capital = Current Assets – Current Liabilities

Using Banyan Goods, working capital is computed as follows for the current year:

$$\text{Working capital} = \$200{,}000 - \$100{,}000 = \$100{,}000 \quad \text{(A4)}$$

In this case, current assets were $200,000, and current liabilities were $100,000. Current assets were far greater than current liabilities for Banyan Goods and they would easily be able to cover short-term debt.

The dollar value of the difference for working capital is limited given company size and scope. It is most useful to convert this information to a ratio to determine the company's current financial health. This ratio is the current ratio.

Current Ratio

Working capital expressed as a ratio is the current ratio. The current ratio considers the amount of current assets available to cover current liabilities. The higher the current ratio, the more likely the company can cover its short-term debt. The formula for current ratio is:

$$\text{Current Ratio} = \left(\frac{\text{Current Assets}}{\text{Current Liabilities}}\right)$$

The current ratio in the current year for Banyan Goods is:

$$\text{Current ratio} = \left(\frac{\$200{,}000}{\$100{,}000}\right) = 2 \text{ or } 2{:}1 \tag{A5}$$

A 2:1 ratio means the company has twice as many current assets as current liabilities; typically, this would be plenty to cover obligations. This may be an acceptable ratio for Banyan Goods, but if it is too high, they may want to consider using those assets in a different way to grow the company.

Quick Ratio

The quick ratio, also known as the acid-test ratio, is similar to the current ratio except current assets are more narrowly defined as the most liquid assets, which exclude inventory and prepaid expenses. The conversion of inventory and prepaid expenses to cash can sometimes take more time than the liquidation of other current assets. A company will want to know what they have on hand and can use quickly if an immediate obligation is due. The formula for the quick ratio is:

$$\text{Quick Ratio} = \left(\frac{\text{Cash + Short-Term Investments + Accounts Receivable}}{\text{Current Liabilities}}\right)$$

The quick ratio for Banyan Goods in the current year is:

$$\text{Quick ratio} = \left(\frac{\$110{,}000 + \$20{,}000 + \$30{,}000}{\$100{,}000}\right) = 1.6 \text{ or } 1.6{:}1 \tag{A6}$$

A 1.6:1 ratio means the company has enough quick assets to cover current liabilities.

Another category of financial measurement uses solvency ratios.

Solvency Ratios

Solvency implies that a company can meet its long-term obligations and will likely stay in business in the future. To stay in business the company must generate more revenue than debt in the long-term. Meeting long-term obligations includes the ability to pay any interest incurred on long-term debt. Two main solvency ratios are the debt-to-equity ratio and the times interest earned ratio.

Debt to Equity Ratio

The debt-to-equity ratio shows the relationship between debt and equity as it relates to business financing. A company can take out loans, issue stock, and retain earnings to be used in future periods to keep operations running. It is less risky and less costly to use equity sources for financing as compared to debt resources. This is mainly due to interest expense repayment that a loan carries as opposed to equity, which does not have this requirement. Therefore, a company wants to know how much debt and equity contribute to its financing. Ideally, a company would prefer more equity than debt financing. The formula for the debt to equity ratio is:

$$\text{Debt-to-Equity Ratio} = \left(\frac{\text{Total Liabilities}}{\text{Total Stockholder Equity}}\right)$$

The information needed to compute the debt-to-equity ratio for Banyan Goods in the current year can be found on the balance sheet.

$$\text{Debt-to-equity ratio} = \left(\frac{\$150{,}000}{\$100{,}000}\right) = 1.5 \text{ or } 1.5{:}1 \tag{A7}$$

This means that for every $1 of equity contributed toward financing, $1.50 is contributed from lenders. This would be a concern for Banyan Goods. This could be a red flag for potential investors that the company could be trending toward insolvency. Banyan Goods might want to get the ratio below 1:1 to improve their long-term business viability.

Times Interest Earned Ratio

Time interest earned measures the company's ability to pay interest expense on long-term debt incurred. This ability to pay is determined by the available earnings before interest and taxes (EBIT) are deducted. These earnings are considered the operating income. Lenders will pay attention to this ratio before extending credit. The more times over a company can cover interest, the more likely a lender will extend long-term credit. The formula for times interest earned is:

$$\textbf{Times Interest Earned} = \left(\frac{\textbf{Earnings before Interest and Taxes}}{\textbf{Interest Expense}}\right)$$

The information needed to compute times interest earned for Banyan Goods in the current year can be found on the income statement.

$$\text{Times interest earned} = \left(\frac{\$43{,}000}{\$2{,}000}\right) = 21.5 \text{ times} \tag{A8}$$

The $43,000 is the operating income, representing earnings before interest and taxes. The 21.5 times outcome suggests that Banyan Goods can easily repay interest on an outstanding loan and creditors would have little risk that Banyan Goods would be unable to pay.

Another category of financial measurement uses efficiency ratios.

Efficiency Ratios

Efficiency shows how well a company uses and manages their assets. Areas of importance with efficiency are management of sales, accounts receivable, and inventory. A company that is efficient typically will be able to generate revenues quickly using the assets it acquires. Let's examine four efficiency ratios: accounts receivable turnover, total asset turnover, inventory turnover, and days' sales in inventory.

Accounts Receivable Turnover

Accounts receivable turnover measures how many times in a period (usually a year) a company will collect cash from accounts receivable. A higher number of times could mean cash is collected more quickly and that credit customers are of high quality. A higher number is usually preferable because the cash collected can be reinvested in the business at a quicker rate. A lower number of times could mean cash is collected slowly on these accounts and customers may not be properly qualified to accept the debt. The formula for accounts receivable turnover is:

$$\text{Accounts Receivable Turnover} = \left(\frac{\text{Net Credit Sales}}{\text{Average Accounts Receivable}}\right)$$

$$\text{Average Accounts Receivable} = \left(\frac{\text{Beginning Accounts Receivable} + \text{Ending Accounts Receivable}}{2}\right)$$

Many companies do not split credit and cash sales, in which case net sales would be used to compute accounts receivable turnover. Average accounts receivable is found by dividing the sum of beginning and ending accounts receivable balances found on the balance sheet. The beginning accounts receivable balance in the current year is taken from the ending accounts receivable balance in the prior year.

When computing the accounts receivable turnover for Banyan Goods, let's assume net credit sales make up $100,000 of the $120,000 of the net sales found on the income statement in the current year.

$$\begin{aligned} \text{Average accounts receivable} &= \frac{\$20{,}000 + \$30{,}000}{2} = \$25{,}000 \\ \text{Accounts receivable turnover} &= \frac{\$100{,}000}{\$25{,}000} = 4 \text{ times} \end{aligned} \tag{A9}$$

An accounts receivable turnover of four times per year may be low for Banyan Goods. Given this outcome, they may want to consider stricter credit lending practices to make sure credit customers are of a higher quality. They may also need to be more aggressive with collecting any outstanding accounts.

