Chapter 8
The Capital Budget: Evaluating Capital Expenditures

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Let's say you're considering two very different purchases: a compact disc and a new car. Certainly, each of these purchases will require different amounts of time and effort. For instance, you probably won't review your long-term goals and annual budget before you buy the CD, nor will you likely create a list of costs and benefits to determine which CD to buy. However, when thinking about buying a new car, you'll probably first spend considerable time deciding whether you really need one, and whether you can afford it. Then, if you decide to go forward, you'll likely spend a significant amount of time determining what kind of car to buy.

The purchase of an expensive item such as a car warrants careful planning. For one thing, once you have bought something expensive it's usually costly to change your mind. In our example, you would have to sell or trade the new car, probably at a substantial loss. What is true in your personal financial decisions is also true in business. Unlike personal expenditures made for comfort or convenience, companies make business expenditures (large and small) to further the goals of the business. In fact, companies make most business expenditures to increase profits. For this reason, business expenditures are really investments, from which the company hopes to earn both a return *of* the investment and a return *on* the investment.

Business expenditures for acquiring expensive assets that will be used for more than one year are called capital investments. Because of the cost and extended useful life of these assets, companies devote tremendous time and energy to evaluating potential capital investments. If companies made these investments in projects that did not perform as the company hoped they would, it could lead to disaster. Certainly, this magnitude of investment required serious analysis on the part of this company before it committed to the various projects those dollars represent.

Generally, capital investments – also known as capital projects – are investments in property, plant, and equipment. Examples include investments in computer equipment, production equipment, another factory, a new wing of a hospital, or a new campus dormitory. Capital budgeting is the planning and decision process for making investments in capital projects. Although we focus on business firms in our discussion, all types of organizations can use capital budgeting techniques – not-for-profit, for profit, and social organizations.

In this chapter, we explain how firms make capital budgeting decisions. Capital budgeting, however, is only part of a much more involved planning process, which we also discuss in this chapter.

Two of the evaluation techniques used to assess potential capital projects rely heavily on a knowledge of the time value of money. For this reason, we have included two appendices to the chapter that deal with the time value of money. The first details calculations for the time

value of money using financial tables and the second details similar calculations using a financial calculator.

LEARNING OBJECTIVES

After completing your work on this chapter, you should be able to do the following:

1. Describe the overall business planning process and where the capital budget fits in that process.
2. Explain in your own words the process of capital budgeting.
3. Discuss the four shared characteristics of all capital projects.
4. Describe the cost of capital and the concept of scarce resources.
5. Determine the information relevant to the capital budgeting decision.
6. Evaluate potential capital investments using four capital budgeting decision models: net present value, internal rate of return, payback period, and accounting rate of return.
7. Determine present and future values using present value tables and future value tables (Appendix A).
8. Determine present and future values using a financial calculator (Appendix B)

THE BUSINESS PLANNING PROCESS

Managers use accounting information for two main types of business decisions, planning and control. In this section, we give an overview of how organizations plan for the future. We discuss the why, the what, the how, and the who of business planning. Though management accounting information is used in all steps in the planning process, it is especially important to the what, the how, and the who decisions.

The Mission – Overall Company Goals: The Why

People form an organization to accomplish a purpose or several purposes – the organization's goals. These goals define *why* the organization exists; goals are the why of the business.

Organizational goals constitute the core beliefs and values of the company, so those goals should not be subject to short-term economic pressures. Examples of some organizational goals might be to earn money, to save lives, or to improve communication among employees. Most companies' goals are stated in general terms that are not easily quantified, which means that although progress toward fulfillment can be measured, it is not really possible to determine when the goals have been attained. For instance, a firm with the goal of earning money usually does not specify exactly how much money it must earn to meet its goal.

The goals of a business organization are usually a combination of nonfinancial and financial aspirations. Whether nonfinancial or financial, however, almost all goals have either a direct or indirect effect on the company's financial well-being. Does this sound strange? The next section explains why almost all goals can affect the financial health of a business.

Nonfinancial Goals

Typically, nonfinancial goals do not mention money. Rather, they refer to activities that may or may not result in profits. A hospital's nonfinancial goals, for instance, might be to provide the best health care possible to its patients; to recruit and employ highly qualified workers; to provide a safe, pleasant environment for its employees and patients; and to create an atmosphere of caring for both the physical and the emotional concerns of its patients.

Discussion Questions

8-1. Consider the hospital's nonfinancial goals. What financial effect will occur if the hospital *does* work toward those goals?

8-2. What financial effect will result if the hospital *does not* work toward those goals?

8-3. Review the hospital's nonfinancial goals. How would you determine when those goals have been reached?

Note that the nonfinancial goals for the hospital are stated in very general language. More than specific results, these goals represent standards of conduct and performance toward which the hospital should always be striving. They are stated in such a way that it is very difficult, if not impossible, to determine when the goals have been attained.

Financial Goals

For most business organizations, the primary financial goal is to earn a profit. What this really means, of course, is that the goal is to earn a return on investment for the business owner or owners. This goal may be worded as "achieving superior financial performance," "earning a reasonable return for the stockholders," "maximizing shareholder value," or similar language. As was the case with the nonfinancial goals, it is difficult to determine when these financial goals have been attained.

Goal Awareness

Once goals have been set, the company should communicate them to every person in the organization. This communication maximizes the likelihood that a business will achieve its goals. Many companies use a mission statement – a summary of the main goals of the organization – to communicate the firm's goals to all employees. Exhibit 8-1 is a sample mission statement from Johnson & Johnson. This mission statement is representative of those of many large companies.

Exhibit 8-1. **Johnson & Johnson** Mission Statement. Copyright @ Johnson & Johnson, Inc.

Our Credo

We believe our first responsibility is to the doctors, nurses and patients, to mothers and fathers and all others who use our products and services. In meeting their needs everything we do must be of high quality. We must constantly strive to reduce our costs in order to maintain reasonable prices. Customers' orders must be serviced promptly and accurately. Our suppliers and distributors must have an opportunity to make a fair profit.

We are responsible to our employees, the men and women who work with us throughout the world. Everyone must be considered as an individual. We must respect their dignity and recognize their merit. They must have a sense of security in their jobs. Compensation must be fair and adequate, and working conditions clean, orderly and safe. We must be mindful of ways to help our employees fulfill their family responsibilities. Employees must feel free to make suggestions and complaints. There must be equal opportunity for employment, development and advancement for those qualified. We must provide competent management, and their actions must be just and ethical.

We are responsible to the communities in which we live and work and to the world community as well. We must be good citizens-support good works and charities and bear our fair share of taxes. We must encourage civic improvements and better health and education. We must maintain in good order the property we are privileged to use, protecting the environment and natural resources.

Our final responsibility is to our stockholders. Business must make a sound profit. We must experiment with new ideas. Research must be carried on, innovative programs developed and mistakes paid for. New equipment must be purchased, new facilities provided and new products launched. Reserves must be created to provide for adverse times. When we operate according to these principles, the stockholders should realize a fair return.

Johnson & Johnson

The goals in the Johnson & Johnson mission statement address the concerns of all parties who have a stake in how the company conducts its business. For instance, Johnson & Johnson's stakeholders include health care providers, consumers, suppliers, employees, the community, and stockholders. Johnson & Johnson's mission statement communicates the firm's goals and presents the image of a responsible, ethical business.

Stating lofty goals in a mission statement is not a guarantee of reaching those goals. Businesses must act in a manner consistent with their goals to ensure progress. Consider the following two examples. In 1982 Johnson & Johnson demonstrated the company's commitment to its goals after two fatalities occurred in the Chicago area when someone injected cyanide into six bottles of Tylenol. Once aware of these events, Johnson & Johnson immediately responded by recalling all Tylenol throughout the United States. The company also instituted a nationwide advertising campaign advising consumers not to use Tylenol and provided full disclosure about the situation. In short, the company responded in a manner consistent with its goals.

Compare Johnson & Johnson's actions to Ford Motor Company's 1996 response to faulty ignition systems in some of its cars. These faulty ignition systems caught fire without warning and created a dangerous and potentially fatal situation. Ford's response was to wait for the federal government to tell the company which cars it had to recall. Legal? Certainly. A smart way to conduct business? Well, while it cost Ford less than a total recall of the affected vehicles, the company’s reputation suffered, and many people agree that Ford did not conduct its business in a way consistent with its stated goal of total quality.

Core Values: What the Company Stands For

Each of us has personal core values that define who we are, how we act, and what we stand for. Core values define our perception of what is most important in life and also define a sense of right and wrong, of just or unjust. Companies must have a similar set of core values in order to succeed. Company values include a sense of caring and a commitment to the health and well being of people and the environment. Exhibit 8-2 presents the core values of Best Buy Corporation.

Exhibit 8-2 **Best Buy Corporation** – “Our Values” [i]

Our Values

- Unleash the power of our people
- Have fun while being the best
- Show respect, humility, and integrity
- Learn from challenge and change

"Best Buy is committed to fueling our growth as a responsible, values-driven global corporation. We aspire to have our employees make daily business decisions that take into account economic value to our shareholders, the ethical responsibility of the enterprise and their impact on people, communities and the environment."

Vision : The Hope for the Future

Company leadership must develop a vision of the company's future. Vision is where is the company going and how will it get there. What products and services will the company sell and how will it sell them? Where will the company conduct its business and how will the company learn, innovate, and grow as the future unfolds? These are all questions that are answered by vision. For Best Buy, a major component of the company's vision results from learning from its customers and working to improve their lives. As stated by Robert A. Willett, CEO of Best Buy International:

> *"We believe it's essential that we have the broadest, most diverse perspective possible on customer needs. What we learn in China can improve our business in Canada and the United States — and vice versa. By connecting human beings around the globe with one common vision — to improve the lives of our customers — we believe we can learn faster. More access to new ideas in different markets, we think, fuels faster growth."* [ii]

The words of Robert Willett emphasize the fact that company vision is not all about income and financial results. Of course, without financial prosperity, companies are unable to fulfill other aspects of their corporate vision so future financial success, growth and prosperity are also an important aspect of vision.

Strategy: The Business Plan of Attack

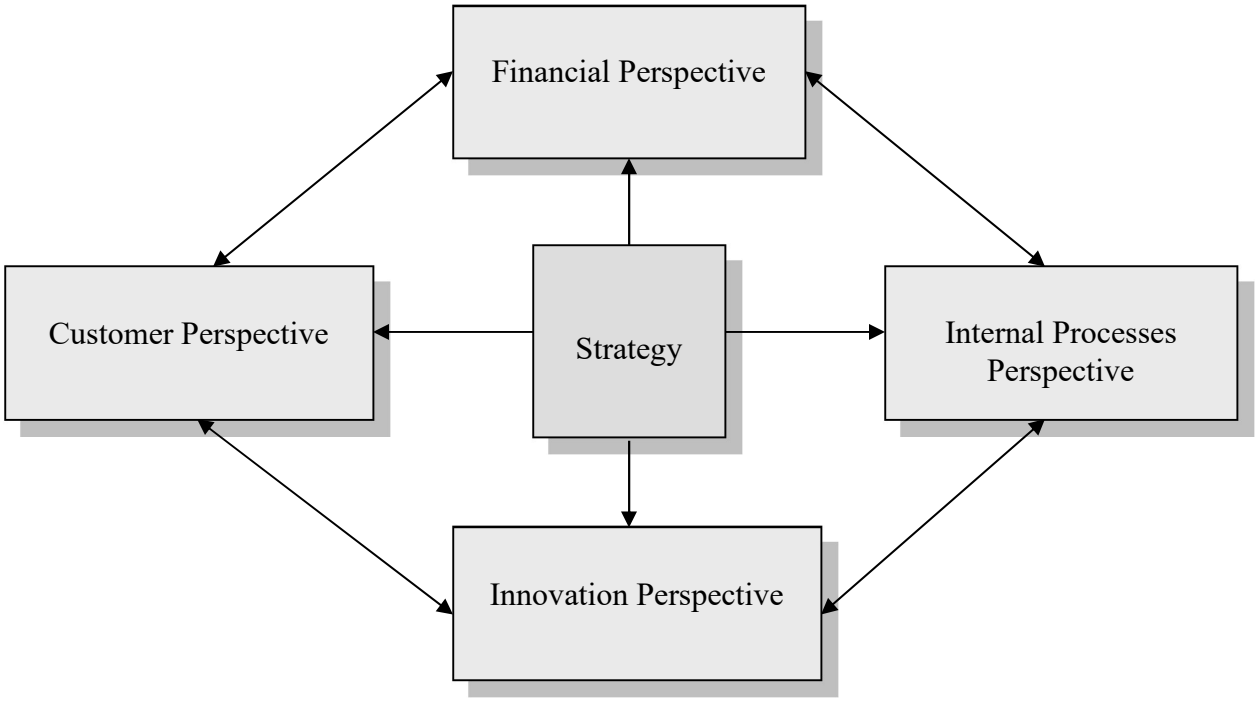
Once a company has established its mission, its core values, and its vision for the future, it must establish a workable strategy to achieve them. It is not enough for a business to have a mission and vision that includes building wealth through corporate earnings, it must also have a plan of attack or a strategy to create those earnings. For some companies, a strategy includes low prices and high volume. For others the strategy is high quality, superior service, and high prices. Some companies have profit strategy based on fast inventory turnover, while others have an earnings strategy based on higher margins and slower turnover

Putting together a successful business strategy involves analyzing the situation that exists and the situation that is anticipated which includes among other things, evaluating the company, competitors, and social, economic, and market conditions. A three step approach to establishing

a strategy is to determine where you are today, where you would like to be in the future, and finally, how you are going to get there. How you are going to get there is the business strategy. In forming a successful strategy, it is important to avoid focusing on the narrow view of business. For example, it is not wise to prepare a business strategy that focuses primarily on the financial aspirations of the company.

In the past, business in the United States has focused almost exclusively on financial amounts to measure success. Success has been gauged by how much revenue can be generated, how much costs can be reduced, or how much profit can be earned. Recently, however, many companies have begun to also consider nonfinancial performance measures in evaluating business performance. Managers are finding that a more strategic, balanced approach is necessary to drive corporate performance. Harvard professor Robert Kaplan and consultant David Norton have developed a management technique called the balanced scorecard. The balanced scorecard is an integrated set of performance measures organized around four distinct perspectives – financial, customer, internal, and innovation and learning as shown in Exhibit 8-3.

Exhibit 8-3. The Four Perspectives of the Balanced Scorecard



The balanced scorecard can help managers successfully create and implement a balanced business strategy. Successful strategy execution doesn't just happen. In fact, in recent years

many businesses have failed, not because they lacked a good strategy, but rather because they failed to adequately implement their strategy. The balanced scorecard can help with strategy execution through the use of objectives, measures, and targets. When a company adopts the balanced scorecard, managers must create objectives, measures, and performance targets for each scorecard perspective. The balanced scorecard is discussed in greater depth in Chapter 11.

Once a business has established its mission, vision, and strategy, the firm must then create a strategic plan – a long-range plan that sets forth the actions the firm will take to attain its goals. In the following section, we explore briefly how firms develop strategic plans.

The Strategic Plan: The What

The steps outlined in the strategic plan, sometimes referred to as a long-range budget, are the *what* of doing business. The actions specified in the strategic plan describe what actions a business must take to implement its goals. To be effective, then, strategic plans should support – not conflict – with the company's goals.

Companies make long-range plans so they are well positioned to reach their goals as the future unfolds. For example, it can take Dow Chemical Company five years or longer to build a production facility, so Dow managers must anticipate product demand accurately in advance, in order to build a plant of the appropriate size in time to produce enough to meet consumer demand.

A company's strategic plan tends to have objectives that are quantifiable, and a time frame for attainment of the objectives. A company might specify, for instance, that it plans to replace its four least efficient production facilities over the next five years, reduce customer complaints by 20 percent over the next three years, or increase market share for its newest product by 25 percent within 10 years. As you can readily see, a firm can determine exactly when it has met all these objectives.

After an organization develops a strategic plan that specifies the actions it will take to reach its goals, the company then decides how to allocate its monetary resources to implement its strategies, and who will be responsible for the day-to-day activities of the business. This step in the planning process is the preparation of budgets.