Total Asset Turnover

Total asset turnover measures the ability of a company to use their assets to generate revenues. A company would like to use as few assets as possible to generate the most net sales. Therefore, a higher total asset turnover means the company is using their assets very efficiently to produce net sales. The formula for total asset turnover is:

$$\text{Total Asset Turnover} = \left(\frac{\text{Net Sales}}{\text{Average Total Assets}}\right)$$

$$\text{Average Total Assets} = \left(\frac{\text{Beginning Total Assets} + \text{Ending Total Assets}}{2}\right)$$

Average total assets are found by dividing the sum of beginning and ending total assets balances found on the balance sheet. The beginning total assets balance in the current year is taken from the ending total assets balance in the prior year.

Banyan Goods' total asset turnover is:

$$\begin{aligned} \text{Average total assets} &= \frac{\$200{,}000 + \$250{,}000}{2} = \$225{,}000 \\ \text{Total assets turnover} &= \frac{\$120{,}000}{\$225{,}000} = 0.53 \text{ times (rounded)} \end{aligned} \tag{A10}$$

The outcome of 0.53 means that for every $1 of assets, $0.53 of net sales are generated. Over time, Banyan Goods would like to see this turnover ratio increase.

Inventory Turnover

Inventory turnover measures how many times during the year a company has sold and replaced inventory.

This can tell a company how well inventory is managed. A higher ratio is preferable; however, an extremely high turnover may mean that the company does not have enough inventory available to meet demand. A low turnover may mean the company has too much supply of inventory on hand. The formula for inventory turnover is:

$$\text{Inventory Turnover} = \left(\frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}\right)$$

$$\text{Average Inventory} = \left(\frac{\text{Beginning Inventory + Ending Inventory}}{2}\right)$$

Cost of goods sold for the current year is found on the income statement. Average inventory is found by dividing the sum of beginning and ending inventory balances found on the balance sheet. The beginning inventory balance in the current year is taken from the ending inventory balance in the prior year.

Banyan Goods' inventory turnover is:

$$\begin{aligned} \text{Average inventory} &= \frac{\$35{,}000 + \$40{,}000}{2} = \$37{,}500 \\ \text{Inventory turnover} &= \frac{\$60{,}000}{\$37{,}500} = 1.6 \text{ times} \end{aligned} \tag{A11}$$

1.6 times is a very low turnover rate for Banyan Goods. This may mean the company is maintaining too high an inventory supply to meet a low demand from customers. They may want to decrease their on-hand inventory to free up more liquid assets to use in other ways.

Days' Sales in Inventory

Days' sales in inventory expresses the number of days it takes a company to turn inventory into sales. This assumes that no new purchase of inventory occurred within that time period. The fewer the number of days, the more quickly the company can sell its inventory. The higher the number of days, the longer it takes to sell its inventory. The formula for days' sales in inventory is:

$$\text{Days' Sales in Inventory} = \left(\frac{\text{Ending Inventory}}{\text{Cost of Goods Sold}}\right) \times 365$$

Banyan Goods' days' sales in inventory is:

$$\text{Days' sales in inventory} = \left(\frac{\$40{,}000}{\$60{,}000}\right) \times 365 = 243 \text{ days (rounded)} \tag{A12}$$

243 days is a long time to sell inventory. While industry dictates what is an acceptable number of days to sell inventory, 243 days is unsustainable long-term. Banyan Goods will need to better manage their inventory and sales strategies to move inventory more quickly.

The last category of financial measurement examines profitability ratios.

Profitability Ratios

Profitability considers how well a company produces returns given their operational performance. The company needs to leverage its operations to increase profit. To assist with profit goal attainment, company revenues need to outweigh expenses. Let's consider three profitability measurements and ratios: profit margin, return on total assets, and return on equity.

Profit Margin

Profit margin represents how much of sales revenue has translated into income. This ratio shows how much of each $1 of sales is returned as profit. The larger the ratio figure (the closer it gets to 1), the more of each sales dollar is returned as profit. The portion of the sales dollar not returned as profit goes toward expenses. The formula for profit margin is:

$$\text{Profit Margin} = \left(\frac{\text{Net Income}}{\text{Net Sales}}\right)$$

For Banyan Goods, the profit margin in the current year is:

$$\text{Profit ma gin} = \left(\frac{\$35{,}000}{\$120{,}000}\right) = 0.29 \text{ (rounded) or } 29\% \tag{A13}$$

This means that for every dollar of sales, $0.29 returns as profit. If Banyan Goods thinks this is too low, the company would try and find ways to reduce expenses and increase sales.

Return on Total Assets

The return on total assets measures the company's ability to use its assets successfully to generate a profit. The higher the return (ratio outcome), the more profit is created from asset use. Average total assets are found by dividing the sum of beginning and ending total assets balances found on the balance sheet. The beginning total assets balance in the current year is taken from the ending total assets balance in the prior year. The formula for return on total assets is:

$$\text{Return on Total Assets} = \left(\frac{\text{Net Income}}{\text{Average Total Assets}}\right)$$

$$\text{Average Total Assets} = \left(\frac{\text{Beginning Total Assets} + \text{Ending Total Assets}}{2}\right)$$

For Banyan Goods, the return on total assets for the current year is:

$$\begin{aligned} \text{Average total assets} &= \frac{\$200{,}000 + \$250{,}000}{2} = \$225{,}000 \\ \text{Return on total assets} &= \frac{\$35{,}000}{\$225{,}000} = 0.16 \text{ (rounded) or } 16\% \end{aligned} \tag{A14}$$

The higher the figure, the better the company is using its assets to create a profit. Industry standards can dictate what is an acceptable return.

Return on Equity

Return on equity measures the company's ability to use its invested capital to generate income. The invested capital comes from stockholders investments in the company's stock and its retained earnings and is leveraged to create profit. The higher the return, the better the company is doing at using its investments to yield a profit. The formula for return on equity is:

$$\text{Return on Equity} = \left(\frac{\text{Net Income}}{\text{Average Stockholder Equity}}\right)$$

$$\text{Average Stockholder Equity} = \left(\frac{\text{Beginning Stockholder Equity} + \text{Ending Stockholder Equity}}{2}\right)$$

Average stockholders' equity is found by dividing the sum of beginning and ending stockholders' equity balances found on the balance sheet. The beginning stockholders' equity balance in the current year is taken from the ending stockholders' equity balance in the prior year. Keep in mind that the net income is calculated after preferred dividends have been paid.

For Banyan Goods, we will use the net income figure and assume no preferred dividends have been paid. The return on equity for the current year is:

$$\begin{aligned} \text{Average stockholder equity} &= \frac{\$90{,}000 + \$100{,}000}{2} = \$95{,}000 \\ \text{Return on equity} &= \frac{\$35{,}000}{\$95{,}000} = 0.37 \text{ (rounded) or } 37\% \end{aligned} \tag{A15}$$

The higher the figure, the better the company is using its investments to create a profit. Industry standards can dictate what is an acceptable return.