The Capital Budget: The How

The capital budget is the *how* of the planning process. The **capital budget** is the budget that outlines how a firm intends to allocate its scarce resources over a five-year, 10-year, or even longer time period.

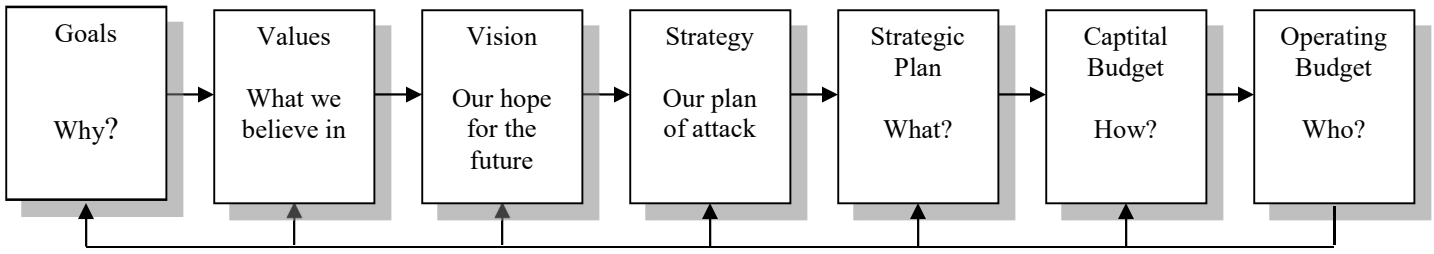
The capital budget lays out plans for acquiring and replacing long-lived expensive assets such as land, buildings, machinery, and equipment. During the capital budgeting process, companies decide whether and what items they should purchase, how much they should spend, and how much profit the items can generate. Capital budgeting decisions, then, should further the strategic plan and goals of the business.

The Operating Budget: The Who

Companies not only must budget for long-term activities, they also must plan and budget for day-to-day business activities. The budget that pertains to routine company operations for one to five years in the future is called the operating budget. The operating budget establishes who is responsible for the day-to-day operation of the organization, so we refer to it as the who of the planning process. The operating budget will be our focus in Chapter 9.

An important thing to understand about the planning process is the interrelationship among goals, strategic plan, capital budget, and operating budget. Exhibit 8-4 demonstrates that interrelationship.

Exhibit 8-4. Interrelationship among the Planning Elements



The overall function of management accounting in this process is to provide a substantial portion of the information that company management needs not only to achieve the what, the how, and the who, but also to ensure that these functions are achieved within the context of the why.

THE CAPITAL BUDGET: WHAT IS IT?

The capital budget plans for the acquisition and replacement of long-lived expensive items such as land, buildings, machinery, and equipment. These long-lived items are called capital assets. The capital budget focuses on the long-term operations of the company to determine how an organization intends to allocate its scarce resources over the next five, 10, or even 20 years. Thus, we refer to this part of the planning process as the how of being in business and doing business.

During the capital budgeting process, companies decide whether they should purchase items, how much they should spend, and how much profit the items promise to generate. No decisions made in the capital budgeting process, however, should conflict with the company's strategic plan or organizational goals.

Capitalizing Assets

Capital budgeting deals with decisions regarding investments that will benefit the company for many years, so most companies do not use capital budgeting techniques for small purchases or for those that provide benefits for only the current year.

When a company makes an expenditure, the cost of the item purchased will be reflected either as an expense on the company's income statement for the year of purchase, or as an increase in the company's assets on its balance sheet. Theoretically, the distinction lies in whether the item purchased will provide economic value to the company beyond the year of purchase. If a purchased item is expected to provide economic benefits beyond the year in which it is purchased, it should be capitalized, which means that its cost is recorded as an increase in long-term assets and will be depreciated (converted from asset to expense) over the item's estimated useful life. Conversely, if a purchased item is not expected to provide economic benefit to the company beyond the year of purchase, its cost should be reflected as an expense on the income statement for that year.

To illustrate, the cost of a delivery truck should be reflected as an increase in assets because the truck will likely be used for several years. In contrast, the cost of last month's lawn service does not provide any future value and therefore should be reflected as an expense immediately.

Judgment plays an important role in determining whether a purchased item should be capitalized or expensed. For example, how should a company record the cost of a $3 wastebasket with an estimated useful life of three years? Because the wastebasket will be used for several years, the item should theoretically be capitalized – its cost should be added to long-term assets and depreciated over the wastebasket's estimated useful life.

From a practical standpoint, it is senseless to expend the additional accounting effort to capitalize and then depreciate the wastebasket. Why? Because, whether the wastebasket is capitalized and depreciated over its estimated useful life or expensed immediately, the effect on a company's financial statements would be so minimal that no economic decision maker will be influenced by the alternative selected. Thus, the cost of the wastebasket is immaterial, so due to the modifying convention of materiality discussed in financial accounting, the wastebasket is expensed when purchased.

Capitalization Amount

Generally, companies set a cost threshold that helps determine the appropriate accounting treatment for capitalizing long-lived items. For example, a company might say that any long-lived item costing less than $3,000 will be expensed when purchased, while those costing $3,000 or more will be capitalized. There are no hard and fast rules for setting the capitalization threshold, but most businesses choose an amount between $500 and $5,000 as their capitalization amount.

Characteristics of Capital Projects

Capital budgeting deals with planning for purchases of items that will be capitalized, meaning they will be classified as assets when purchased and then depreciated over their estimated useful lives. While the capitalization amount and the evaluation process for capital projects vary from company to company, all capital projects share certain characteristics. The four main shared characteristics include:

1. *Long life*. Capital projects are expected to benefit the company for at least two years, which is the whole idea behind capitalizing the cost of a purchased item. As discussed in the previous section, if a purchased item will benefit the company only in the year of purchase, the cost of the item is expensed immediately. If the item purchased is likely to benefit a company in years beyond the year of purchase, the cost of that item is capitalized. Usually, the kinds of purchases we are discussing in this chapter benefit the company longer than two years – perhaps five, 10, or an even greater number of years.

2. *High cost*. Technically, the purchase of any long-lived item for which the cost exceeds a company's capitalization amount is considered a capital project. As stated earlier, this may be as low as $500 for some firms. As a practical matter, however, the capital budgeting techniques we consider in this chapter are used to evaluate high-cost projects. A good example is the cost of a new factory built by **Motorola** or **Intel**. Such a factory may cost $500 million or more. Another example is the decision by **Wal-Mart** or **Kmart** to open a new store in a particular location. Many millions of dollars are involved in opening a store for these companies.

3. *Quickly sunk costs*. Costs that cannot be recovered are called sunk costs. A capital project usually requires a firm to incur substantial cost in the early stages of the project. As new information about market size, technology, and so on becomes available, the company's management may decide the project should be abandoned. Unfortunately, the company may not be able to recoup much of the cost already incurred. For example, consider the case of a manufacturer that begins construction on a new factory with an estimated cost of $500 million. After spending $200 million on construction, the company decides the

new factory is not needed because the product it planned to manufacture in the facility has become obsolete. The company cannot sell the partially completed factory and has no other use for it. The $200 million is a sunk cost because it cannot be recovered.

4. *High degree of risk*. Capital projects have a high degree of business risk because they involve the future, which always entails uncertainty. Because of the long lives, high costs, and sunk costs of capital projects, companies must try to estimate the returns from those projects in future years. These characteristics increase the likelihood of erroneous estimates. The uncertainty of the future coupled with the high initial investment make capital projects quite risky.

Discussion Question

Consider these questions: "Will I be paid?" "How much will I be paid?" and "When will I be paid?"

8-4. Why do you think these questions were extremely difficult for **Microsoft** to answer as the company considered the development of *Windows Vista* as a potential capital project?

THE COST OF CAPITAL AND THE CONCEPT OF SCARCE RESOURCES

When you put money into a savings account, you expect to earn interest. This interest is the return on your investment. Like most people, you would like the return to be as high as possible. If you were going to deposit $5,000 in a savings account, you would probably shop for a secure bank, with a return as high as or higher than that of competing banks.

Businesses shop for capital projects the same way you would shop for a bank in which to deposit your $5,000. If it appears that a capital project will be profitable, how does a company determine whether it will be profitable enough to warrant investing its money? A proposed project should promise a return that is equal to or exceeds the firm's cost of capital.

In evaluating potential capital projects, a company must determine a benchmark rate of return to help select which capital project or projects it will undertake. The benchmark return rate for selecting projects is usually the company's cost of capital, which is the cost of obtaining financing from all available financing sources. Cost of capital is also referred to as the cost of capital rate, the required rate of return, or the hurdle rate. For the sake of consistency, we use cost of capital throughout all our discussions in this chapter.

As you may recall from financial accounting, companies can obtain financing from two sources, borrowing from creditors (debt financing) and investments by owners (equity financing). When a company invests in a capital project, the money must come from one or both of these sources. Both creditors and owners require a return on the funding they provide to the company, and the company must seek investments that provide a return at least equal to the cost

of obtaining funding from debt and equity sources. If a company borrows funds at an interest rate of 9 percent, then the expected return on a capital project must be at least 9 percent. Similarly, if a company's owners provide the financing and expect a return of 20 percent on their investment, then the expected return from a capital project should be at least 20 percent to be acceptable.

Weighted Average Cost of Capital

The funding for a company's capital projects usually comes from a combination of debt and equity financing. The combined cost of debt and equity financing is called the weighted average cost of capital. The rate for the weighted average cost of capital represents the combined rate of the cost of both debt and equity financing. The weighted average cost of capital is sometimes referred to as the blended cost of capital.

The cost of debt capital is the interest a company pays on all forms of borrowing. The interest rate, say 8 percent, is agreed upon when a company borrows from either the bank or the bond market. The amount of interest a company pays is easy to determine because it is reported on the company's income statement as interest expense.

The cost of a company's equity financing is more challenging to determine than the cost of its debt financing, because the cost of equity capital is what equity investors relinquish when they invest in one company rather than another. To illustrate, assume Elizabeth Todd has $5,000 to invest and she is considering the purchase of either Boardman Company stock or Hoffman Company stock. What does Elizabeth give up if she invests her $5,000 in Boardman? She relinquishes what she would have earned had she invested in Hoffman. That is, she lost the opportunity to earn whatever she would have earned had she purchased Hoffman's stock rather than Boardman's.

The amount an equity investor earns is a combination of dividends received and the appreciation in the market value of the stock the investor owns. In Elizabeth's case, the amount earned if she buys the Boardman Company stock is a combination of the dividends she receives from Boardman, plus any increase in the market value of the Boardman stock she owns.

Discussion Question

Assume Elizabeth buys the Boardman stock and consistently earns an 8% return on her investment (dividends plus appreciation of the Boardman stock).

8-5. If Elizabeth could earn a 17% return on an investment in Hoffman Company stock (or some other company), what would you advise her to do? Explain your reasoning.

It's all well and good for us to discuss this topic from the investor's point of view (in this case Elizabeth Todd), but what has this to do with the cost of equity capital for Boardman Company? Well, if Boardman wants to keep Elizabeth as a stockholder, it must return to her an

amount at least as great as she could earn by investing her money somewhere else. If Elizabeth can earn 17 percent from an investment in Hoffman, Boardman must give her that kind of return or she may sell her Boardman stock and invest in Hoffman (or some other company). Boardman, then, would use 17 percent as the cost of the equity capital it received from Elizabeth, because that is what she could earn elsewhere. In other words, that is what she gave up by investing in Boardman.

In a real-world situation, Boardman Company would not know about the alternatives being considered by Elizabeth Todd and her $5,000. Therefore, the company cannot determine the specific percentage return Elizabeth must earn to keep her happy. What Boardman must do is try to determine what percentage return equity investors can generally expect on their investments and use that percentage as the cost of equity capital.

Unlike debt financing costs (interest expense), the cost of equity financing is not reported in financial statements in its entirety. Firms do report profit distributions to stockholders in the form of dividends, but the larger part of the cost of equity capital is the appreciation in the market value of stockholders' ownership interest. This market value is not reported on financial statements.

Most equity investors want to own stock in high return companies because they naturally want their investment to earn the highest possible return. Many high return companies in the stock market yield as high as 17 percent to 20 percent annually to their stockholders in the form of dividends and appreciation in stock value.

Discussion Questions

Assume you own stock in a publicly traded company and you consistently earn an 8% return on your investment (dividends plus appreciation of the company's stock).

8-6. If you are certain you could earn a 20% return on an investment in some other company's stock, what would you do? Explain your reasoning.

8-7. Because a publicly traded company receives money only when its stock is originally issued, why do you think it would care about the stock's market value in the stock market?

It is important to note here that the issue is not whether investors can, in fact, earn a 17 to 20 percent return by selling their stock in one company and investing in another. They only need to think they can earn the higher return.

If enough of a company's stockholders begin selling their stock, the market price of the stock will drop – the economic law of supply and demand at work. As the stock price drops,

more stockholders may decide to sell their stock before the price drops even lower. This, of course, makes the stock price drop further.

Discussion Question

8-8. What would you think about a company whose stock was selling for $50 a share in January and $12 a share in December?

Stock analysts, customers, suppliers, and many other parties have a tendency to gauge a company's health by the market value of its stock. For this reason, companies have a vested interest in making sure the market value of their stock does not begin a downward spiral.

Because the investors in the stock market think they can earn a 17 to 20 percent return by investing in the top performing companies, a company must return 17 to 20 percent annual return to its stockholders to be considered one of the high performing companies. Publicly traded companies usually consider their cost of equity financing to be as high as 20 percent. This percentage is commonly used to compute the company's weighted average cost of capital.

To illustrate the calculation of the weighted average cost of capital, we consider the case of Adler Enterprises, which has $2,000,000 in assets. A total of $1,200,000 or 60 percent ($1,200,000/$2,000,000) of these assets are financed by debt (borrowing) with an interest rate of 7.5 percent. The remaining $800,000 or 40 percent ($800,000/$2,000,000) are financed by equity (the sale of Adler Enterprises stock) and the company uses a 20 percent cost of equity financing. We find the weighted average cost of capital for Adler Enterprises using the following calculation.

Method of Financing	**Proportion of Financing Provided**		**Cost of Financing**		**Weighted Cost of Financing**
Debt	60%	X	7.5%	=	4.5%
Equity	40%	X	20.0%	=	8.0%
	Weighted average Cost of Capital				12.5%

We see that Adler's weighted cost of debt financing is the proportion of debt financing (60 percent) multiplied by the cost of that financing (7.5 percent). The company's weighted cost of equity financing is the proportion of equity financing (40 percent) times the cost of the equity financing (20 percent). Its weighted average cost of capital is the sum of the weighted cost of each type of financing – 12.5 percent.

Firms use their weighted average cost of capital as a benchmark rate of return to evaluate capital projects. For example, suppose Adler Enterprises is considering a capital project that

requires an investment of $200,000. If Adler decides to undertake this project, it must obtain $200,000 to fund it. Recall that Adler's weighted average cost of capital is 12.5 percent. Unless the expected rate of return on the project is 12.5 percent or higher, Adler's management will probably reject the project. Otherwise, it would cost more to fund the project than the project could earn.

Discussion Questions

8-9. When you consider that companies are generally in business to earn a profit, why might it be acceptable to select a capital project that promises a return that is just equal to the weighted average cost of capital?

8-10. Under what circumstances do you think a company might accept one capital project over another even though the project selected promises a lower return?

8-11. Do you think there would ever be a situation when a company should proceed with a capital project even though the project promises a return lower than the cost of capital? Explain your reasoning.

8-12. What do you think might cause a company to reject a proposed capital project even though it promises a return significantly higher than the cost of capital?

Scarce Resources

In our personal lives, what we buy is usually not limited by how much we want, but rather by how much money we have available to spend. Well, what is true for individuals is also true for businesses. The number and size of capital projects a company undertakes is not limited by a lack of viable alternative projects. What limits companies is that they simply do not have access to enough money to take advantage of all the opportunities available to them. This limitation on the amount available to spend is commonly called scarce resources. Even huge multinational companies must select only investments they consider most favorable from a virtually unlimited pool of possible investment opportunities, because firms do not have access to enough money to invest in every good project that comes along. Managers must carefully evaluate the alternative capital projects available to their companies so they can select the projects that promise the highest return (as long as the projects are consistent with the company's goals and strategies).

EVALUATING POTENTIAL CAPITAL PROJECTS

Because capital projects are usually long lived, costly, and high risk, managers must carefully evaluate capital expenditure decisions, especially in light of their financial limitations. The evaluation process generally includes the following four steps:

1. Identifying possible capital projects
2. Determining the relevant cash flows for alternative projects

3. Selecting a method of evaluating the alternatives
4. Evaluating the alternatives and selecting the capital project or projects to be funded

Let us investigate each of these steps from the manager's point of view.

Identifying Possible Capital Projects

Businesses usually make capital expenditures to maximize profits by increasing revenue, reducing costs, or a combination of the two. A project that satisfies the company's desire to maximize profits will be identified as a potential capital expenditure.

Firms often generate revenue increases by investing in projects that increase capacity or draw more customers. For a hotel chain, an increase in available rooms might increase revenue. For a restaurant, revenue might be enhanced by investing in cooking equipment that prepares food more rapidly. For a hospital, the ability to provide additional services or increasing the number of beds might be the key to added revenue.

To reduce operating costs a manufacturer might upgrade production equipment so less direct labor or less electricity is required. An airline catering company could invest in more energy-efficient ovens to reduce food preparation cost. Reducing cost has exactly the same effect as increasing revenue. As Benjamin Franklin said, "A penny saved is a penny earned." If you think about it, this really makes sense. If a company saves $1 by reducing costs by $1, the cost reduction has the same impact on profits as increasing selling price to increase revenue by $1.

Although the majority of potential capital projects are intended to either increase revenue or reduce costs, in certain instances a company must make a capital expenditure that will result in neither. These projects are usually concerned with safety or environmental issues and may come as a result of governmental regulation requirements; or, a company may simply determine such an expenditure is necessary given its goal of worker safety or good corporate citizenship.

In any event, capital projects a company deems necessary but do not promise either to increase revenue or reduce costs are usually not evaluated using the same criteria as those projects that do promise increased profits. In this chapter, we restrict ourselves to the evaluation of potential capital projects that promise to either increase revenue or reduce costs.

As the need for increasing revenue or reducing costs presents itself, a company should explore all alternative courses of action. Brainstorming sessions and input from multiple sources both within and outside a firm can help generate ideas for alternative options.

Determining Relevant Cash Flows for Alternative Projects

Throughout our discussion of capital budgeting, we have discussed capital projects that promise to increase a company's profits by either increasing revenue or reducing costs (expenses). Recall,

however, that under accrual accounting, revenue is not the same as cash inflow and expense is not the same as cash outflow in the short run.

Because capital projects usually are long lived, most business managers believe it is appropriate to analyze an alternative using cash inflow and cash outflow over the life of the project. They do this by determining the net cash flow of a project – the project's expected cash inflows minus its cash outflows for a specific time period. For example, if a manager estimates that investing in a new production machine will yield $40,000 in cash inflows during the useful life of the machine but will require spending $30,000 for the same period, the net cash flow would be $10,000 ($40,000 - $30,000).

Only relevant net cash flows should be considered in a capital budgeting decision. Relevant net cash flows are future cash flows that differ between or among alternatives. Thus, a relevant cash flow must be one that will occur in the future, not one that has already occurred, and it must be affected by the investment decision. Past cash flows, or cash flows that will not change as a result of the investment decision, are irrelevant and should not be considered in the decision process. This concept should seem familiar because it follows the same reasoning as our discussion of relevant costs, the subject of Chapter 7.

Once a company obtains and assesses the relevant net cash flows for each alternative project, the next step is to choose a method to measure the value of each project.

Selecting a Method of Evaluating the Alternatives

Over time, accountants and managers have developed many capital budgeting decision methods to evaluate potential capital projects. In this chapter, we present four methods:

1. Net present value
2. Internal rate of return
3. Payback period
4. Accounting rate of return

Each of these methods offers a different way to measure a project's value, and sometimes the different methods render conflicting rankings. In such a case, managers should be aware of the strengths and weaknesses of each capital budgeting method. In the next major section we discuss each of the four methods and the advantages and disadvantages of each.

Selecting Capital Projects

To select a capital project, firms decide first whether to accept or reject a project using one or more capital budgeting techniques to measure the project's value. If the project does not generate an acceptable rate of return, it will probably be rejected. Furthermore, a company should reject

any proposed capital project that is inconsistent with the company's goals and strategic plan, even if the promised return on that project is higher than some other potential project.

Once a project has been accepted as viable, that project can then be ranked with other acceptable projects based on expected performance.

CAPITAL BUDGETING DECISION METHODS

In this section, we present four capital budgeting methods: net present value, internal rate of return, payback period, and accounting rate of return. The first two methods, which are discounted cash flow methods, are used more frequently in business because they include the concept of the time value of money.

A dollar received or paid at some point in the future does not have the same value as a dollar received or paid today. The reason for the difference in value is that if cash is available now, it can be invested now and earn a return as time passes. This increase in the value of cash over time due to investment income is referred to as the time value of money. The concept of the time value of money is used to determine either the future value of money invested today or the present value of money to be received at some point in the future.

In the following discussion of net present value and internal rate of return, we assume you have a working knowledge of the time value of money, discussed in detail in Appendix A to this chapter. Refer to it now if you need to refresh your understanding. In addition, Appendix B to this chapter demonstrates how to do present value and future value calculations using a financial calculator. Throughout the remainder of this chapter, we will demonstrate present value calculations using both present value tables and a financial calculator. The amounts will differ somewhat due to rounding. Because not all students have access to a financial calculator, we will demonstrate both, but we will use only the amounts derived from using the tables.

Capital projects deal with cash flows that begin in the present and extend into the future, sometimes for many years. Therefore, the evaluation of these kinds of projects uses the concept of present value. Determining the present value of cash to be received in future periods is called discounting cash flows.

Discounted Cash Flow Methods

Business managers use two discounted cash flow methods to evaluate potential capital projects: net present value and internal rate of return.

Net Present Value

The net present value (NPV) of a proposed capital project is the present value of cash inflows minus the present value of cash outflows associated with a capital project. Note that NPV is different from the present value. The former is the difference between the present value of a

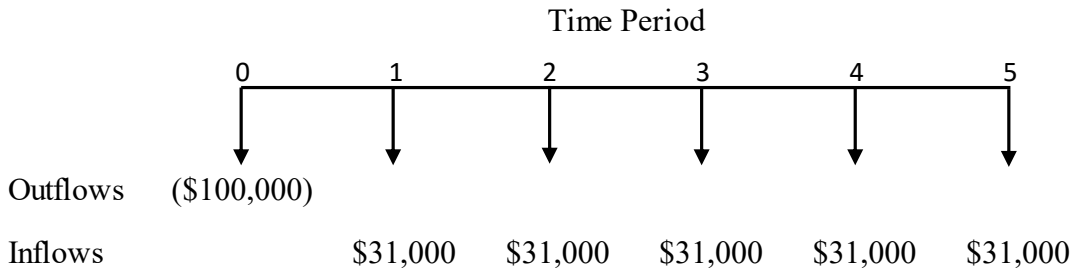
capital project's cash inflow and the present value of its cash outflow. The latter is the amount a future payment or series of payments is in today's dollars evaluated at the appropriate discount rate. NPV is used to determine whether a proposed capital project's anticipated return is higher or lower than the weighted average cost of capital.

A company calculates the NPV of a capital project by discounting the net cash flows for all years of the project using the company's weighted average cost of capital as the discount rate. A positive NPV indicates that the expected return on a proposed project is higher than the company's cost of capital. A negative NPV indicates that the expected return on a proposed project is lower than the company's cost of capital. An NPV of zero shows that the expected return on a project is exactly equal to the company's cost of capital.

To illustrate the NPV calculations, assume Whitewater Adventure Company is considering a computer hardware upgrade that would require an investment of $100,000. Assume further that the enhanced speed of the computer is expected to save $31,000 annually in operator salaries. Remember, this reduction of cash outflow is a cash inflow in NPV analysis. The computer has an estimated useful life of five years with no residual value.

The cash flows associated with the computer upgrade are shown in Exhibit 8-5.

Exhibit 8-5. Expected Cash Flows for Whitewater Adventure Company Computer Upgrade



Notice in Exhibit 8-5 that the initial cash outlay of $100,000 occurs at "time 0." When working with present values, time 0 is considered today, or the present. Unless otherwise specified, we assume all other cash flows for this project will occur at the end of each period. We also ignore depreciation in our analysis because depreciation is a noncash expense under accrual accounting and the NPV method focuses on cash flow rather than accrual operating income.

Whitewater has a 14 percent weighted average cost of capital so we use 14 percent as the discount rate to evaluate whether the company should accept the computer upgrade project; that is, we use a 14 percent discount rate to calculate the present value of the project's cash outflows and cash inflows. In this case, the project's $100,000 cash outflow occurs today (time 0), so that amount is already stated in present value terms.

Next, we must find the present value of the project's cash inflows, which occur at the end of each of the next five years. Because the stream of $31,000 positive cash flows constitutes an annuity, we use the Present Value of an Annuity of $l Table, found in Exhibit A8-10 of Appendix A at the end of this chapter. In this case, we use the table to find the present value factor of a five-year annuity, with a discount rate of 14 percent. We have reproduced a portion of the table as Exhibit 8-6. As you can see from the highlighted portion in this exhibit, the factor for five years with a discount rate of 14 percent is 3.433.

Exhibit 8-6. Partial Present Value of an Annuity of $1 Table

Present Value of an Annuity of $1 Table

Period	8%	9%	10%	11%	12%	13%	14%	15%
1	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626
3	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283
4	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855
5	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352
6	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784
7	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160
8	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487
9	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772
10	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019

We multiply $31,000, the amount of the annuity, by the 3.433 present value factor and find that the present value of the annuity is $106,423 ($31,000 X 3.433 = $106,423). See Exhibit 8-7 for instructions on how to use a financial calculator to determine this.

Exhibit 8-7. How to use a financial calculator

Using a Financial Calculator

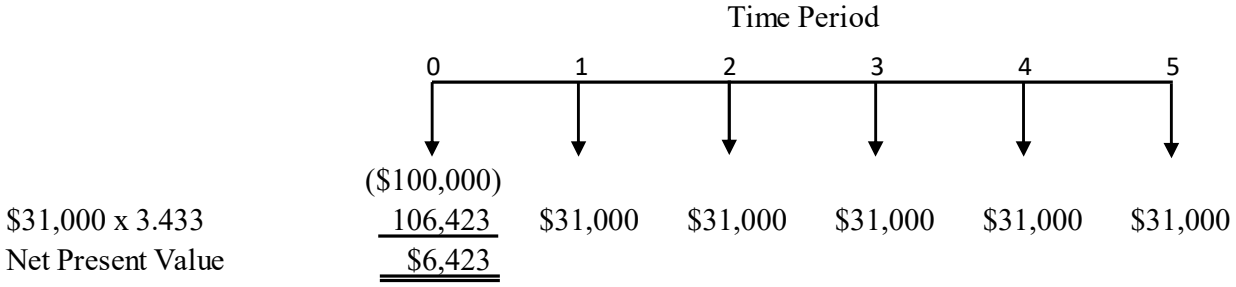
To calculate the present value of the 31,000 payments using a financial calculator we would enter the information in our financial calculator and solve for a solution as follows:

	n	i	PV	PMT	FV
Input:	5	14	?	31,000	0
Answer:			106,426		

Notice that the amount is $3 more than the amount we obtained when we used the present value table. This is because financial calculators typically round to 12 decimal places while our tables round to only three. What this means is that the answer we get from the calculator is more precise than the one from the tables. Although we will demonstrate each present value calculation using both tables and a financial calculator, because not all students have access to a financial calculator, throughout the remainder of the chapter we will use the amounts from the tables.

Finally, we find the NPV of the project by subtracting the present value of cash outflows from the present value of cash inflows. In our example, the net present value calculations are presented in Exhibit 8-8.

Exhibit 8-8. Net Present Value Calculations



NPV = PV of Project's Expected Returns - Initial Cash Outlays
NPV = $106,423 - $100,000
NPV = $6,423

As Exhibit 8-8 shows, the positive NPV of $6,423 indicates that the project's expected return exceeds Whitewater's 14 percent weighted average cost of capital.

A word of caution here. A net present value of $6,423 does not mean that the project's return is only $6,423. Rather, it means that the project's return exceeds the company's 14 percent cost of capital by $6,423.

Discussion Questions

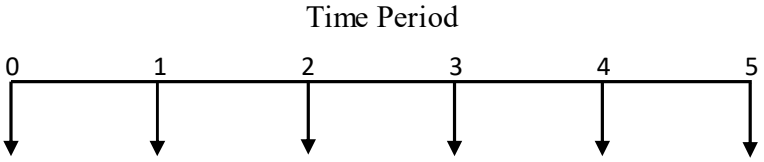
8-13. How would you explain the difference between present value and net present value?

8-14. Should a business accept or reject a project with an NPV of zero? Explain your reasoning.

Net Present Value Calculations with Uneven Cash Flows

The Whitewater Adventure Company example was relatively easy to calculate because the project's expected cash flows were the same each year (an annuity). When the expected cash flows are uneven, we find the present value of each year's net cash flow and then add those amounts. To demonstrate, assume that Whitewater's computer upgrade has expected annual returns of $31,000, but in year 3 the computer system will require $12,000 in maintenance fees (a cash outflow), and at the end of year 5, the system can be sold for $6,000 (a cash inflow). A time line showing these additional cash flows is shown in Exhibit 8-9.

Exhibit 8-9. Uneven Expected Cash Flows for Whitewater Adventure Company Computer Upgrade



Initial Investment	($100,000)					
Maintenance				($12,000)		
Operating Costs		$31,000	$31,000	$31,000	$31,000	$31,000
Residual Value						$6,000
Net Cash Flow	($100,000)	$31,000	$31,000	$19,000	$31,000	$37,000

Each of the amounts for the five years shown in Exhibit 8-9 can be discounted to present value using the Present Value of $1 Table, found in Exhibit A8-5 of Appendix A at the end of the chapter, a portion of which is reproduced as Exhibit 8-10.