Advantages and Disadvantages of Financial Statement Analysis

There are several advantages and disadvantages to financial statement analysis. Financial statement analysis can show trends over time, which can be helpful in making future business decisions. Converting information to percentages or ratios eliminates some of the disparity between competitor sizes and operating abilities, making it easier for stakeholders to make informed decisions. It can assist with understanding the makeup of current operations within the business, and which shifts need to occur internally to increase productivity.

A stakeholder needs to keep in mind that past performance does not always dictate future performance. Attention must be given to possible economic influences that could skew the numbers being analyzed, such as inflation or a recession. Additionally, the way a company reports information within accounts may change over time. For example, where and when certain transactions are recorded may shift, which may not be readily evident in the financial statements.

A company that wants to budget properly, control costs, increase revenues, and make long-term expenditure decisions may want to use financial statement analysis to guide future operations. As long as the company understands the limitations of the information provided, financial statement analysis is a good tool to predict growth and company financial strength.

B Time Value of Money

Present Value of $1 Table

Present Value of $1 Table

$$\text{Factor} = \frac{1}{(1+i)^n}$$

Period (n) \ Rate (i)	1%	2%	3%	5%	8%	10%	12%	15%	20%
1	0.990	0.980	0.971	0.952	0.926	0.909	0.893	0.870	0.833
2	0.980	0.961	0.943	0.907	0.857	0.826	0.797	0.756	0.694
3	0.971	0.942	0.915	0.864	0.794	0.751	0.712	0.658	0.579
4	0.961	0.924	0.888	0.823	0.735	0.683	0.636	0.572	0.482
5	0.952	0.906	0.863	0.784	0.681	0.621	0.567	0.497	0.402
6	0.942	0.888	0.837	0.746	0.630	0.564	0.507	0.432	0.335
7	0.933	0.871	0.813	0.711	0.583	0.513	0.452	0.376	0.279
8	0.924	0.853	0.789	0.677	0.540	0.467	0.404	0.327	0.233
9	0.914	0.837	0.766	0.645	0.500	0.424	0.361	0.284	0.194
10	0.905	0.820	0.744	0.614	0.463	0.386	0.322	0.247	0.162
11	0.896	0.804	0.722	0.585	0.429	0.350	0.287	0.215	0.135
12	0.888	0.788	0.701	0.557	0.397	0.319	0.257	0.187	0.112
13	0.879	0.773	0.681	0.530	0.368	0.290	0.229	0.163	0.093
14	0.861	0.758	0.661	0.505	0.340	0.263	0.205	0.141	0.078
15	0.861	0.743	0.642	0.481	0.315	0.239	0.183	0.123	0.065
16	0.853	0.728	0.623	0.458	0.292	0.218	0.163	0.107	0.054
17	0.844	0.714	0.605	0.436	0.270	0.198	0.146	0.093	0.045
18	0.836	0.700	0.587	0.416	0.250	0.180	0.130	0.081	0.038
19	0.828	0.686	0.570	0.396	0.232	0.164	0.116	0.070	0.031
20	0.820	0.673	0.554	0.377	0.215	0.149	0.104	0.061	0.026

Figure B.1 Present Value of $1 Table.

Present Value of an Ordinary Annuity Table

Future Value of an Ordinary Annuity Table

$$\text{Factor} = \frac{[1 - 1 / (1 + i)^n]}{i}$$

Rate (*i*)

Period (*n*)	1%	2%	3%	5%	8%	10%	12%	15%	20%
1	0.990	0.980	0.971	0.952	0.926	0.909	0.893	0.870	0.833
2	1.970	1.942	1.913	1.859	1.783	1.736	1.690	1.626	1.528
3	2.941	2.884	2.829	2.723	2.577	2.487	2.402	2.283	2.106
4	3.902	3.808	3.717	3.546	3.312	3.170	3.037	2.855	2.589
5	4.853	4.713	4.580	4.329	3.993	3.791	3.605	3.352	2.991
6	5.795	5.601	5.417	5.076	4.623	4.355	4.111	3.785	3.326
7	6.728	6.472	6.230	5.786	5.206	4.868	4.564	4.160	3.605
8	7.652	7.325	7.020	6.463	5.747	5.335	4.968	4.487	3.837
9	8.566	8.162	7.786	7.108	6.247	5.759	5.328	4.772	4.031
10	9.471	8.983	8.530	7.722	6.710	6.145	5.650	5.019	4.192
11	10.368	9.787	9.253	8.306	7.139	6.495	5.938	5.234	4.327
12	11.255	10.575	9.954	8.863	7.536	6.814	6.194	5.421	4.439
13	12.134	11.348	10.635	9.394	7.904	7.103	6.424	5.583	4.533
14	13.004	12.106	11.296	9.899	8.244	7.367	6.628	5.725	4.611
15	13.865	12.849	11.938	10.380	8.559	7.606	6.811	5.847	4.675
16	14.718	13.578	12.561	10.838	8.851	7.824	6.974	5.954	4.730
17	15.562	14.292	13.166	11.274	9.122	8.022	7.120	6.047	4.775
18	16.398	14.992	13.754	11.690	9.372	8.201	7.250	6.128	4.812
19	17.226	15.678	14.324	12.085	9.604	8.365	7.366	6.198	4.844
20	18.046	16.351	14.877	12.462	9.818	8.514	7.469	6.259	4.870

Figure B.2 Present Value of an Ordinary Annuity Table.

Future Value of $1 Table

Future Value of $1 Table
Factor = $(1 + i)^n$
Rate (i)

Period (n)	1%	2%	3%	5%	8%	10%	12%	15%	20%
1	1.010	1.020	1.030	1.050	1.080	1.100	1.120	1.150	1.200
2	1.020	1.040	1.061	1.103	1.166	1.210	1.254	1.323	1.440
3	1.030	1.061	1.093	1.158	1.260	1.331	1.405	1.521	1.728
4	1.041	1.082	1.126	1.216	1.360	1.464	1.574	1.749	2.074
5	1.051	1.104	1.159	1.276	1.469	1.611	1.762	2.011	2.488
6	1.062	1.126	1.194	1.340	1.587	1.772	1.974	2.313	2.986
7	1.072	1.149	1.230	1.407	1.714	1.949	2.211	2.660	3.583
8	1.083	1.172	1.267	1.477	1.851	2.144	2.476	3.059	4.300
9	1.094	1.195	1.305	1.551	1.999	2.358	2.773	3.518	5.160
10	1.105	1.219	1.344	1.629	2.159	2.594	3.106	4.046	6.192
11	1.116	1.243	1.384	1.710	2.332	2.853	3.479	4.652	7.430
12	1.127	1.268	1.426	1.796	2.518	3.138	3.896	5.350	8.916
13	1.138	1.294	1.469	1.886	2.720	3.452	4.363	6.153	10.699
14	1.149	1.319	1.513	1.980	2.937	3.797	4.887	7.076	12.839
15	1.161	1.346	1.558	2.079	3.172	4.177	5.474	8.137	15.407
16	1.173	1.373	1.605	2.183	3.426	4.595	6.130	9.358	18.488
17	1.184	1.400	1.653	2.292	3.700	5.054	6.866	10.761	22.186
18	1.196	1.428	1.702	2.407	3.996	5.560	7.690	12.375	26.623
19	1.208	1.457	1.754	2.527	4.316	6.116	8.613	14.232	31.948
20	1.220	1.486	1.806	2.653	4.661	6.727	9.646	16.367	38.338

Figure B.3 Future Value of $1 Table.