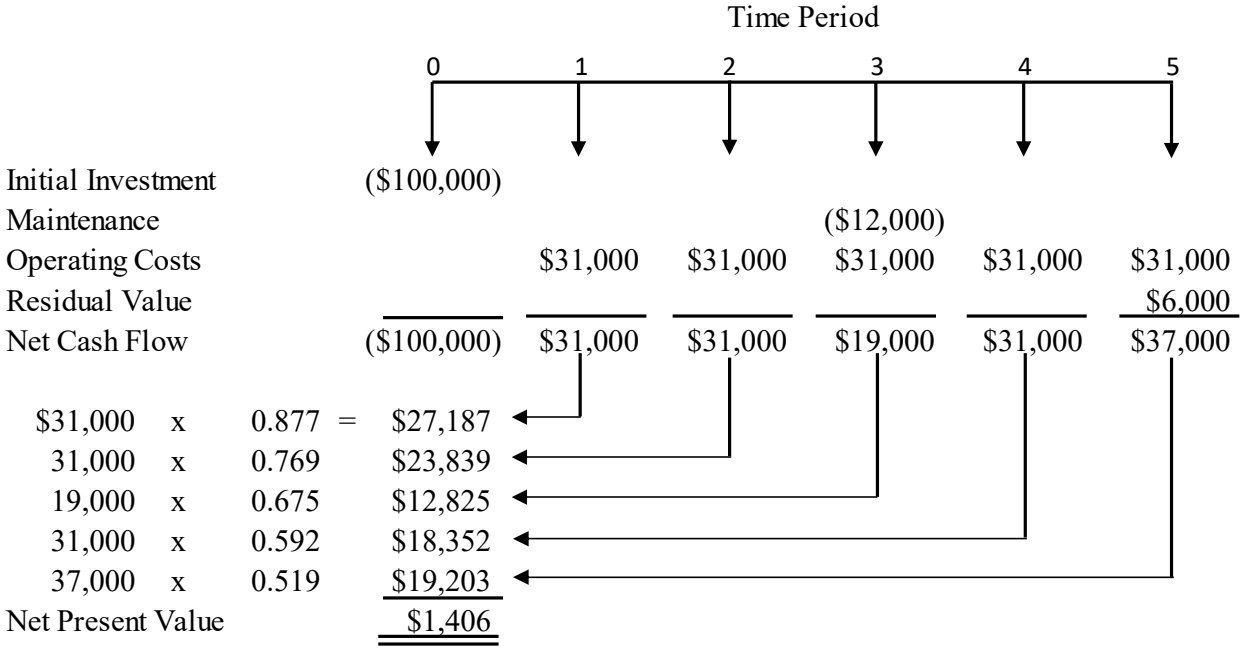
Exhibit 8-10. Partial Present Value of $1 Table

Present Value of $1 Table

Period	8%	9%	10%	11%	12%	13%	14%	15%
1	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	0.857	0.842	0.826	0.812	0.797	0.783	0.769	0.756
3	0.794	0.772	0.751	0.731	0.712	0.693	0.675	0.658
4	0.735	0.708	0.683	0.659	0.636	0.613	0.592	0.572
5	0.681	0.650	0.621	0.593	0.567	0.543	0.519	0.497
6	0.630	0.596	0.564	0.535	0.507	0.480	0.456	0.432
7	0.583	0.547	0.513	0.482	0.452	0.425	0.400	0.376
8	0.540	0.502	0.467	0.434	0.404	0.376	0.351	0.327
9	0.500	0.460	0.424	0.391	0.361	0.333	0.308	0.284
10	0.463	0.422	0.386	0.352	0.322	0.295	0.270	0.247

The calculation of the present values, using the highlighted factors in the 14 percent discount rate column, is shown in Exhibit 8-11.

Exhibit 8-11. Net Present Value Calculations with Uneven Cash Flows



As Exhibit 8-10 demonstrates, the positive $1,406 NPV indicates that the computer upgrade exceeds Whitewater's 14 percent weighted average cost of capital. This positive NPV indicates that the project is acceptable for the company. See Exhibit 8-12 for instructions on calculating the present value of the net cash flows for each year using a financial calculator.

Exhibit 8-12. Calculating the present value of the net cash flows for each year

Using a Financial Calculator

To calculate the present value of the net cash flows for each year using a financial calculator we would enter the information in our financial calculator and solve for a solution as follows:

YEAR 1					
Input:	1	14	?	0	31,000
	n	**i**	**PV**	**PMT**	**FV**
Answer:			27,193		
YEAR 2					
Input:	2	14	?	0	31,000
	n	**i**	**PV**	**PMT**	**FV**

Answer:			23,853		
YEAR 3					
Input:	3	14	?	0	19,000
	n	**i**	**PV**	**PMT**	**FV**
Answer:			13,824		
YEAR 4					
Input:	4	14	?	0	31,000
	n	**i**	**PV**	**PMT**	**FV**
Answer:			18,354		
YEAR 5					
Input:	5	14	?	0	37,000
	n	**i**	**PV**	**PMT**	**FV**
Answer:			19,217		

Notice that the amounts are different than those we obtained when we used the present value of $1 table.

Again, this is due to rounding.

Although the NPV method indicates whether a proposed capital project is acceptable, it does have limitations as a ranking method to compare alternative projects. A direct comparison of the NPVs of various projects may lead to poor decisions regarding project selection, because NPV is measured in dollars rather than percentages. For example, assume that management intends to select one of two projects, Project A or Project B. Calculations indicate that the NPV of Project A is $5,000, whereas the NPV of Project B is $6,000.

While choosing the project with the higher NPV seems wise, this is not always a good choice because NPV analysis does not consider the relative investments required by the projects. In our example, for instance, say the present value of Project A's net cash inflows is $105,000 and its required investment is $100,000. Then suppose that the present value of Project B's cash inflows is $206,000 and its required investment is $200,000. We see that Project A requires an investment of $100,000, whereas Project B requires double that investment amount. In firms with scarce funds, the relatively small increase in the NPV from $5,000 to $6,000 may not justify selecting a project that requires double the amount of investment. How then can the NPV method be used when ranking various projects? We solve the problem of selecting among projects by using a profitability index.

Profitability Index

The profitability index provides a means of ranking alternative but acceptable capital projects, with an index calculated by dividing the present value of the project's net cash inflows by its required investment. To illustrate, we return to our example of Projects A and B. We know that both projects have positive NPVs and are acceptable projects. Suppose, however, we want to rank the projects in order of preference.

We find that the profitability index for Project A is 1.05 ($105,000 ÷$100,000 = 1.05). The profitability index for Project B is 1.03 ($206,000 ÷ $200,000 = 1.03). The higher the profitability index, the higher the rate of return for the project. Accordingly, we would rank Project A higher than Project B because Project A's index value is 1.05 compared to Project B's lower index value of 1.03.

Although the NPV method indicates whether a project's return is lower or higher than the required rate of return, it does not provide the project's expected percentage return. Many managers find it helpful to know the expected rate of return of projects when making capital budgeting decisions. The internal rate of return method, discussed in the following section, is a technique that provides this information.

Internal Rate of Return

The internal rate of return (IRR) of a proposed capital project is the calculated expected percentage return promised by a project. Just like the NPV method, the IRR method considers all cash flows for a proposed project and adjusts for the time value of money. However, the IRR results are expressed as a percentage, not a dollar amount. This method, also known as the real rate of return, or the time-adjusted rate of return, determines the discount rate that makes the present value of a project's cash inflows and the present value of a project's outflows exactly the same.

To calculate a project's IRR, we use the same present value tables we use to calculate net present value, but we apply them differently. In this application, we use the tables to determine a discount rate (a percentage), rather than using a pre-selected discount rate to determine present value amounts (expressed in dollars).

As an example, assume that Project C requires an initial investment of $300,000 and will provide net cash inflows of $56,232 per year for eight years. Because this project is an annuity, to determine the IRR we will use the Present Value of an Annuity of $1 Table, found in Exhibit A8-10 of Appendix A at the end of this chapter. a portion of which is reproduced as Exhibit 8-13.

Exhibit 8-13. Partial Present Value of an Annuity of $1 Table

Present Value of an Annuity of $1 Table

Period	7%	8%	9%	10%	11%	12%	13%	14%
1	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877
2	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647
3	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322
4	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914
5	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433
6	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889
7	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288
8	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639
9	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946
10	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216

This time when we use the table, instead of using an interest rate to determine the present value factor, we will use a present value factor to determine the interest rate. To do this, the first step is to determine the present value factor we will look up on the table. To calculate the present value factor we divide the required initial investment by the annual net cash inflow as follows:

$$\frac{\text{Required initial investment}}{\text{Annual net cash inflow}} = \text{Present value factor}$$

$$\frac{\$300{,}000}{\$56{,}232} = 5.335 \text{ Present value factor}$$

Now that we know the present value factor, we can find Project C's IRR by moving down the time period column on the table in Exhibit 8-13 to eight periods, as that is the life of the project. Next we follow across the row corresponding to eight periods until we find a factor that is close to the one we calculated (5.335). As we follow across the row for eight periods, we find a factor that is not just close but matches exactly. The factor of 5.335 is in the 10 percent column, which indicates the IRR for Project C is 10 percent. Thus, the actual rate of return promised by Project C is 10 percent.

Once we determine the IRR we compare it to the cost of capital to gauge the project's acceptability. An IRR that exceeds the firm's cost of capital indicates an acceptable project. For

example, if the company's cost of capital is nine percent, Project C's 10 percent IRR shows that the firm would find the project acceptable.

In the example for Project C, we contrived the dollar amounts so that the factor we calculated exactly equaled one of the factors in the present value table. In a real-life situation, the calculated factor will usually fall between two factors on the present value table. For example, assume Project D would require an investment of $330,000 and would generate estimated annual net cash inflows of $64,900 for eight years. The present value factor for this project is 5.085, determined as follows:

$$\frac{\text{Required initial investment}}{\text{Annual net cash inflow}} = \text{Present value factor}$$

$$\frac{\$330,000}{\$64,900} = 5.085 \text{ Present value factor}$$

PaybackReturning to the table in Exhibit 8-13 and following across the year 8 row, we find that our calculated 5.085 factor is between the factors 5.146 (the 11 percent column) and 4.968 (the 12 percent column), but is closer to 5.146. Therefore, the project's IRR would fall between 11 and 12 percent, but would be closer to 11 percent. We then estimate that the IRR for Project D is slightly more than 11 percent.

For instructions on how to calculate the IRR using a financial calculator, see Exhibit 8-14.

Exhibit 8-14. Calculating the Internal Rate of Return

Using a Financial Calculator

To calculate the internal rate of return using a financial calculator, we simply enter all the data we have for the project, and solve for information we need. In other words, we enter the number of years (n=8), the project's required initial investment (PV= -330,000), the project's annual net cash inflows (PMT=$64900), the project's residual value, if any (FV=0) and then solve for the project's rate or return, i. We would enter the information in our financial calculator and solve for a solution as follows:

	n	i	PV	PMT	FV
Input:	8	?	-330,000	64,900	0
Answer:		11.34%			

When calculating the IRR, a financial calculator not only makes the calculations easier to do, but the result is much more precise as well. Additionally, when using a financial calculator you can easily calculate the IRR for any project that has a residual value by simply entering the amount as the FV. What's more, although it is beyond the scope of this text, many financial calculators can also easily accommodate situations where cash flows differ from year to year.

Comparing Projects Using the IRR Method Managers can use the IRR to rank projects. For example, the IRR of Project C (10 percent), can be compared to the approximate IRR of Project D (just over 11 percent). Assuming both projects were acceptable, Project D would be ranked higher than Project C because it promises a higher IRR.

Comparing NPV and IRR Both NPV and IRR are well-respected techniques used to determine the acceptability of a proposed capital project for two reasons. First, they are based on cash flows, not accounting income. Second, both methods consider the time value of money.

NPV is used to determine whether the promised return from a proposed capital project meets the minimum acceptable return requirements (cost of capital). A drawback of this method is that the calculated NPV is stated in dollars rather than percentages. Thus, comparison between projects of different size is difficult. The profitability index overcomes this difficulty.
IRR is used to calculate a proposed capital project's actual expected rate of return. Because this method is calculated using percentages rather than dollars, it can be used as a direct comparison of various proposed projects.

Nondiscounted Cash Flow Methods

Decision makers generally consider the NPV and IRR methods the most reliable techniques available because they utilize the time value of money in their evaluation of potential capital projects. Other methods that ignore the time value of money exist, however, and many companies use them to some degree. We now discuss two of them – the payback period and the accounting rate of return.

Payback Period

As its name implies, the payback period is a capital budgeting technique that measures the length of time a capital project must generate positive net cash flows that equal, or "pay back," the original investment in the project. For instance, assume that a project's estimated initial outlay is $40,000. Assume further that the project is expected to generate a net cash inflow of $12,500 per year. When net cash inflows are equal from one year to the next, we determine the payback period by dividing the required initial investment by the annual net cash inflows. In our example, we find that the payback period is 3.2 years. The calculations follow:

$$\frac{\text{Required initial investment}}{\text{Annual net cash inflow}} = \text{Payback peroid in years}$$

$$\frac{\$40{,}000}{\$12{,}500} = 3.2 \text{ years}$$

If a project has uneven cash flows, we can determine the payback period by adding the net cash inflows year by year until the total equals the required initial investment. For example, suppose a project requires an initial investment of $50,000 and is expected to generate the following net cash inflows:

Year 1	$12,000
Year 2	$15,000
Year 3	$18,000
Year 4	$15,000
Year 5	$12,000

We find the payback period by totaling the net cash inflows until we reach $50,000 as shown in Exhibit 8-15.

Exhibit 8-15. Payback Period with Uneven Cash Flows

Year	Net Cash Received in Prior Years		Net Cash Received in Current Year		Accumulated Net Cash Received
1	0	+	$12,000	=	$12,000
2	$12,000	+	$15,000	=	$27,000
3	$27,000	+	$18,000	=	$45,000
4	$45,000	+	$15,000	=	$60,000
5	$60,000	+	$12,000	=	$72,000

As Exhibit 8-15 shows, the initial investment will be "paid back" after the third year, but before the end of the fourth year. At the end of the third year, it is anticipated that $45,000, or all but $5,000 of the initial $50,000 investment will be recouped. The remaining $5,000 will be received during the fourth year as part of the $15,000 net cash inflows anticipated for that year. It will take about one third ($5,000 ÷ $15,000) of the fourth year to collect the final $5,000 to make up the $50,000 needed to payback the initial investment. Therefore, the payback period is 3⅓ years.

The payback period highlights the liquidity of an investment and companies use it as a screening device to reject projects with unreasonably low net cash flow expectations. This method is simple to use, is easily understood, and offers some limited insight into a project's liquidity.

The payback period is not often used to make final capital investment decisions because it does not consider three crucial elements: (1) the expected returns of a project after the payback period, (2) how the returns will compare to the firm's cost of capital or (3) the time value of money.

Because the payback period ignores the firm's cost of capital, total cash flow, and time value of money concerns, managers do not normally accept or reject a project based solely on the payback period method. If used at all the payback period is usually a screening device only to eliminate potential projects from further evaluation. Companies often establish a maximum payback period for potential projects. If a proposed capital project promises a payback of longer than the established maximum period, that project would be eliminated from further consideration. For example, assume a company has established a maximum payback period of three years. Using this standard, the project presented in Exhibit 8-15 would be rejected because its payback period is longer than three years.

Accounting Rate of Return

In our discussion so far, we have emphasized that the focus in capital budgeting decisions should be on cash flows. Over time, however, the net cash flow associated with a capital project should

approximate operating income as determined using accrual accounting revenue and expense recognition. The accounting rate of return method uses accrual accounting operating income, rather than net cash flow, as the basis for evaluating alternative capital budgeting projects.

The accounting rate of return is the rate of return for a capital project based on the anticipated increase in accounting operating income due to the project, relative to the amount of capital investment required.

This method focuses on a proposed project's required investment and how that project changes a company's operating income. As an example, let's reexamine the computer hardware upgrade project for the Whitewater Adventure Company discussed earlier in the chapter. As you recall, the computer hardware upgrade would require an initial investment of $100,000. Additionally, the upgrade would reduce operating expenses by $31,000 per year for five years. The computer has an estimated useful life of five years with no residual value. Accounting operating income would be affected in two ways by the computer upgrade. First, the reduced operating expenses would increase operating income by $31,000 each year. Second, depreciation for the computer upgrade would decrease operating income. With this information, we can calculate the straight line depreciation expense and accounting rate of return as follows:

Straight-Line Depreciation

$$\frac{\text{Asset's cost – estimated residual value}}{\text{Estimated useful life}} = \text{Straight-line depreciation}$$

$$\frac{\$100{,}000 - \$0}{5 \text{ years}} = \$20{,}000 \text{ Annual depreciation expense}$$

Accounting Rate of Return

$$\frac{\text{Increase in operating income}}{\text{Required investment}} = \text{Accounting rate of return}$$

$$\frac{\$31{,}000 - \$20{,}000}{\$100{,}000} = 11\% \text{ Accounting rate of return}$$

The accounting rate of return is simple to calculate and provides some measure of a project's profitability; however, it has two major drawbacks. First, the accounting rate of return method focuses on accounting income rather than cash flow. In capital budgeting, most analysts believe that a focus on cash flow is preferable to a focus on accounting income. Second, like the payback period method, the accounting rate of return does not consider the time value of money.

Many managers consider the accounting rate of return to be superior to the payback period because it offers at least a limited measure of a proposed capital project's rate of return.

As with the payback period, however, managers should not accept or reject a project based solely on the accounting rate of return. Both of these methods should be used only as screening devices or in conjunction with discounted cash flow methods of evaluating capital project alternatives.

FACTORS LEADING TO POOR CAPITAL PROJECT SELECTION

The process of determining which capital projects to select is a serious matter for any company. If managers do not treat capital budgeting with the seriousness it deserves, they run the risk of making poor decisions as to the capital projects selected. At the very least, selecting the wrong capital projects is enormously costly. At worst, investing in the wrong projects can lead to financial ruin for any company, regardless of its size or past performance. In addition to the difficulties inherent in the capital budgeting process caused by the uncertainty associated with the future, there are two factors that can lead to poor capital project selection. They are natural optimism on the part of managers and the tendency of some managers to turn the capital project evaluation process into a game.

Natural Optimism

Human beings are essentially optimistic. As managers they have a natural tendency to estimate both the cash inflows and outflows associated with a proposed project they are sponsoring with an overly optimistic outlook. This means they will likely overstate the estimated cash inflows and understate the estimated cash outflows. At the very minimum, this natural optimism limits the effectiveness of any of the evaluation techniques we have discussed in this chapter, because all of them use inflow and outflow estimates as the basis of evaluation.

There is nothing wrong with thinking positively. Optimism is, in fact, a desirable trait. Managers must understand, however, that such optimism can cloud their judgment as they assess potential capital projects. Good managers attempt to be as realistic as possible as they prepare proposals for the evaluation of potential capital projects.

Capital Budgeting Games

The managers who propose potential capital projects understand that there is usually not enough money available to fund all projects, even if they all promise a return greater than the cost of capital. A manager who proposes a capital project is, in fact, competing with other managers' projects for a limited number of capital investment dollars. For this reason, the capital project evaluation process is sometimes treated like some sort of game with little consideration of the potentially disastrous consequences. Some managers manipulate the estimates of cash inflow and cash outflow to get "pet" projects approved, often at the expense of other, more deserving projects. Do not confuse this idea with the natural optimism we discussed a moment ago. The manipulation we are talking about here is an additional factor that can lead to selecting the wrong capital projects.

SUMMARY

There are four elements in the overall planning process for any organization. These elements include the establishing of goals, formulating a strategic plan, preparing the capital budget, and preparing the operating budget.

The capital budgeting process has been described as the how of being in business and doing business, which means that the capital budget outlines how a company will allocate its scarce resources over the next five, 10, or even 20 years.

All capital projects have at least four shared characteristics. Such projects are usually long lived, carry with them high costs, have costs associated with the project that usually become sunk almost immediately, and usually involve a high degree of risk.

In the long run, the capital projects a company undertakes must cover at least the cost of the company's capital. The cost of capital is the cost of obtaining financing from both debt and equity sources. The combination of the cost of debt financing and equity financing is referred to as the weighted average cost of capital. If the capital project being considered does not at least cover the cost of capital, it makes no sense, from a purely financial standpoint, to undertake it.

Over time, accountants and managers have developed several methods to evaluate potential capital projects. Among these are the net present value, the internal rate of return, the payback period, and the accounting rate of return. Each of these four methods has certain advantages and disadvantages relative to the other methods. Managers generally consider the NPV and IRR methods to be superior to the payback and accounting rate of return methods because they incorporate the time value of money in their approach to evaluating potential capital projects.

APPENDIX A: THE TIME VALUE OF MONEY

The Time Value of Money -- The Concept of Interest

A dollar received or paid at some point in the future does not have the same value as a dollar received or paid today. If you were asked why this is so, you might think the change in value is due to inflation. Even if inflation did not exist, however, a dollar received or paid in the future would not have the same value as a dollar received or paid today. The reason for the difference in value is that if cash is available now, it can be invested now and earn a return as time passes. This increase in the value of cash over time, due to its earning potential, is referred to as the time value of money. We use the concept of the time value of money to determine either the future value of money invested today or the present value of money to be received or paid at some point in the future.

LEARNING OBJECTIVES

After completing your work in this appendix, you should be able to do the following:

1. Explain the concept of simple interest and compound interest.
2. Determine the future value of a single amount invested today using a future value table.
3. Determine the present value of a single amount to be received at some point in the future using a present value table.
4. Describe the concept of an annuity.
5. Determine the future value of an annuity using a future value table.
6. Determine the present value of an annuity using a present value table.

Future Value

Future value is the value of a payment, or series of payments, at some future point in time calculated at some interest rate. For example, if you were to invest $2,000 at an annual interest rate of 10 percent, your investment would grow to $2,200 in one year. How? The amount of the increase is calculated by multiplying the principal – the original investment – by the interest rate. In our case the principal is $2,000, the interest rate is 10 percent, so the total return on your investment is $200. The $200 is added to the $2,000 investment for a total of $2,200. So far, so good. But suppose you left the investment untouched for three years. What would be its total value at the end of the three years? The answer depends on whether we calculate the interest as simple interest or compound interest.

Simple interest is interest calculated only on the original principal. A calculation of interest earned at 10 percent per year for three years on a $2,000 principal using simple interest is presented in Exhibit A8-1.

Exhibit A8-1. Simple Interest Calculation

	Year 1	Year 2	Year 3
Principal	$2,000	$2,000	$2,000
Times the interest rate	x 10%	x 10%	x 10%
Equals interest earned	$ 200	$ 200	$ 200

Note in Exhibit A8-1 that we calculate interest for each of the three years only on the original investment of $2,000. At the end of three years you would receive your $2,000 (return of your investment) and $600 interest (return on your investment).

Compound interest is interest calculated on the investment principal plus all previously earned interest. Continuing with our example, a principal of $2,000 that earns a compounded rate of 10 percent interest per year for three years is shown in Exhibit A8-2.

Exhibit A8-2. Compound Interest Calculations

	Year 1	Year 2	Year 3
Principal	$2,000	$2,000	$2,000
Previously earned interest	+ 0	+ 200*	+ 420**
Total	2,000	2,200	2,420
Times the interest rate	x 10%	x 10%	x 10%
Equals interest earned	$ 200	$ 220	$ 242

* Interest earned in year 1 ($200) becomes part of the amount earning interest in year 2.
** Interest earned in year 1 ($200) and the interest earned in year 2 ($220) becomes part of the amount earning interest in year 3.

Note in Exhibit A8-2 that we calculate interest for each of the three years not only on the original investment of $2,000, but also on the interest earned in previous years. At the end of three years you would receive your $2,000 back (return of your investment) and $662 interest (return on your investment). The difference of $62 between the interest earned using compound interest ($662) and the interest earned using simple interest ($600) is interest earned on your previously earned interest.

The power of compounding is tremendous. To demonstrate, let us extend our example of the $2,000 investment. Suppose Dick Gustufson invests $2,000 at 10 percent annual interest when he is 18 years old and leaves it untouched until he is 38 years old. Using the simple interest calculation, Dick's investment will earn interest of $4,000 ($2,000 X 10% X 20 years). If, however, the interest over that same 20 years is compounded, the total interest earned would be

$11,454. The $7,454 difference in interest earned is due entirely to interest earning interest on previously earned interest.

Future Value of a Single Sum

We could calculate the amount of compound interest on Dick's investment by extending the three-year example presented in Exhibit A8-2 for another 17 years. This, however, would be cumbersome, time consuming, and tiresome. Fortunately, future value tables greatly simplify the calculation of compound interest.

Future value tables are previously calculated values of $1 at various rates of interest and time periods. The tables are used to determine either the future value of a single payment or the future value of an annuity – that is, a stream of equal payments made at equal intervals.

We use the Future Value of $l Table, Exhibit A8-3, at the end of the chapter, to determine the future value of a single amount deposited today. With this information, we can quickly determine the future value of Dick Gustufson's $2,000 investment at a 10 percent interest rate compounded annually.

As we see in Exhibit A8-3, by moving across the interest rate column headings to the 10 percent column, and then down the time period row to the 20 time periods row, we find a number on the table at the point where the row and column intersect, at a value of 6.727. This number is called a future value factor. Because we are using the Future Value of $1 Table, the 6.727 factor tells us that the value of a single dollar 20 years into the future is $6.727, or about $6.73. That is to say that if $1 is invested today at 10 percent, it will be worth $6.73 in 20 years.

But Dick invested $2,000, not $1. To determine the future value of $2,000, we multiply $2,000 by the factor of 6.727 to determine that $2,000 invested today at 10 percent will be worth $13,454 after 20 years ($2,000 X 6.727 = $13,454). If you subtract his initial investment of $2,000, the amount of interest he will earn is $11,454.

Future Value of an Annuity

We use the Future Value of an Annuity of $1 Table, presented as Exhibit A8-4, at the end of the chapter, to determine the future value of a stream of cash flows when the stream of cash flows constitutes an annuity. An annuity is a stream of cash flows where the dollar amount of each payment and the time interval between each payment are uniform.

To see how the table in Exhibit A8-4 is used, assume Susan King intends to deposit $2,000 in an account at the end of each year for four years at a compound interest rate of 12 percent per year. Using the Future Value of an Annuity of $1 Table we determine that the factor for 4 years at 12 percent is 4.779. Accordingly, if Susan deposits $2,000 at the end of each year for four years at 12 percent, the account balance will be approximately $9,558 ($2,000 X 4.779).

Present Value (Discounting)

The basic premise of the present value of money is that it is more valuable to receive cash today (so it can be invested to receive interest) than to receive the cash later. The question is, just how valuable is it to receive cash sooner rather than later?

If we know the expected rate of return, we can actually calculate the value of receiving cash sooner rather than later. For example, if you are offered the option of receiving $1,000 today or $1,000 one year from now, how much more valuable is it to receive the $1,000 today? If the $1,000 received today can be invested in a savings account earning six percent interest, then it will grow by $60 during the year. At the end of one year, it will be worth $1,060 and you would be $60 richer than if you had opted to receive the $1,000 one year from now. The $60 growth in value over time exemplifies the time value of money. Clearly, if money is available and invested, it grows as time passes.

If cash can be invested at six percent, $1,000 received today is equivalent to receiving $1,060 one year from now. The amount a future cash flow or stream of cash flows is worth today evaluated at the appropriate interest rate is the cash flow's present value. Determining the present value of an amount of cash to be received in the future is called discounting.

Present value tables greatly simplify the calculation of discounting to find the present value of a single amount or an annuity. Present value tables are previously calculated values of $1 at various interest rates and time periods. The tables are used to determine either the present value of a single amount or the present value of an annuity.

Present Value of a Single Sum

We use the Present Value of $1 Table, presented as Exhibit A8-5 at the end of the chapter, to determine the present value of a single amount to be received at some point in the future.

To see how we use the Present Value of $1 Table, suppose you visited your rich Aunt Hattie and helped her wash her dog. Your aunt was so touched by your kindness, she offers you a gift of $1,000. You are excited and hold out your hand for the money, but she informs you that she is not going to give you the money now. Rather she intends to give you the money one year from now. Her only request is that you tell her how much to deposit in a six percent savings account today so that the account will equal $1,000 one year from now.

In this case, you know that the future value of the amount is $1,000 one year from now. The amount your Aunt Hattie wants to know is the present value, the amount that must be deposited today at six percent so that the account will be worth $1,000 in one year. To find out how much Aunt Hattie must deposit, we use the Present Value of $1 Table in Exhibit A8-5 at the end of the chapter. We quickly scan the table to find the point of intersection between the six percent interest rate column and the number of time periods row which is 1. The point of intersection, the present value factor, is 0.943. This factor indicates that the present value of one

dollar discounted at six percent is $0.943, or about 94 cents. Thus, if $0.943 is invested today at six percent, it will be worth $1 one year from now.

But Aunt Hattie is going to give you $1,000, not $1. To determine the present value of $1,000, we simply multiply $1,000 by the factor of 0.943 to determine that $943 invested today at six percent will be worth $1,000 in one year, as shown by the time line presentation in Exhibit A8-6.

Exhibit A8-6. Time Line Presentation of Present Value of $1

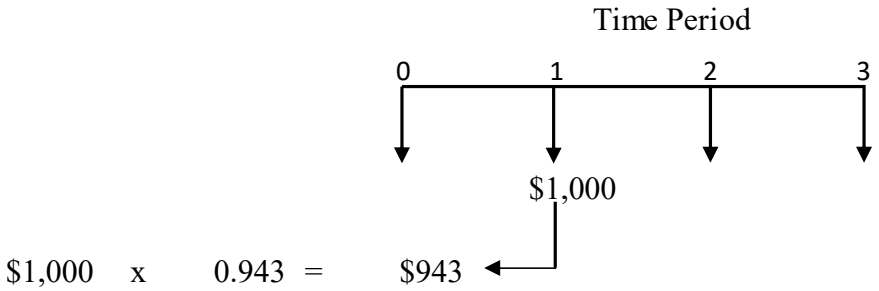
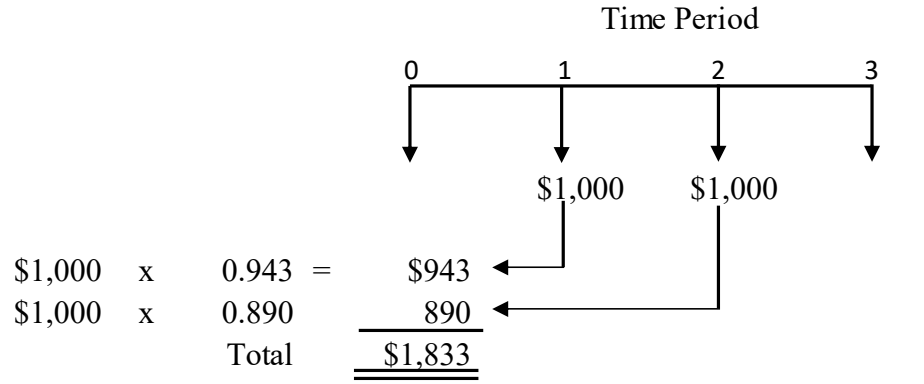


Exhibit A8-6 shows that to have $1,000 a year from now, given an expected rate of interest of six percent per year, Aunt Hattie must deposit $943. So, the present value of $1,000 to be received one year from now at six percent is $943. The $943 will grow in value as it accumulates interest. This growth is the time value of money. You immediately inform your aunt Hattie that she must deposit $943 today at six percent to have the $1,000 gift ready for you one year from now.

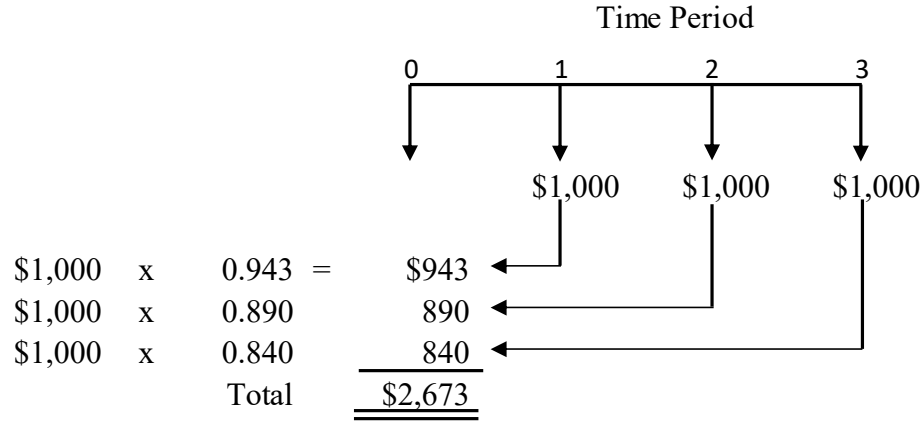
Aunt Hattie is so happy with your quick response that she offers you an additional $1,000 gift. The second $1,000 gift, however, will be given two years from now, which means you will receive the first $1,000 gift at the end of year 1, and the second $1,000 gift at the end of year 2. You are thrilled, but again, your Aunt Hattie requests that you tell her exactly how much she must deposit today at six percent to have the additional $1,000 in two years. We use the Present Value of $1 Table in Exhibit A8-5, at the end of the chapter, to find that the present value factor for a time period of two and an interest rate of six percent is 0.890. Accordingly, the present value of $1,000 to be received two years from now is $890 ($1,000 X 0.890). You quickly inform your aunt that she must deposit a total of $1,833 ($943 + $890) today to pay both the $1,000 at the end of year 1, and the $1,000 at the end of year 2. The time line and calculations are shown in Exhibit A8-7.