Future Value of an Ordinary Annuity Table

Future Value of an Ordinary Annuity Table

$$\text{Factor} = \frac{[(1+i)^n - 1]}{i}$$

Period (n) \ Rate (i)	1%	2%	3%	5%	8%	10%	12%	15%	20%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.010	2.020	2.030	2.050	2.080	2.100	2.120	2.150	2.200
3	3.030	3.060	3.091	3.153	3.246	3.310	3.374	3.473	3.640
4	4.060	4.122	4.184	4.310	4.506	4.641	4.779	4.993	5.368
5	5.101	5.204	5.309	5.526	5.867	6.105	6.353	6.742	7.442
6	6.152	6.308	6.468	6.802	7.336	7.716	8.115	8.754	9.930
7	7.214	7.434	7.662	8.142	8.923	9.487	10.089	11.067	12.916
8	8.286	8.583	8.892	9.549	10.637	11.436	12.300	13.727	16.499
9	9.369	9.755	10.159	11.027	12.488	13.579	14.776	16.786	20.799
10	10.462	10.950	11.464	12.578	14.487	15.937	17.549	20.304	25.959
11	11.567	12.169	12.808	14.207	16.645	18.531	20.655	24.349	32.150
12	12.683	13.412	14.192	15.917	18.977	21.384	24.133	29.002	39.581
13	13.809	14.680	15.618	17.713	21.495	24.523	28.029	34.352	48.497
14	14.947	15.974	17.086	19.599	24.215	27.975	32.393	40.505	59.196
15	16.097	17.293	18.599	21.579	27.152	31.772	37.280	47.580	72.035
16	17.258	18.639	20.157	23.657	30.324	35.950	42.753	55.717	87.442
17	18.430	20.012	21.762	25.840	33.750	40.545	48.884	65.075	105.930
18	19.615	21.412	23.414	28.132	37.450	45.599	55.750	75.836	128.120
19	20.811	22.841	25.117	30.539	41.446	51.159	63.440	88.212	154.740
20	22.019	24.297	26.870	33.066	45.762	57.275	72.052	102.440	186.690

Figure B.4 Future Value of an Ordinary Annuity Table.

C Suggested Resources

The resources listed provide further information on several topics: financial statements from real-world companies, accounting software and tools, personal finance, accounting organizations, and exams and professional certifications for accountants.

Sample Financial Statements

The following income statements and balance sheets show the finances of companies representing the manufacturing, retail, and service industries.

Manufacturing Company: General Motors

- Income statement: https://www.nasdaq.com/symbol/gm/financials?query=income-statement
- Balance sheet: https://www.nasdaq.com/symbol/gm/financials?query=balance-sheet

Retail Company: Costco Wholesale

- Income statement: https://www.nasdaq.com/symbol/cost/financials
- Balance sheet: https://www.nasdaq.com/symbol/cost/financials?query=balance-sheet

Service Company: Prudential

- Income statement https://www.marketwatch.com/investing/stock/pru/financials
- Balance sheet: https://www.marketwatch.com/investing/stock/pru/financials/balance-sheet

Accounting Software and Tools

The resources listed offer a variety of tutorials, training videos, and practice activities using software and tools common in accounting.

QuickBooks

- QuickBooks tutorials: https://quickbooks.intuit.com/tutorials/

Peachtree/Sage 50

- Peachtree 2011 guide: https://www.perdisco.com/peachtreeLearning/quickReferenceGuide/2011.aspx
- Sage 50 training course with videos: https://www.freebookkeepingaccounting.com/single-post/Sage-50-Accounts-Training-Course-Part-1

Microsoft Excel

- Excel tutorials, video guides, trainings, and worksheets: https://chandoo.org/wp/welcome/
- YouTube channel with accounting-specific video tutorials: https://www.youtube.com/user/ExcelIsFun

Financial Calculators

- HP10B setup video guide: https://www.youtube.com/watch?v=lmMdRfKre44
- HP10BII video introduction and examples: https://www.youtube.com/watch?v=fTqkkeG1xlw
- HP10B and HP12C time value of money calculations video guides: https://www.youtube.com/user/mssuprof/videos

Personal Finance

These resources can assist you with personal financial planning.

Earnings

- Current starting salaries for recent college graduates for various majors and degrees: https://careers.kennesaw.edu/employers/docs/2018-nace-salary-survey-winter.pdf
- Accounting-specific salaries and positions: https://www.roberthalf.com/blog/salaries-and-skills/the-rise-of-the-accountant-salary-and-10-top-accounting-jobs

Take-Home Pay

- Salary calculator that determines your net pay—the amount you'll take home in your paycheck that you need to plan your budget around. In addition to calculating state and federal taxes, this resource allows you to input other withholdings such as health insurance or 401K contributions: https://www.paycheckcity.com/

Saving and Retirement Planning

Determining how much your savings will grow and how much you will have in retirement are very important components of personal financial planning. These links will help you better plan for those aspects of saving.

- This basic savings growth calculator includes graphs that provide helpful visuals of the impact of changing any assumptions such as the timing or amount of contributions or the interest rate earned: https://smartasset.com/investing/investment-calculator
- To estimate retirement savings growth, use this calculator that allows you to see the impact of saving now (enter your current age) versus saving later (enter a future age): https://www.daveramsey.com/smartvestor/investment-calculator
- This calculator lets you more accurately plan how your retirement savings will grow by allowing you to input any matching amounts contributed by employers: https://nb.fidelity.com/public/nb/401k/tools/calculators/contributioncalculator

Budgeting

- A well-planned budget is the cornerstone of personal financial planning. Using the salary, pay and savings numbers obtained from the resources above, this calculator will help you create a detailed financial budget: https://www.clearpoint.org/tools/budget-calculator/

Debt Reduction

- Whether it is student loans, credit cards, car loans or any other kind of debt, it is always beneficial to understand the impact of differing payments on paying off debt. This resource will help you see the impact of changing the amount paid on the payoff timing and interest paid on the debt: https://www.money-zine.com/calculators/loan-calculators/debt-reduction-calculator/

Accounting-Related Organizations

A number of organizations are dedicated to regulating and supporting the variety of work undertaken in the discipline of accounting.