Exhibit A8-7. Time Line Presentation



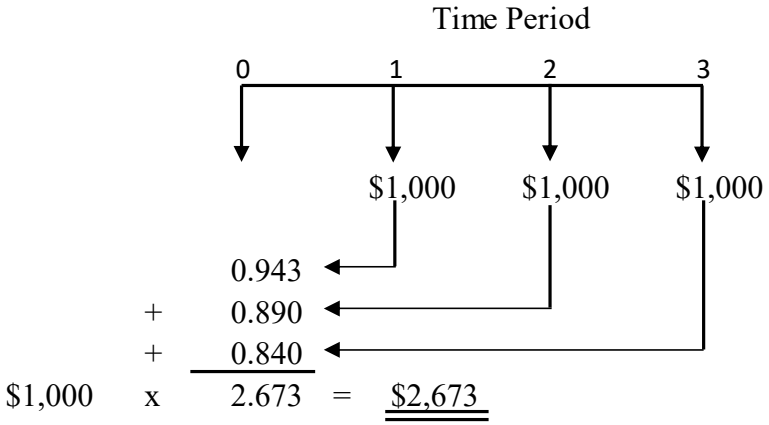
Now suppose your Aunt Hattie planned to give you a gift of $1,000 per year for the next three years. We could rely on the Present Value of $1 Table and add the totals for each year as shown in Exhibit A8-8.

Exhibit A8-8. Time Line Presentation



We can simplify the calculations, however, by multiplying the $1,000 by the sum of the three present value factors, which is 2.673. Accordingly, instead of multiplying $1,000 by 0.943, then $1,000 by 0.890, then $1,000 by 0.840, and summing the total, we simply multiply the $1,000 by the sum of the factors as shown in Exhibit A8-9.

Exhibit A8-9. Time Line Presentation



Present Value of an Annuity

Because the stream of cash flows in our example is an annuity – three equal payments made at regular intervals of one year – we can use the Present Value of an Annuity of $l Table, found in Exhibit A8-10 of Appendix A at the end of this chapter.

By examining the table in Exhibit A8-10, we find that the present value factor of an annuity for three periods at six percent is 2.673. Notice that the 2.673 equals the sum of the individual present value of $1 factors for each of the three years in Exhibit A8-9. Next, we multiply the $1,000 by the 2.673 factor to find that the present value of Aunt Hattie's $1,000, three-year annuity paid yearly is $2,673.

As you use the future value and present value tables provided in this book, note that the number of interest rates and time periods is limited. Although these smaller tables are useful for learning the basics, in business practice future value and present value tables include a much larger number of interest rates and time periods. If needed, comprehensive tables are available at bookstores and office supply stores.

A working knowledge of present and future value concepts will be extremely important to you not only in your college course work but also in your professional career. Whether the task is evaluating potential capital projects, as in this chapter, or any of its many other applications, you will find these concepts invaluable throughout your life.

Most computers can also be used to solve present value and future value problems. Many software packages now include modules that can handle simple and advanced calculations dealing with the time value of money.

As an alternative to using a computer or future and present value tables, we can compute future value and present value using nothing more than a handheld financial calculator. It must be a financial or business calculator. Engineering and scientific calculators generally do not have

present value and future value functions. In the business world, most managers rely on calculators and computers to calculate future and present values. Appendix B of this chapter describes how to use a financial calculator for present value and future value computations.

APPENDIX B – USING A FINANCIAL CALCULATOR

Once you have mastered Appendix A and know about the time value of money and how financial tables work, you are ready to learn about the modern-day equivalent of the tables – the financial calculator. A financial calculator can provide all the information that financial tables provide and more.

LEARNING OBJECTIVES

After completing your work in this appendix, you should be able to do the following:

1. Use a financial calculator for future value calculations.
2. Use a financial calculator for present value calculations
3. Use a financial calculator for auto loan calculations.
4. Use a financial calculator for home mortgage calculations.

Recall that in Appendix A we calculated several amounts as we demonstrated the future value and present value tables. In this appendix, we will use the same information to re-calculate those same amounts, but this time we will use a financial calculator. In addition, we will demonstrate how to use the calculator for common situations such as auto financing and home mortgages. Once you understand how to use a financial calculator, calculating loan payments, present values, and future values will be quick and easy.

Calculator Differences

The way financial calculators work is quite simple. Generally, we know four of the variables and must use the calculator to solve for the one that's missing. Almost all financial calculators use the following five keys:

Where:

n – Is the number of periods.
i – Is the interest rate per period
PV – Is the present value.
PMT – Is the amount of the payments per period. It is the amount of the annuity.
FV – Is the future value. It is the cash flow that occurs at the end of the last period.

Although they all use the same financial keys (n, i, PV, PMT, and FV), not all financial calculators work exactly the same way. Consult your calculator's instruction manual to figure out just how your calculator works. Afterwards, it will be easy to do future value and present value calculations. Then, as you read this appendix, you can experiment with your calculator by entering each of our examples into it to make sure you get the same solution we do. Here are some of the calculator differences you may encounter:

Buttons vs. Display Many calculators have separate buttons on the face of the calculator for the financial function. On others, however, the financial function keys are shown on the display after the operator has accessed the calculator's present value menu.

Determining the solution On many calculators you simply press the key corresponding to the amount you are trying to determine and the calculator provides the solution. But some calculators require that you press a compute key or start key and then the key corresponding to the amount you need to know.

Compounding Periods Another difference among calculators has to do with the interest rate and compounding. In business, interest is most often compounded monthly. Accordingly, some calculators are programmed so that the calculator automatically converts the interest rate you enter to monthly compounding. With these calculators, when you enter the interest rate the calculator automatically converts it to a monthly rate by dividing the rate by 12. This is fine if you are truly doing a problem with monthly compounding of interest, but for academic problems, compounding is often assumed to occur yearly so you must either re-program your calculator for yearly compounding or you can fool the calculator by multiplying the interest rate by 12 so that when the calculator divides it by 12 you end up with the correct rate.

Pluses and Minuses Some calculators are programmed so the cash inflows and cash outflows offset each other. But for many calculators, the operator must indicate whether the cash flow is an inflow or an outflow or an error message may appear. If you notice that error messages appear, try entering all cash inflows as positive amounts and all cash outflows as negative amounts. This may solve the problem. For our examples, we will use positive and negative amounts to show inflows and outflows respectively.

Timing of Cash Flows All financial calculators are able to do future value and present value calculation assuming the cash flow takes place at the end of the period or at the beginning of the period. For this appendix, we will assume that cash flows take place at the end of each period. In the case of annuities, if the cash flow takes place at the end of each period it is sometimes called an ordinary annuity, and if the cash flow takes place at the beginning of each period it is often called an annuity due. For the calculations in this appendix, you should be sure your calculator is set to assume that cash flows take place at the end of the period. This is the default setting for most financial calculators.

In the following sections, we will re-calculate each of the examples we presented in Appendix A. We will indicate the amounts we enter into our financial calculator followed by the solution.

Future Value of a Single Sum

As we did in Appendix A, let's assume that Dick Gustufson invests $2,000 today at 10 percent interest compounded annually, and would like to know how much his investment will be worth in 20 years. Keep in mind that the when Dick invests, he has a $2,000 outflow because he is taking the cash and putting it into the investment. Therefore we will enter a negative amount in our calculator for this $2,000 outflow. We would enter the information in our financial calculator and solve as follows:

Input:	20	10	-2,000	0	?
	n	**i**	**PV**	**PMT**	**FV**
Answer:					13,455

In this case, we entered 20 for n, 10 for i, -2,000 for the PV, and zero for PMT. We then press the FV key to determine that the future value of Dick's investment is $13,455. This amount is $1 more than the amount we obtained when we used the future value tables in Appendix A because the calculator rounds to 12 decimal places and our tables round to only three. What this means is that the answer we get from the calculator is more precise than the one from the tables.

What if Dick wanted to determine how much less he would earn if he could only find a 9 percent investment? The information is already in our calculator, but we need to change the interest rate from 10 percent to 9 percent. All we need to do is enter 9 for i and then press the FV key again to calculate the new future value. When an element of the calculation changes, you only need to re-enter that element. If the other amounts stay the same, we need not re-enter them.

Already					
In Calculator	20	10	-2,000	0	13,455
New Input:		9			?
	n	**i**	**PV**	**PMT**	**FV**
Answer:					11,209

So if Dick can only find a 9 percent investment compounded annually, his $2,000 investment will be worth $11,209 at the end of 20 years.

Future Value of an Annuity

As we did in Appendix A, let's say Susan King intends to deposit $2,000 in an account at the end of each year for four years at a compound interest rate of 12 percent per year. We would enter the information in our financial calculator and solve as follows:

Input:	4	12	0	-2,000	?
	n	**i**	**PV**	**PMT**	**FV**
Answer:					9,559

In this case, we entered 4 for n, 12 for i, zero for the PV, and -2,000 for PMT. We then press the FV key to determine that the future value of Susan's investment is $9,559. As it happens, this is the same amount we obtained when we used the future value tables in Appendix A. Bear in mind, however, because financial calculators round to 12 decimal places and financial tables usually do not, differences between the results of the two methods are likely to occur.

Present Value of a Single Sum

To demonstrate how to determine present value of a single sum, let's revisit the Aunt Hattie example in Appendix A. Remember that your aunt was touched by your kindness, so she offered to give you a gift of $1,000. Her only request is that you tell her how much to deposit in a six percent savings account today so that the account will equal $1,000 one year from now. We would enter the information in our financial calculator and solve as follows:

Input:	1	6	?	0	1,000
	n	**i**	**PV**	**PMT**	**FV**
Answer:			943		

In this case, we entered 1 for n, 6 for i, 0 for PMT, and 1,000 for FV. We then press the PV key to determine that the present value, or the amount Aunt Hattie should deposit, is $943.

Now assume your Aunt Hattie is so happy with your quick response that she offers you an additional $1,000 gift. The second $1,000 gift, however, will be given two years from now, which means you will receive the first $1,000 gift at the end of year 1, and the second $1,000 gift at the end of year 2. As we enter the amounts in our calculator for the second $1,000 payment we should keep in mind that most of the amounts stay the same. Only the number of years changes. Accordingly, we would enter the information in our financial calculator and solve as follows:

Already in					
Calculator:	1	6	943	0	1,000
New Input:	2		?		
	n	**i**	**PV**	**PMT**	**FV**
Answer:			890		

So your aunt must deposit a total of $1,833 ($943 + $890) today to pay both the $1,000 at the end of year 1, and the $1,000 at the end of year 2.

Now suppose your Aunt Hattie planned to give you a gift of $1,000 per year for the next three years. We would enter the information in our financial calculator and solve as follows:

Already in					
Calculator:	2	6	890	0	1,000
New Input:	3		?		
	n	**i**	**PV**	**PMT**	**FV**

Answer: 840

So your aunt must deposit a total of $2,673 ($943 + $890 + $840) today to pay $1,000 at the end of each of the next three years.

Present Value of an Annuity

Because the stream of cash flows in our example is an annuity – three equal payments made at regular intervals of one year – we can find the present value of the stream of $1,000 payments using the PMT key instead of calculating the present value of each individual cash flow. We would enter the information in our financial calculator and solve as follows:

Input:	3	6	?	$1,000	0
	n	**i**	**PV**	**PMT**	**FV**

Answer: 2,673

So again we determine that your aunt must deposit a total of $2,673 today to pay $1,000 at the end of each of the next three years.

Common Uses of a Financial Calculator

Having a financial calculator and knowing the basics of how to use it provides you with a valuable business decision tool. The information a financial calculator offers can help you make adjustments in financing and investment situations so they best fit your needs and abilities. We have already discussed how to determine the future value and present value of investments. In the following sections we will use a financial calculator to provide valuable information for auto loans and home mortgages.

Auto Loans

Let's say you're buying a new car. You have $6,000 as a down payment and the total price of the car you have selected is $24,000. Accordingly, you intend to finance $18,000 ($24,000 - $6,000). The bank offers to make the loan at 7 percent. You have looked over your finances and feel you could pay $300 a month and would like the term of the auto loan to be four years, or 48 monthly payments. Unlike the academic problems we have been working so far, interest is compounded monthly for an auto loan, not annually. The bank's interest rate is an annual rate, not a monthly one. For some financial calculators, we must divide the 7 percent annual rate by

12 to determine the monthly rate of interest that we will enter for the i key. We would enter the information in our financial calculator and solve as follows:

		7/12=			
Input:	48	.583333	18,000	?	0
	n	**i**	**PV**	**PMT**	**FV**
Answer:				-431	

So we enter 48 for n, .583333 for i, 18,000 for PV and 0 for FV. Then we press the PMT key and the calculator determines that the payment will be $431. But wait. Although the loan term is 48 months, the monthly payment is more than your $300 limit. Let's assume that you decide that a longer-term loan would be easier to manage than a higher monthly payment. If you want to know how much the payments would be for a 60 month loan instead of a 48 month loan, just enter 60 for n and then press the PMT key again to calculate the new monthly payment amount. When only the length of the loan changes, the interest rate (i) and the amount of the loan (PV) stay the same, so we need not re-enter them. Accordingly, we would enter the information in our financial calculator and solve as follows:

Already		7/12=			
In Calculator	48	.583333	18,000	-431	0
New Input:	60			?	
	n	**i**	**PV**	**PMT**	**FV**
Answer:				356	

The monthly loan payment for a 60 month loan is $356. If the maximum you can pay per month is $300, how much can you borrow for 60 months? Well, to find out we enter an acceptable payment amount, the $300, and press PV to determine the amount we can borrow. All the other amounts in the calculator are fine and do not need to be changed. We would enter the information in our financial calculator and solve as follows:

Already		7/12=			
In Calculator	60	.583333	18000	-356	0
New Input:			?	-300	
	n	**i**	**PV**	**PMT**	**FV**
Answer:			15,151		

So for a 60 month loan at 7 percent interest with a monthly payment of $300, you can borrow $15,151. What this means is that, with your $6,000 down payment, you'd better look for a car that costs about $21,151 or less.

Home Mortgages

The calculations for a home mortgage are exactly the same as they are for an auto loan. The only difference is that the loan amounts and terms are usually much longer for home mortgages.

Assume that you are thinking about buying a home and have $10,000 available as a down payment. Assume further that you have found a house that you can buy for $150,000 and have been pre-approved for a 6.5 percent, 30 year mortgage loan. Accordingly, you intend to finance $140,000 ($150,000 - $10,000). As was the case in the auto loan example, interest is compounded monthly for home mortgages. The bank's 6.5 percent interest rate is an annual rate, not a monthly one. For some financial calculators, we must divide the 6.5 percent annual rate by 12 to determine the monthly rate of interest that we will enter for the i key. We would enter the information in our financial calculator and solve as follows:

	30X12	6.5/12=			
Input:	360	.541667	140,000	?	0
	n	**i**	**PV**	**PMT**	**FV**
Answer:				-885	

So we enter 360 for n, .541667 for i, 140,000 for PV and 0 for FV. Then we press the PMT key and the calculator determines that the payment will be $885. Keep in mind that the $885 only pays the interest and principal on the loan. You will also have to pay homeowner's insurance and property taxes on the property, which could add significantly to the monthly payment. For our purposes, we will focus on the $885 principal and interest.

Assume that you feel the payment amount is affordable, but the term of the loan seems way too long. What if the term of the loan were cut in half? Instead of a 30 year loan, the term would be only 15 years. Will the payments nearly double if you have to pay the loan off in half the time? No, the monthly payment will increase substantially, but the new payment will be far less than double. We would enter the change in our financial calculator and solve as follows:

Already in	30X12	6.5/12=			
Calculator:	360	.541667	140,000	-885	0
New Input:	15X12				
	180			?	
	n	**i**	**PV**	**PMT**	**FV**
Answer:				-1,220	

Assume that the $1,220 payment is acceptable and you inform the bank that you would like a 15 year loan. The interest rate for a 15 year loan will probably be less than that for a 30 year loan. Assume the bank reduces the rate to 6.25% due to the shorter loan term. We would enter the change in our financial calculator and solve as follows:

Already in	15X12	6.5/12=			
Calculator:	180	.541667	140,000	-1,220	0
New Input:		6.25/12			
		.520833			
	n	**i**	**PV**	**PMT**	**FV**

Answer: -1,200

By reducing the interest rate from 6.5 percent to 6.25 percent, your monthly payment would go down by $20 per month.