- Governmental Accounting Standards Board (GASB): https://www.gasb.org
- Financial Accounting Standards Board (FASB): https://www.fasb.org
- U.S. Securities and Exchange Commission (SEC): https://www.sec.gov
- Association of Chartered Certified Accountants (ACCA): https://www.accaglobal.com
- Institute of Management Accountants (IMA): https://www.imanet.org

Accounting Exams and Certificates

These sites provide information on exams and professional certifications.

Certified Public Accountant (CPA)

- American Institute of Certified Public Accountants (AICPA): https://www.aicpa.org/content/aicpa/
- National Association of State Boards of Accountancy (NASBA): https://nasba.org/
- This Way to the CPA: https://thiswaytocpa.com/

Certified Management Accountant (CMA)

- Institute of Management Accountants (IMA): https://www.imanet.org/cma-certification?ssopc=1

Certified Internal Auditor (CIA)

- Institute of Internal Auditors (IIA)-Global: https://global.theiia.org/Pages/globaliiaHome.aspx
- Institute of Internal Auditors (IIA)-North America: https://na.theiia.org/Pages/IIAHome.aspx

Certified Fraud Examiner (CFE)

- Association of Certified Fraud Examiners (ACFE): http://www.acfe.com/default.aspx

Chartered Financial Analyst (CFA)

- CFA Institute: https://www.cfainstitute.org/Pages/index.aspx

Certified Financial Planner (CFP)

- Certified Financial Planners (CFP) Board: https://www.cfp.net/home

Answer Key

Chapter 1

Multiple Choice

1. D
3. A
5. A
7. A
9. C
11. A
13. C
15. C
17. C
19. B
21. D
23. D
25. D
27. C

Questions

1. Answers will vary but should include that cost analysis, branding, pricing, and competition all fall under positioning, and this information comes from the managerial accounting staff. It is used to plan for future processes.
3. Answers will vary but should include the following: Managers must determine what modifications and changes need to be made to operations to get back on track to meet the stated goals and objectives. Managers need to decide if stated goals and objectives should continue to be pursued as they are, or if they should be modified or completely scrapped. Examples may include revising inventory controls to include antitheft tags that trigger an alarm when inventory is moved from an approved location in order to reduce inventory losses; installing more cameras in more strategic locations to further reduce theft from shoplifting; revising the financial metrics such as ratios or other performance measurements to provide more meaningful and timely insight to help determine how to get back on track; investigating why market share has not changed as expected by talking to the sales force and analyzing market data; evaluating same-store sales to understand how to expand sales in accordance with goals and objectives; and investigating why a production process has experienced a bottleneck and how to relieve the pressure in that specific area, such as making sure appropriate raw materials are available in a timely manner to avoid machine shutdowns waiting on materials to arrive.
5. Reports generated from financial accounting are a compilation of a company's various transactions and contain aggregated information for the entire company in the form of financial statements. For publicly traded companies, these reports follow the rules set forth by the Financial Accounting Standards Board (FASB). In addition, the financial statements are verified by external auditors. Reports generated by managerial accounting are varied in nature because they are driven by the questions that need to be addressed by management. Different companies and different questions require different reports. Managerial accounting reports are therefore on a more detailed level, such as on a product or division level. There are no specific rules guiding the creation of these reports, and they are usually unaudited.
7. The primary users of information gathered by managerial accountants are internal users, including management, employees, and officers.
9. Six qualities a managerial accountant should exhibit are commercial awareness, collaboration, effective communication, strong technology skills, analytical skills, and ethics.
11. The chain of command for someone being hired into an organization as a staff managerial accounting is: Management accounting supervisor → Controller → CFO → CEO → Board of Directors
13. Specialization areas for management accountants includes budget analyst, financial analyst, accounting manager, controller, chief financial officer.
15. Professional business organizations that have a code of ethics include the American Institute of Public Accountants, the Association of Certified Fraud Examiners, the Financial Executives Institute, the American Marketing Association, and National Society of Professional Engineers.
17. Several accounting scandals involving publicly traded companies (Enron, WorldCom, and Arthur Andersen) led to the act. It was aimed particularly at public accounting organizations that performed audits of publicly traded corporations.

Chapter 2

Multiple Choice

1. C
3. A
5. A
7. D
9. D
11. B
13. D
15. D
17. C

Questions

1. Answers will vary but should include merchandising, service, and manufacturing businesses.
3. Answers will vary but should include a discussion of operating costs such as salaries and wages, advertising, rent, and office expenses.
5. Answers will vary but must include direct materials, direct labor, and manufacturing overhead.
7. Answers will vary but should include that fixed costs remain fixed in total across the relevant range, bounded by a minimum and maximum activity level.
9. Answers will vary but should include that prime costs are the direct material and direct labor costs, and conversion costs are direct labor and general factory overhead combined.
11. Answers will vary.

Chapter 3

Multiple Choice

1. A
3. C
5. B
7. C
9. D
11. B
13. C
15. C
17. C
19. D
21. C
23. D

Questions

1. Answers will vary. Responses should include that per-unit contribution margin is the amount by which a product's selling price exceeds it total variable cost per unit.
3. Answers will vary. Responses should include that contribution income statements express total contribution margin for a given level of activity and can be useful in making decisions about product pricing and optimal levels of activity.
5. Answers will vary. Responses should include the fact that the contribution margin ratio represents the percentage of every sales dollar available to cover fixed expenses. Businesses can use this ratio when projecting profit at various levels of sales revenue.
7. Answers will vary. Responses should include a description of how the CVP analysis information can be brought into a projected income statement that takes into account additional revenues and expenses of the business to create a "big picture" of what happens as a result of a change in cost, volume, and profit
9. Answers will vary. Responses should include the definition of sales mix as the relative proportions in which a company's products are sold as well as a description of how products within the sales mix have unique sales prices, variable costs, and contribution margins.
11. Answers will vary. Responses should include an explanation of how margin of safety allows the business to operate at a level where the risk of falling to or below the break-even point is low. There should also be some mention of the usefulness of the margin safety as an "alarm" for companies, such that when sales fall to the margin of safety level, action may be warranted.

Chapter 4

Multiple Choice

1. B
3. B
5. C
7. A
9. A
11. D
13. A
15. C
17. D

Questions

1. The company should use process costing. Since there are many similar items, process costing is a better fit than job order costing.
3. The conversion cost is $72,000: the sum of direct labor, factory depreciation expense, and utility expense.
5. The expense recognition principle requires that expenses follow the revenue. Product costs are assigned to the product because they are associated with the revenue from the sale of the product. The cost is transferred from inventory to cost of goods sold when the item is sold. This matches the revenue from the sale with the cost of the item being sold. Period costs are expensed when incurred because they are not related to a specific product but are instead related to the time period in which revenue is earned.
7. B, D, C, A.
9. Management uses the activity considered to be the cost driver and multiplies that rate by the activity for each specific job. The result is the amount of overhead applied to that specific job.
11. Expenses normally have a debit balance, and the manufacturing overhead account is debited when expenses are incurred to recognize the incurrence. When the expenses are allocated to the asset, the work in process inventory, the expense account manufacturing overhead is credited. This is in accordance with the expense recognition principle. The timing of the expense follows the revenue, and when the costs are allocated to inventory, they become a part of the product's cost and are recognized when the asset is sold.
13. direct materials

Chapter 5

Multiple Choice

1. C
3. A
5. D
7. A
9. C
11. B
13. C
15. C
17. C
19. C

Questions

1.

Answers will vary but should include the following:

Area	Process	Job Order
Types of jobs	Identical	Custom order
Quantity within each job	Large volume	Small volume
Cost accumulation	In each department	In each job

3. The weighted-average method assigns the beginning inventory and the costs added during the period. The weighted-average method does not differentiate between the beginning inventory and the units started in production. This is different from the FIFO method that accounts for the beginning inventory differently and separately from current period costs.
5. Prime costs and conversion costs both include labor. Prime costs are the direct costs, other than equipment, used in manufacturing and therefore are direct material and direct labor. Conversion costs are the costs involved in converting the direct material into the product and therefore are direct labor and manufacturing overhead.
7. Job order costing and process costing are the accounting systems used to record the costs expended to produce a product. Conversion costs are the direct labor and manufacturing overhead involved in the production process and exist regardless of the accounting system used.
9. While conversion typically occurs evenly throughout the process, materials are not typically added evenly, so the ending work in process can be different. For example, when materials are added at the beginning of the process, materials can be 100% complete and conversion can be 50% complete. Different completion percentages result in different equivalent units.
11. Step 1: Determine the units to which costs are assigned. Step 2: Compute the equivalent units of production. Step 3: Determine the cost per equivalent unit. Step 4: Allocate the costs to the units transferred out and the units partially completed.
13. The costs transferred in are treated in the same way as direct material that is added to production at the beginning of the process.
15. A. iv; B. ii; C. vi; D. vii; E. iii; F. v; G. i; H. viii.
17. Prior to the new year, a company computes the estimates of the annual overhead per department divided by the estimated driver for that department. A driver is the measure that increases the cost of overhead and is commonly direct labor hours, direct labor cost, or machine hours. The result is the predetermined overhead rate. Costs are accumulated in an account called *manufacturing overhead*. At the end of each period, the overhead is removed from the overhead account and applied to the department.

Chapter 6

Multiple Choice

1. B
3. B
5. C
7. A
9. C
11. B
13. B
15. C
17. A
19. C

Questions

1. The predetermined overhead rate is the amount of manufacturing overhead that is estimated to be applied to each product or department depending on the cost system used (job order costing or process costing). It typically is estimated at the beginning of each period by dividing the estimated manufacturing overhead by an activity base. While it is most commonly a year, the period can be a year, quarter, or month as determined by management. In traditional allocation systems, that base is typically direct labor hours, direct labor dollars, or machine hours. In activity-based costing systems, the activity base is one or more cost drivers.
3. Non-value-added costs can often be eliminated since they are rarely essential, and identifying them helps managers reduce their costs.

5. Answers may vary but should be similar to the following: A. number of orders; B. number of customers; C. number of meals; D. number of material requisitions received.
7. Activity-based costing has multiple cost drivers and focuses on the overhead-related activities performed during manufacturing. Traditional allocation has a single unit-level base for allocating overhead and focuses on the units of production.
9. Estimated overhead costs are first allocated to activity cost pools. Then, an allocation rate is determined based on the estimated usage of the cost driver for that pool. Then the costs are allocated to each product based on that product's cost driver usage.
11. The traditional method of applying overhead does not allocate overhead as precisely as with the ABC method. Management relies on the costing information when setting selling prices and bidding on service jobs. If the costing method is not accurate, some products may be considered profitable under traditional allocation, when those products are actually operating at a loss.
13. While variable costing is not acceptable for financial reporting purposes, some managers prefer variable costing because they believe fixed costs are period costs and do not change during the period. Variable costing separates variable and fixed manufacturing overhead, and using only variable costs allows them to make decisions based on the more reliable variations in unit costs.
15. Yes, as long as the system computes the amount of fixed manufacturing overhead per unit. The total amount can be expensed under variable costing and assigned to overhead produced during absorption costing. This will allow a portion to be included in ending inventory for absorption costing and not included for variable costing.

Chapter 7

Multiple Choice

1. D
3. A
5. B
7. D
9. C
11. C
13. C
15. A
17. C

Questions

1. A budget is a written financial plan for a set period, which is typically a year. There are several different types of budgets including the master budget, operating budget, financial budget, flexible budget, and operating budget.
3. This approach begins at the lowest levels of management. These managers know the details involved with their departments. This allows for more accurate budget estimates when management understands how their department contributes to the company's goals. Disadvantages include that this type of budgeting takes time, which leads to more labor costs, and when management doesn't fully understand how it contributes to the company goals, the budget may support the department and not the company.
5. Operating budgets plan the primary operations of the business and need accurate information in order to provide accurate planning. Assumptions such as sales in units, sales price, desired ending inventory in units, manufacturing costs per unit, which include direct material needed per unit, desired direct materials ending inventory, amount of direct labor hours and rate, and the overhead required for production and managing the company.
7. The budgeted income statement includes the estimated revenue and expenses for the company. Using historical data on cash collections helps plan when the cash will be received and is used to develop the cash collections schedule. The company applies its payment policies on its purchases and other items requiring cash expenditures. This creates the cash payments schedule. Information from the cash collections schedule, cash payments schedule, and the capital expense budget are combined to develop the cash budget. The information from the cash budget and the ending balance sheet from the preceding year are used to develop the budgeted balance sheet.
9. A. cash budget; B. cash receipts budget; C. production budget; D. cash payments schedule; E. capital assets budget
11. This budget is the plan for the purchase and disposal of plant assets and lists the estimated dollar amounts for each.
13. Before the time period begins, the organization's goals should be defined so the budget can be set to achieve the goals. During the time period, the results should be properly measured and reported so necessary changes can be made during the year. Then, the results of the operations can be evaluated and compared to

the original budget and organization’s goals.

Chapter 8

Multiple Choice

1. A
3. A
5. A
7. C
9. C
11. A
13. C
15. B
17. A
19. B
21. C
23. A
25. B

Questions

1. The expected price of materials per unit and the expected quantity usage are needed to help determine a standard.
3. Fixed overhead and variable overhead should be considered.
5. Paying more or less than the standard price
7. Buying a different quality level of material; good or bad purchasing/negotiation
9. A direct labor rate variance is the actual rate paid being different from the standard rate.
11. Employees have a different level of experience than standards; the labor market is tighter or looser than expected; contract renegotiation.
13. Total direct labor variance = (Actual hours × Actual rate) – (Standard hours × Standard rate) or the total direct labor variance is also found by combining the direct labor rate variance and the direct labor time variance.
15. The difference between the actual and standard amounts of the allocation base cause variable overhead efficiency variance.
17. It is caused by paying or using less than the standard amount.
19. It may not be a good outcome when buying substandard material or hiring substandard employees.
21. Causes may include substandard material, quantity discount, negotiated better price, quantity discount, or price drop.
23. Causes may include higher-quality material, better-qualified employees, or a change in manufacturing process.
25. Causes may include less-qualified employees or a change in quality level of employees due to a change in process.
27. Causes may include better material, higher-quality employees, or a change in process.