Whether you are evaluating potential capital projects or a home mortgage, a financial calculator can quickly and easily provide you with a wealth of valuable information. A financial calculator is truly worth every penny it costs and learning how to use one is time very well spent.

COMPANY INDEX AND KEY TERMS

COMPANY INDEX

REVIEW THE FACTS

A. What constitutes a firm's goals?

B. What is a mission statement and how does it relate to a company's goals?

C. Describe core values, vision and strategy.

D. List the perspectives of the balanced scorecard.

E. What is a strategic plan and how does it relate to a company's goals?

F. What is the purpose of a capital budget and how does it relate to the strategic plan and a company's goals?

G. What is the purpose of an operating budget and how does it relate to the capital budget, the strategic plan, and a company's goals?

H. What are capital investments?

I. What is the difference between a capital investment and a capital project?

J. What is the focus of the capital budget?

K. What does it mean when the cost of a purchased item is capitalized?

L. What does it mean when the cost of a purchased item is expensed?

M. What are the four shared characteristics of virtually all capital projects?

N. What are some other terms used to describe the cost of capital?

O. Describe what is meant by the net present value of an investment.

P. With respect to net present value calculations, what is the advantage of calculating the profitability index?

Q. What is determined by the internal rate of return?

R. What is determined by the payback method?

S. What is the accounting rate of return?

T. What are two factors that can lead to poor capital project selection?

U. What is the basic difference between simple interest and compound interest? (Appendix)

V. What is an annuity? (Appendix)

APPLY WHAT YOU HAVE LEARNED

LO 1: Match Elements of Planning to Characteristics

8-15. Following are the elements of the planning process as discussed in this chapter, with some characteristics pertaining to those elements.

a. Goals b. Strategic plan c. Capital budget d. Operating budget

1. _____ Pertains to day-to-day activities
2. _____ Pertains to the allocation of scarce resources
3. _____ Consists of both financial and nonfinancial considerations
4. _____ Stated in terms that are not easily quantified
5. _____ Stated in terms that are easily quantified
6. _____ Constitutes the who of business planning
7. _____ Constitutes the why of business planning
8. _____ Constitutes the how of business planning
9. _____ Constitutes the what of business planning
10. _____ Relates to long-lived, expensive assets

REQUIRED:
Match each element of the planning process with the appropriate characteristics. Each letter may be used more than once.

LO 4: Discuss and Calculate the Cost of Capital

8-16. The Marcus Company is in the process of determining a return rate to use for its cost of capital. Upon review of the financial statements it was determined that the total interest bearing debt is $1,400,000 and total stockholders' equity is $1,000,000. In addition, it was determined that the cost of debt financing is 8%, and the cost of equity financing is 18%.

REQUIRED:

a. What proportion of the Marcus Company's total financing comes from debt?
b. What proportion of the Marcus Company's total financing comes from equity?
c. Calculate the Marcus Company's blended cost of capital rate.

LO 4: Discuss and Calculate the Cost of Capital

8-17. The Byrne Company is in the process of determining a return rate to use for its cost of capital. Upon review of the financial statements it was determined that the total interest bearing debt is $4,800,000 and total stockholders' equity is $14,400,000. In addition, it was determined that the cost of debt financing is 7%, and the cost of equity financing is 22%.

REQUIRED:

a. What proportion of The Byrne Company's total financing comes from debt?

b. What proportion of The Byrne Company's total financing comes from equity?
c. Calculate The Byrne Company's blended cost of capital rate.

LO 4: Discuss and Calculate the Cost of Capital

8-18. The Cunningham Company is in the process of determining a return rate to use for its cost of capital.

Upon review of the financial statements it was determined that the total interest bearing debt is $800,000 and total stockholders' equity is $1,700,000. In addition, it was determined that the cost of debt financing is 9%, and the cost of equity financing is 20%.

REQUIRED:

a. What proportion of The Cunningham Company's total financing comes from debt?
b. What proportion of The Cunningham Company's total financing comes from equity?
c. Calculate The Cunningham Company's blended cost of capital rate.

LO 2: Determine the Sequence of Evaluating Capital Expenditures

8-19. Following in random order are the five steps for evaluating a capital expenditure.

a. _____ Identify alternative capital projects.
b. _____ Identify the need for a capital expenditure.
c. _____ Select a method for evaluating the alternatives.
d. _____ Evaluate the alternatives and select the project or projects to be funded.
e. _____ Determine relevant cash inflow and cash outflow information.

REQUIRED:

In the space provided, indicate a logical sequence of the steps for evaluating a capital expenditure.

LO 6 & 7: Determine Net Present Value, No Residual Value

8-20. Florence Kundrat owns Discount Fashions. She is contemplating the purchase of a soda machine which would be used to sell soft drinks to customers for $0.75 each. The following estimates are available:

Initial outlay	$3,500
Annual cash inflow	$1,000
Cost of capital	10%
Estimated life of the soda machine	5 years
Estimated residual value of the soda machine	$0

REQUIRED:

Determine the net present value of the soda machine purchase.

LO 6 & 7: Determine Net Present Value, No Residual Value

8-21. Brianna Garcia is contemplating the purchase of an ice cream vending machine which would be used to sell ice cream to customers for $2 each. The following estimates are available.

Initial outlay	$4,000
Annual cash inflow	$1,200
Cost of capital	12%
Estimated life of the ice cream machine	5 years
Estimated residual value of the ice cream machine	$0

REQUIRED:
Determine the net present value of the ice cream machine purchase.

LO 6 & 7: Determine Net Present Value, No Residual Value
8-22. Javier Cruz is contemplating the purchase of a machine which will automate the production of baseball bats in his factory. The following estimates are available.

Initial outlay	$97,000
Annual reduction in manufacturing labor cost	$22,500
Cost of capital	14%
Estimated life of the baseball bat machine	8 years
Estimated residual value of the bat machine	$0

REQUIRED:
Determine the net present value of the baseball bat machine purchase.

LO 6 & 7: Determine Net Present Value, No Residual Value
8-23. Dahlia Garcia is contemplating the purchase of a machine which will automate the production of hosiery in her factory. The following estimates are available.

Initial outlay	$112,000
Annual reduction in manufacturing labor cost	$ 22,500
Cost of capital	12%
Estimated life of the hosiery machine	8 years
Estimated residual value of the hosiery machine	$0

REQUIRED:
Determine the net present value of the hosiery machine purchase.

LO 6 & 7: Determine Net Present Value and Profitability Index, Various Rates, No Residual Value
8-24. Michael Diaz Sporting Goods is considering the purchase of a machine that is used to cut material to make baseball gloves. The cost of the machine is $265,000. The machine has an estimated useful life of eight years, with no residual value. Currently, the company leases a similar machine for $50,000 per year. If the new machine is purchased, the company's cost of labor would be reduced by $12,000 per year.

REQUIRED:
a. Determine the net present value of the machine under each of the following assumptions.

1. The cost of capital is 12%
2. The cost of capital is 14%
3. The cost of capital is 16%

b. Determine the profitability index under each of the following assumptions.
   1. The cost of capital is 12%
   2. The cost of capital is 14%
   3. The cost of capital is 16%

LO 6 & 7: Determine Net Present Value and Profitability Index, Various Rates, No Residual Value

8-25. Carlos Urriola Manufacturing is considering the purchase of a computer controlled manufacturing machine that is used in its factory. The cost of the machine $3,600,000. The machine has an estimated useful life of 10 years, with no residual value. If the new machine is purchased, the company's cost of labor would be reduced by $650,000 per year.

REQUIRED:

a. Determine the net present value of the machine under each of the following assumptions.
   1. The cost of capital is 10%
   2. The cost of capital is 12%
   3. The cost of capital is 14%
b. Determine the profitability index under each of the following assumptions.
   1. The cost of capital is 10%
   2. The cost of capital is 12%
   3. The cost of capital is 14%

LO 6 & 7: Determine Net Present Value, No Residual Value

8-26. Frank Eiroa is considering the purchase of an engine lift for use in his marine repair business. He has determined that a used lift is available for $5,500. The engine lift has an estimated useful life of eight years and a residual value of zero. Currently, Frank rents engine lifts as needed. If the lift is purchased, annual rental payment of $1,400 would be saved. The cost of capital is 16%.

REQUIRED:

Calculate the net present value of the engine lift purchase.

LO 6 & 7: Determine Net Present Value, No Residual Value

8-27. Alfredo Lomando is considering the purchase of an industrial glass cutting machine for use in his business. He has determined that a used glass cutter is available for $25,800. The cutter has an estimated useful life of 10 years and a residual value of zero. Currently, Alfredo rents an industrial cutter for $4,400 annually. The cost of capital is 14%.

REQUIRED:

Calculate the net present value of the industrial glass cutter.

LO 6 & 7: Determine Net Present Value, with Residual Value

8-28. The owner of Wynn Sports Cards is contemplating the purchase of a machine which will automate the production of baseball cards in her factory. The following estimates are available.

Initial outlay	$35,000
Annual reduction in manufacturing labor cost	$ 8,500
Cost of capital	14%
Estimated life of the card machine	5 years
Estimated residual value of the card machine	$ 2,000

REQUIRED:
Determine the net present value of the baseball card machine purchase.

LO 6 & 7: Determine Net Present Value, with Residual Value

8-29. Kevin Petty owns Discount Parts, Inc. He is contemplating the purchase of a brake lathe that could be used to refurbish brake parts for customers. The following estimates are available.

Initial outlay	$6,500
Annual cash inflow	$1,500
Cost of capital	16%
Estimated life of the brake lathe	6 years
Estimated residual value of the brake lathe	$1,000

REQUIRED:
Determine the net present value of the brake lathe purchase.

LO 6 & 7: Determine Net Present Value, with Residual Value

8-30. Paola Grillon owns Grillon Skin Care Products. She is contemplating the purchase of an industrial mixer that would be used to mix cosmetics in her factory. The following estimates are available.

Initial outlay	$78,500
Annual cash inflow	$19,500
Cost of capital	16%
Estimated life of the mixer	7 years
Estimated residual value of the mixer	$ 4,000

REQUIRED:
Determine the net present value of the industrial mixer purchase.

LO 6 & 7: Determine Net Present Value, with Residual Value

8-31. Elianne Vinas owns Vinas Shoe Company. She is contemplating the purchase of a cutting machine that would be used to make shoes in her factory. The following estimates are available.

Initial outlay	$58,000
Annual cash inflow from reduced labor cost	$11,500
Cost of capital	12%
Estimated life of the cutter	8 years
Estimated residual value of the cutter	$ 2,000

REQUIRED:
Determine the net present value of the cutting machine purchase.

LO 6 & 7: Determine Net Present Value and Profitability Index,
Various Rates, with Residual Value

8-32. George Gonzalez Construction Company is considering the purchase of a new road grader. The cost of the road grader is $68,000. The road grader has an estimated useful life of seven years and an estimated residual value of $5,000. Currently, the company rents road graders as needed. If the road grader is purchased, annual rental payments of $17,000 would be saved.

REQUIRED:

a. Determine the net present value of the grader purchase under each of the following assumptions.
    1. The cost of capital is 12%
    2. The cost of capital is 14%
    3. The cost of capital is 16%
b. Determine the profitability index under each of the following assumptions.
    1. The cost of capital is 12%
    2. The cost of capital is 14%
    3. The cost of capital is 16%

LO 6 & 7: Determine Net Present Value and Profitability Index, Various Rates, with Residual Value

8-33. Wesley Parks Pencil Company is considering the purchase of a new machine to make pencils. The cost of the machine is $248,000. The pencil machine has an estimated useful life of 10 years and an estimated residual value of $25,000. Currently, the company leases a similar machine for $45,000 per year.

REQUIRED:

a. Determine the net present value of the pencil machine purchase under each of the following assumptions.
    1. The cost of capital is 10%
    2. The cost of capital is 12%
    3. The cost of capital is 14%
b. Determine the profitability index under each of the following assumptions.
    1. The cost of capital is 10%
    2. The cost of capital is 12%
    3. The cost of capital is 14%

LO 6 & 7: Determine Net Present Value and Profitability Index, Various Rates, with Residual Value

8-34. Sylvia Heain's Catering Service is considering the purchase of new energy-efficient cooking equipment. The cost of the new equipment is $78,000. The equipment has an estimated useful life of eight years and an estimated residual value of $5,000. Currently, the company leases similar cooking equipment for $10,000 per year. If the new cooking equipment is purchased, the company's cost of electricity would be reduced by $8,000 per year.

REQUIRED:

a. Determine the net present value of the cooking equipment under each of the following assumptions.
    1. The cost of capital is 12%
    2. The cost of capital is 14%
    3. The cost of capital is 16%
b. Determine the profitability index under each of the following assumptions.
    1. The cost of capital is 12%
    2. The cost of capital is 14%
    3. The cost of capital is 16%

LO 6 & 7: Determine Internal Rate of Return, Various Rates, No Residual Value

8-35. Penny Williams is contemplating the purchase of a new computer system for her company, Williams Manufacturing. She has made the following estimates.

Initial outlay	$18,023.88
Annual cash savings	$ 5,000.00
Estimated life of the computer	5 years
Estimated residual value of the computer	$0

REQUIRED:

a. Determine the internal rate of return for the computer purchase.
b. Indicate whether the computer purchase should be accepted under each of the following assumptions.
    1. The cost of capital is 9%
    2. The cost of capital is 11%
    3. The cost of capital is 13%
    4. The cost of capital is 15%

LO 6 & 7: Determine Internal Rate of Return, Various Rates, No Residual Value

8-36. Valdez Moving and Storage is contemplating the purchase of a new delivery truck. The following estimates are available.

Initial outlay	$51,590
Annual cash flow from the new truck	$14,000.00
Estimated life of the truck	6 years
Estimated residual value of the truck	$-0

REQUIRED:

a. Determine the internal rate of return for the truck purchase.
b. Indicate whether the truck purchase should be accepted under each of the following assumptions.
    1. The cost of capital is 14%
    2. The cost of capital is 16%
    3. The cost of capital is 18%

LO 6 & 7: Determine Internal Rate of Return for Three Projects, Select Project, No Residual Value

8-37. Hank Maupin & Company is in the process of replacing its existing computer system. The following three proposals are being considered.

	System A	System B	System C
Initial outlay	$18,023.88	$22,744.72	$24,031.57
Annual cash savings	$ 5,000.00	$ 6,000.00	$ 7,000.00
Estimated useful life	5 years	5 years	5 years

The estimated residual value of all computer systems under consideration is zero.

REQUIRED:

a. Determine the internal rate of return for each of the proposed computer systems.
b. Which computer system would you recommend? Explain your reasoning.

LO 6 & 7: Determine Internal Rate of Return for Three Projects, Select Project, No Residual Value

8-38. David Wilson Equipment Company is in the process of selecting some new manufacturing equipment. The following three proposals are being considered.

	Equipment A	Equipment B	Equipment C
Initial outlay	$14,902.92	$18,555.46	$26,674.63
Annual cash savings	$ 3,000.00	$ 4,000.00	$ 5,000.00
Estimated useful life	8 years	8 years	8 years

The estimated residual value of all equipment under consideration is zero.

REQUIRED:

a. Determine the internal rate of return for each of the proposed pieces of equipment.
b. Which piece of equipment would you recommend? Explain your reasoning.

LO 6 & 7: Determine Net Present Value, Profitability Index, and Internal Rate of Return, Various Rates, No Residual Value

8-39. Dunn Manufacturing Company is considering the purchase of a factory that makes valves. These valves would be used by Dunn to manufacture water pumps. The purchase would require an initial outlay of $1,564,800. The factory would have an estimated life of

10 years and no residual value. Currently, the company buys 500,000 valves per year at a cost of $1.50 each. If the factory were purchased, the valves could be manufactured for $0.90 each.