Chapter 9

Multiple Choice

1. B
3. A
5. C
7. C
9. A
11. C
13. B
15. D
17. D
19. B

Questions

1. A management control system allows management to establish, implement, and monitor the organization’s achievement of strategic goals. Once the goals are developed, goals must be communicated throughout the organization and activities of the organization should align to achieve the strategic goals. The control system

must also provide feedback and allow for alterations, as necessary, to the organization's strategic goals.
3. Centralized organizations reserve decision-making authority for top management. Decentralized organizations disperse decision-making throughout the organization. Companies of all sizes may exhibit tendencies for both centralized and decentralized decision-making. For example, while Apple might give its stores great latitude to meet customer needs, the company will reserve research and development activities for the highest levels of the organization.
5. Daily decisions are frequent and usually have a short-term impact. Strategic decisions are infrequent and usually have a long-term impact. Daily decisions impact the operational effectiveness and efficiency of the organization while strategic decisions address the long-term aspect of the business. For example, daily decisions for a grocery store might relate to signage, displays, and inventory levels to maintain. Strategic decisions for a grocery store might include whether or not to offer online ordering or leasing in-store space to other businesses such as a coffee shop, nail salon, or bank.
7. These activities represent a significant cost to the organization, require specialization, relate to strategic and quality goals, and allow for benefits related to buying power. Also, there is the possibility that without centralizing some of these costs, they might experience a significant cost overrun. For example, the company might want to finance capital improvements, and they often can do so less expensively, in terms of interest rates, by packaging bonds into one issue. Similar cost savings and improvements in operational efficiencies could probably be identified in the other examples listed.
9. Answers will vary. Sample answer: McDonald's might have a policy that all stores must sell items at a price set by the company. The purpose of this is to prevent stores from competing with each other based on price and causing confusion or frustration with customers.
11. Answers will vary. Responses should include factors relating to establishing a competitive pay rate based on the local economy, hiring experienced workers, investing in training, and other factors necessary to ensure the store's success.
13.

Netflix has three segments: Domestic Streaming, International Streaming, and Domestic DVD. Responses should present the following information:

Domestic Streaming	**2017**	**2016**	**2015**
Paid memberships	54,750	47,905	43,401
Revenues	$6,153,025	$5,077,307	$4,180,339
Contribution profit/(loss)	$2,280,454	$1,838,686	$1,375,500
International Streaming	**2017**	**2016**	**2015**
Paid memberships	62,832	41,185	27,438
Revenues	$5,089,191	$3,211,095	$1,953,435
Contribution profit/(loss)	$226,589	($308,521)	($333,386)
Domestic DVD	**2017**	**2016**	**2015**
Paid memberships	3,380	4,029	4,787
Revenues	$450,497	$542,267	$645,737
Contribution profit/(loss)	$249,972	$279,525	$321,829

Responses may note that Domestic Streaming memberships, revenues, and contribution profit are all increasing. International streaming is experiencing significant increases in memberships and revenues, but the contribution loss continues (the loss decreased from 2016 to 2017). The Domestic DVD segment is experiencing declining memberships, revenues, and contribution profit.

15. Answers will vary. Responses should include an organizational chart for a decentralized structure that

includes three divisions: residential, corporate, and nonprofit. Under each of these divisions would be the mowing, trimming, and landscaping activities. Alternative responses may present three divisions: mowing, trimming, and landscaping activities with the client categories (residential, corporate, and nonprofit) below each. This is less desirable due to inefficiency. The advantage of this approach is the speed of decision-making and responding to clients. Lavell would need to ensure the quality of the services remains at a high standard.
17. Answers will vary. One example is the transportation division in a school system. The goal of the transportation division is to manage costs while maintaining safety in transporting students.
19. Answers will vary. The benefits of an ROI structure include consideration for the segment's investment and evaluation of management's ability to generate profitability. In addition, this framework incentivizes management to undertake value-added investments. A disadvantage is that the segment may prioritize the segment over company financial goals.
21. Answers will vary. Managers can influence controllable costs but have little or no ability to influence uncontrollable costs. While it is common to include uncontrollable (including allocated) costs in the financial information of the responsibility center, managers should be evaluated only on controllable costs.
23. Answers will vary. An advantage of a market-based approach is that the company remains up-to-date on current cost levels. This allows the business to compare its current cost structure to the market and to identify areas where changes are necessary. A disadvantage is this approach is that it requires a significant investment of time and resources on the part of the business.
25. Answers will vary. An advantage of a negotiated approach is that the responsibility center management must be actively involved in the process of establishing the transfer price. This approach may encourage managers to remain attentive to opportunities for cost improvements. A disadvantage would include the possibility of significant disagreements between responsibility center managers.

Chapter 10

Multiple Choice

1. B
3. D
5. B
7. B
9. D
11. A
13. A
15. B

Questions

1. Primarily disagree, but there are a few times where fixed costs can be avoided or partially avoided. Variable costs are avoidable costs since variable costs do not exist if the product is no longer made, or if the portion of the business (such as a segment or division) that generated the variable costs ceases to operate. Fixed costs, on the other hand, may be unavoidable, partially unavoidable, or avoidable only in certain circumstances. When a company discontinues a product or service, certain fixed costs may not be required.
3.

Cost	Relevant or Irrelevant	Sunk, Fixed, Variable, or Opportunity?
Rent	Relevant	Fixed
Baker wages	Relevant	Variable
Felipe's culinary school tuition	Irrelevant	Sunk
Berries for pies	Relevant	Variable
Painting dining area last year	Irrelevant	Sunk
Felipe's decision not to attend graduate school	Irrelevant	Opportunity

5. One issue is the concern for how existing customers will feel if they discover that the company offered a lower price to the special-order customer for the same goods or services. If the goods in the special order are

modified, and thus cheaper for that reason, current customers may prefer the modified, cheaper version of the product. The company would need to determine if selling the new version of the project would hurt profitability or the company's reputation.
7. First and foremost, customer service quality is a consideration, followed closely by the ability of the offshore personnel to speak clearly in English and to understand the customer's needs. Chief operating officers should also make sure that the call centers are adequately staffed and run in an ethical manner, similar to the main company contracting with the outsourced service. Offshoring disadvantages should be weighed against domestic outsourcing in the areas of time zone problems, politically correct labor choices, rising labor costs abroad, as well as culture and language.
9. The bakery manager's salary would be avoidable and therefore differential in the analysis.
11. In general, if the differential revenue from processing further is greater than the differential costs, then it will be profitable to process a joint product after the split-off point. Any costs incurred prior to the split-off point are irrelevant to the decision to process further, as those are sunk costs, and only future costs are relevant costs. Joint product costs are common costs that are incurred simultaneously to produce a variety of end products. Even though they are common costs, they are routinely allocated to the joint products.

Chapter 11

Multiple Choice

1. B
3. D
5. C
7. A
9. B
11. D
13. B
15. A

Questions

1. The process for capital decision-making involves five steps: 1. Determine capital needs. 2. Explore resource limitations. 3. Establish baseline criteria for alternatives. 4. Evaluate alternatives using screening and preference decisions. 5. Make the decision.
3. The company then needs to establish alternatives, which are options available for investment, and evaluate the options using common measurement methods, including the payback method, accounting rate of return, net present value, and internal rate of return.
5. From the standpoint of the decision to replace the asset, the book value of an existing asset is irrelevant. Book value is just the historical cost (or value) of the asset less the total depreciation calculated to date. A gain or loss situation often happens when the asset is sold for more or less than its book value, respectively. It is only at that point that the company truly realizes whether they have extra value or not enough value in the assets. This difference can provide either a gain or a loss to the company that will impact the taxes at year-end. Therefore, gains or losses affecting tax payments, plus cash flows, are important, since cash-flow effects are relevant in capital investment decisions.
7. It is used to determine the length of time needed for a long-term project to recapture or pay back the initial investment in the project.
9. Advantage: The ARR compares income to the initial investment rather than to cash flows; thus, incremental revenues, cost savings, and incremental expenses associated with the investment are reviewed and provide a more complete picture than payback, which uses cash flows. Disadvantage: ARR is limited in that it does not consider the value of a dollar over time.
11. Accounting Rate of Return = (Incremental revenues – Incremental expenses) ÷ Initial Investment
13. They need to know what the future value is of their investment compared to today's present value, and what potential earnings they could see because of delayed payment.
15. The Present Value of $1 table.
17. For NPV computations, a minimum required rate of return or discount rate is used as a screening tool to determine whether or not a capital investment decision meets a predetermined set of criteria. If the net present value of an investment is positive, then the capital investment generates an actual return greater than the discount rate and the project will be deemed acceptable. The discount rate, however, is not the actual rate of return earned by the project.
The internal rate of return determines the actual rate of return that a project earns.
19. The internal rate of return (IRR) shows the profitability or growth potential of an investment. All external factors are removed from calculation, such as inflation concerns, and the project with the highest return rate percentage is considered for investment. A company may have several viable alternatives that need a differentiating factor. IRR gives a solid differentiation, presented as a percentage rather than a dollar figure, as

seen in NPV. This removes bias from projects with dissimilar NPVs and is a way to compare more than one option.
21. Answers will vary but should include something like the following: the NPV weighs the early receipt of cash more heavily because when the receipts come in earlier, the discount is closer to 100%; however, the interest rate also impact the NPV.
23. Strengths: It considers the time value of money, removes the dollar bias, and allows for a company to make a decision, unlike non-time value methods. Weaknesses: It has a bias toward return rates instead of higher risk investment consideration, uses a more difficult calculation, and does not consider the time it will take to recoup an investment.

Chapter 12

Multiple Choice

1. C
3. A
5. A
7. B
9. C
11. B
13. C
15. C
17. B
19. C

Questions

1. Answers will vary. Responses may focus on the short-term view versus long-term views and include examples such as: managers focusing on only profitability might avoid spending the money for long-term assets to fuel the future; managers may miss other opportunities like funding the expense for creation of a customer database, if profitability is the focus in the short term; managers may avoid research and development costs that would be used to create the next generation of their product to achieve profitability in the short term.
3. Controllable. Responses will vary based on students' prior experiences.
5. Revenue center—the manager has control over the revenues that are generated for the corporation but not over the costs of the organization. Cost center—the manager has control over costs but not over revenues. Profit center—the manager has control over both revenues and costs. Investment center— the manager has control over revenues, costs, and capital assets.
7. Short-term goals include goals such as reducing costs of production by a certain percentage for the current year or increasing year-over-year sales by a certain percentage. Long-term goals may include goals such as expanding into new territories or adding new products over the next five years. A good performance measurement system will include both short- and long-term measures in order to motivate managers to make decisions that will fulfill both the corporations and their own short- and long-term goals.
9. Answers will vary and should lead to discussions. Goal congruence means aligning the goals of the business with the personal goals of the manager. For example, when a company has a goal to significantly improve sales of a certain product, the regional sales manager will have an increased sales goal as a result.
11. EVA is residual income adjusted for accounting distortions. Like residual income, it encourages managers to make appropriate levels of investment. In addition, it treats items such as research and development costs as having a long-term benefit to the company.
13. Answers may vary but should include some of these ideas. The idea for using both quantitative and qualitative measures in the form of a balanced scorecard was first suggested by Art Schneiderman of Analog Devices in 1987 and was later added to by Kaplan and Norton. The resulting design incorporated various performance measures grouped under four categories: financial perspective, internal operations perspective, customer perspective, and learning and growth. These areas were chosen because the success of a company is dependent on how it performs financially, which is directly related to the company's internal operations, how the customer perceives and interacts with the company, and the direction in which the company is headed.

Chapter 13

Multiple Choice

1. B
3. D

5. D
7. B
9. A
11. A
13. D
15. C

Questions

1. Sustainability is meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. Corporations can incorporate sustainability practices into their businesses a variety of ways; through the reduction of greenhouse gas emissions, efficient use of water and scarce resources, by ensuring that employees have access to a safe working environment, adequate health care and that they are not exploited with an imbalance of power between the employer and employee. Responses may include a variety of suggestions.
3. An oil company might include measures as to how they would sequester excess carbon emissions in their production phase, they may also include information about both environmental and employee safety measures implemented. The company may also provide information on how they have improved the communities in which they operate. A car manufacturer might include a good deal of information on employee well-being as well as community outreach and philanthropy. The company may also provide information on moves toward more environmentally sustainable new automobiles. A large retailer might provide information on GHG reductions through improved energy in their value chain as well as employee well-being programs. The company might also demonstrate its community outreach, and that products are sourced from ethically sustainable suppliers. For example, Walmart has announced that they will no longer sell cage eggs, selling only barn laid and free-range eggs.
5. With the exception of lenders and major shareholders, the majority of these stakeholders are not able to command tailor made sustainability information and so are reliant upon disclosures by the organization. At present there is little legal requirement of non-financial disclosures related to sustainability unless there are material factors which may affect the investment decision-making of a user. (See SASB discussion on materiality)
7. This is a difficult question. Without a mandatory framework for sustainability disclosures, companies can produce “boilerplate reports” that look attractive and say a lot without saying too much of real substance. However, there is increasing evidence that investors are looking for more than just financial reports and they want to know an organization’s environmental philosophy and strategy.
9. The SASB is a private sector Sustainability Accounting Standards body that aims to enhance capital market efficiency by encouraging high-quality disclosure of material sustainability information that meets user needs.

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