REQUIRED:

a. Determine the net present value of the proposed project and whether it should be accepted under each of the following assumptions.
    1. The cost of capital is 12%
    2. The cost of capital is 14%
    3. The cost of capital is 16%
b. Determine the profitability index under each of the following assumptions.
    1. The cost of capital is 12%
    2. The cost of capital is 14%
    3. The cost of capital is 16%
c. Determine the internal rate of return of the proposed project and indicate whether it should be accepted under each of the following assumptions.
    1. The cost of capital is 12%
    2. The cost of capital is 14%
    3. The cost of capital is 16%

LO 6: Determine Payback Period, Even Cash Flows

8-40. Tom Robinson owns Discount Hardware. He is contemplating the purchase of a copy machine which would be used to make copies to sell to customers for five cents each. The following estimates are available.

Initial outlay	$4,500
Annual cash inflow	$1,800

REQUIRED:

Determine the payback period for the copy machine purchase.

LO 6: Determine Payback Period, Even Cash Flows

8-41. Rebecca Pons owns Pons Magic Makers Manufacturing. She is contemplating the purchase of a machine that would be used to manufacture various products that would be sold to magic shops. The following estimates are available.

Initial outlay	$23,539.20
Annual cash inflow	$ 7,356.00

REQUIRED:

Determine the payback period for the machine purchase.

LO 6: Determine Payback Period, Even Cash Flows

8-42. Claudia Vargas is contemplating the purchase of a machine that would be used in her business. The following estimates are available.

Initial outlay	$5,826.50
Annual cash inflow	$1,355.00

REQUIRED:
Determine the payback period for the machine purchase.

LO 6: Determine Payback Period, Even Cash Flows
8-43. Cesar Nieto is contemplating the purchase of a machine that would be used in his business. The following estimates are available.

Initial outlay	$323,400.00
Annual cash inflow	$ 33,000.00

REQUIRED:
Determine the payback period for the machine purchase.

LO 6: Determine Payback Period, Uneven Cash Flows
8-44. Junior Gonzales Racing Fuel is considering the purchase of a fuel truck that he would use to sell gasoline at motor sport racing events in Puerto Rico. He has determined that a used truck is available for $11,000. He believes that the cash inflows would grow each year as he is able to sign fuel supply contracts at more and more events. He has made the following cash inflow estimates.

First year	$3,000
Second year	$4,500
Third and subsequent years	$5,000

REQUIRED:
Determine the payback period for the purchase of the fuel truck.

LO 6: Determine Payback Period, Uneven Cash Flows
8-45. Veronica Torres is considering opening a ceramic studio. She has determined that it would require an investment of $14,000 to open the store. She believes that the cash inflows would grow each year as more and more people learn of the store. She has made the following cash inflow estimates.

First year	$2,000
Second year	$4,000
Third and subsequent years	$5,000

REQUIRED:
Determine the payback period for the ceramic studio.

LO 6: Determine Payback Period, Uneven Cash Flows
8-46. Karen Calloway is considering adding a new style of gym shorts to her product line. She has determined that it would require an investment of $22,000 to add the new style

shorts. She believes that the cash inflows would grow each year as the new style becomes more popular. She has made the following cash inflow estimates.

First year	$ 4,000
Second year	$ 6,000
Third and subsequent years	$10,000

REQUIRED:
Determine the payback period for the new style of gym shorts.

LO 6: Determine Accounting Rate of Return

8-47. BRV Construction Company is contemplating the purchase of scaffolding at the cost of $32,000. Currently, the company rents similar scaffolding for use at each of its construction sites. The scaffolding has an estimated useful life of five years and an estimated residual value of $2,000. By purchasing the scaffolding, BRV could save rental fees of $11,760 per year.

REQUIRED:
Determine the accounting rate of return for BRV's investment in the scaffolding.

LO 6: Determine Accounting Rate of Return

8-48. Smith and Smith & Associates is contemplating the purchase of equipment that would cost $196,600. Currently, the company rents similar equipment for $45,076 per year. The proposed new equipment has an estimated useful life of eight years and an estimated residual value of $9,000.

REQUIRED:
Determine the accounting rate of return for the Smith and Smith & Associates investment in the new equipment.

LO 6: Determine Accounting Rate of Return

8-49. Condore & Company is contemplating the purchase of a machine that would cost $142,790. The machine would provide an annual contribution margin of $47,262.55 each year. The proposed new machine has an estimated useful life of five years and an estimated residual value of $10,000.

REQUIRED:
Determine the accounting rate of return for Condore & Company's investment in the new machine.

LO 5, 6, & 7: Determine Relevant Information, Net Present Value, Screen Project, with Residual Value

8-50. Frank's Marine Service purchased a forklift five years ago for $16,000. When it was purchased, the forklift had an estimated useful life of 10 years and a residual value of $4,000. The forklift can be sold now for $6,000. The operating cost for the forklift is $4,500 per year.

Frank is thinking about buying a newer forklift for $17,000. The newer forklift would have an estimated useful life of five years and a residual value of $7,000. The operating cost for the newer forklift would be 3,000 per year.

The company's cost of capital is 10%.

REQUIRED:

a. Prepare a relevant cost schedule showing the benefits of buying the new forklift. (For this requirement, ignore the time value of money.)
b. How much must the company invest today to replace the old forklift?
c. If the company replaces the old forklift, what is the increase in the company's annual contribution margin?
d. If the company sells the old forklift now to make room for the new one, it will not receive the $4,000 residual value at the end of its useful life. Instead, the company will receive the $7,000 residual value from the new forklift. With this in mind, if the company buys the forklift, what is the change in the residual value the company is to receive at the end of the five-year life of the equipment?
e. Calculate the net present value of replacing the old forklift.
f. Do you think the company should replace the old forklift?

LO 5, 6, & 7: Determine Relevant Information, Net Present Value, Screen Project, with Residual Value

8-51. Al Hart of Hart Engineering is considering the purchase of a new copy machine. He purchased the old machine two years ago for $8,500. When it was purchased the old machine had an estimated useful life of eight years and a residual value of $500. The operating cost of the old machine is $3,000 per year. The old machine can be sold today for $2,000. A new machine can be bought today for $10,000 and would have an estimated useful life of six years with a residual value of $1,000. The operating cost of the new copy machine is expected to be $1,500 per year. The company's cost of capital is 8%.

REQUIRED:

a. Prepare a relevant cost schedule showing the benefit of buying the new copy machine. (For this requirement, ignore the time value of money.)
b. How much must the company invest today to replace the old copy machine?
c. If the company replaces the old copy machine, what is the increase in the company's annual contribution margin?
d. If the company sells the old copy machine now to make room for the new one, it will not receive the $500 residual value at the end of its useful life. Instead, the company will receive the $1,000 residual value from the new copy machine. With this in mind, if the company buys the copy machine, what is the change in the residual value the company is to receive at the end of the six-year life of the eql1ipment?
e. Calculate the net present value of replacing the old copy machine.
f. Do you think the company should replace the old copy machine?

LO 5, 6, & 7: Determine Relevant Information, Net Present Value, Screen Project, No Residual Value

8-52. The managers at AAA Manufacturing Company are considering replacing an industrial mixer used in the company's factory. The company's cost of capital is 10%.

Information about the old mixer:	
Cost $28,000	
Estimated useful life	10 years
Estimated residual value	$0
Current age	5 years
Estimated current fair value	$ 8,000
Annual operating cost	$18,000
Information about the new mixer:	
Cost $34,000	
Estimated useful life	5 years
Estimated residual value	$0
Annual operating cost	$12,000

REQUIRED:

a. Prepare a relevant cost schedule showing the benefit of buying the new mixer.
b. How much must the company invest today to replace the industrial mixer?
c. If the new mixer is purchased, how much would be saved in operating costs each year?
d. How much would the company receive at the end of the five-year useful life of the new mixer?
e. Calculate the net present value of replacing the old mixer.
f. Do you think the company should replace the old mixer?

LO 5, 6, & 7: Determine Relevant Information, Net Present Value, Screen Project, No Residual Value

8-53. The managers at General Manufacturing Company are considering replacing the industrial lathe used in the company's factory. The company's cost of capital is 12%.

Information about the old lathe:	
Cost $57,000	
Estimated useful life	8 years
Estimated residual value	$0
Current age	2 years
Estimated current fair value	$32,000
Annual operating cost	$32,000
Information about the new lathe:	
Cost $61,000	
Estimated useful life	6 years
Estimated residual value	$0
Annual operating cost	$24,000

REQUIRED:

a. Prepare a relevant cost schedule showing the benefit of buying the new lathe. (For this requirement, ignore the time value of money.)

b. How much must the company invest today to replace the old lathe?
c. If the company replaces the old lathe, how much will be saved in operating costs each year?
d. Calculate the net present value of replacing the old lathe.
e. Do you think the company should replace the old lathe?

LO 5, 6, & 7: Determine Relevant Information, Net Present Value, Screen Project, with Residual Value

8-54. John Paul Hudik, president of Hudik Boat Hauling, is considering replacing the company's industrial lift used to haul boats. The new lift would allow the company to lift larger boats out of the water. The company's cost of capital is 14%.

Information about the old lift:	
Cost	$94,000
Estimated useful life	12 years
Estimated residual value	$10,000
Current age	4 years
Estimated current fair value	$48,000
Annual contribution margin	$50,000
Information about the new lift:	
Cost	$128,000
Estimated useful life	8 years
Estimated residual value	$ 35,000
Annual contribution margin	$ 65,000

REQUIRED:

a. Prepare a relevant cost schedule showing the benefit of buying the new lift. (For this requirement, ignore the time value of money.)
b. How much must the company invest today to replace the old lift?
c. If the company replaces the old lift, what is the increase in the company's annual contribution margin?
d. If the company sells the old lift now to make room for the new one, it will not receive the $10,000 residual value at the end of its useful life. Instead, the company will receive the $25,000 residual value from the new lift. With this in mind, if the company buys the new lift, what is the change in the residual value the company is to receive at the end of the eight-year life of the equipment?
e. Calculate the net present value of replacing the old lift.
f. Do you think the company should replace the old lift?

LO 5, 6, & 7: Determine Relevant Information, Net Present Value, Screen Project, with Residual Value

8-55. The managers at Wilma Manufacturing are considering replacing a printing press with a new, high-speed model. The company's cost of capital is 12%.

Information about the old printing press:	
Cost	$255,000

Estimated useful life	10 years
Estimated residual value	$ 5,000
Annual depreciation	$ 25,000
Current age	3 years
Accumulated depreciation to date	$75,000
Estimated current fair value	$150,000
Annual contribution margin	$110,000
Information about the new printing press:	
Cost	$535,000
Estimated useful life	7 years
Estimated residual value	$ 45,000
Annual depreciation	$ 70,000
Annual contribution margin	$150,000

REQUIRED:

a. Prepare a relevant cost schedule showing the benefit of buying the new printing press. (For this requirement, ignore the time value of money.)
b. How much must the company invest today to replace the old printing press?
c. If the company replaces the old printing press, what is the increase in the company's annual contribution margin?
d. If the company sells the old printing press now to make room for the new one, it will not receive the $25,000 residual value at the end of its useful life. Instead, the company will receive the $45,000 residual value from the new printing press. With this in mind, if the company buys the printing press, what is the change in the residual value the company is to receive at the end of the seven-year life of the equipment?
e. Calculate the net present value of replacing the old printing press.
f. Do you think the company should replace the old printing press?

APPENDIX

LO 7: Calculate Simple, Compound Interest, Full Years

8-56. Greg Gluck Marine borrowed $5,000 from National Bank on January 1, year 1.

REQUIRED:

a. Assuming 9% simple interest is charged, calculate interest for year 1, year 2, and year 3.
b. Assuming 9% compound interest is charged, calculate interest for year 1, year 2, and year 3.

LO 7: Calculate Simple, Compound Interest, Full Years

8-57. Gary borrowed $8,000 from Orlando National Bank on January 1, year 1.

REQUIRED:

a. Assuming 8% simple interest is charged, calculate interest for year 1, year 2, and year 3.
b. Assuming 8% compound interest is charged, calculate interest for year 1, year 2, and year 3.

LO 7: Calculate Simple, Compound Interest, Full Years

8-58. Cam borrowed $2,000 from Miami National Bank on January 1 year 1.
REQUIRED:

a. Assuming 6% simple interest is charged, calculate interest for year 1, year 2, and year 3.
b. Assuming 6% compound interest is charged, calculate interest for year 1, year 2, and year 3.

LO 7: Calculate Future Value, Single Cash Flow, Various Rates and Maturities
8-59. Susan Jones made the following investments on January 1, year 1:

1. $ 2,000 at 10% for 5 years
2. $12,000 at 4% for 8 years
3. $ 9,000 at 14% for 15 years

Assume the interest on each investment is compounded annually.

REQUIRED:
Calculate the future value of each of the investments listed above at their maturity.

LO 7: Calculate Future Value, Single Cash Flow, Various Rates and Maturities
8-60. Ivan Zhang made the following investments on January 1 year 1:

1. $3,000 at 8% for 6 years
2. $4,000 at 6% for 8 years
3. $5,000 at 10% for 5 years

Assume the interest on each investment is compounded annually.

REQUIRED:
Calculate the future value of each of the investments listed above at their maturity.

LO 7: Calculate Future Value, Single Cash Flow, Various Rates and Maturities
8-61. Orlando Gonzalez made the following investments on January 1 year 1:

1. $1,000 at 14% for 3 years
2. $2,000 at 10% for 5 years
3. $4,000 at 8% for 8 years

Assume the interest on each investment is compounded annually.

REQUIRED:
Calculate the future value of each of the investments listed above at their maturity.

LO 7: Calculate Future Value, Yearly Cash Flows, Various Rates and Maturities
8-62. Consider the following investments:

1. $2,000 at the end of each of the next five years at 10% interest compounded annually.
2. $12,000 at the end of each of the next eight years at 4% interest compounded annually.

3. $9,000 at the end of each of the next 15 years at 14% interest compounded annually.

REQUIRED:
Calculate the future value of each of the investments listed above at their maturity.

LO 7: Calculate Future Value, Yearly Cash Flows, Various Rates and Maturities
8-63. Consider the following investments.

1. $12,000 at the end of each of the next three years at 12% interest compounded annually.
2. $16,000 at the end of each of the next five years at 10% interest compounded annually.
3. $20,000 at the end of each of the next 10 years at 8% interest compounded annually.

REQUIRED:
Calculate the future value of each of the investments listed above at their maturity.

LO 7: Calculate Future Value, Yearly Cash Flows, Various Rates and Maturities
8-64. Consider the following investments.

1. $1,000 at the end of each of the next five years at 6% interest compounded annually.
2. $1,000 at the end of each of the next five years at 8% interest compounded annually.
3. $1,000 at the end of each of the next five years at 10% interest compounded annually.

REQUIRED:
Calculate the future value of each of the investments listed above at their maturity.

LO 7: Calculate Present Value, Single Cash Flow, Single Rate
8-65. Jim Johnson is planning to buy a new car when he graduates from college in three years. He would like to invest a single amount now, in order to have the $24,000 he estimates the car will cost.

REQUIRED:
Calculate the amount Jim must invest today, to have enough to buy the new car assuming his investment will earn 4% compounded annually for the three-year investment.

LO 7: Calculate Present Value, Single Cash Flow, Single Rate
8-66. Lowell Pitman needs to have $50,000 at the end of five years. Lowell would like to invest a single amount now, to have the $50,000 in five years.

REQUIRED:
Calculate the amount Lowell must invest today, to have the amount of money he needs assuming his investment will earn 8% compounded annually for the five year investment.

LO 7: Calculate Present Value, Single Cash Flow, Single Rate

8-67. Lauren Elsea is planning to buy a house when she graduates from college. She would like to have $20,000 for the down payment. Lauren would like to invest a single amount now, to have the $20,000 at the end of three years.

REQUIRED:
Calculate the amount Lauren must invest today, to have the amount of money she needs assuming her investment will earn 6% compounded annually for the three year investment.

LO 7: Calculate Present Value, Yearly Cash Flows, Single Rate
8-68. Linda Chidister is planning to send her son, Edward, to college. While he is in college, Linda intends to give him $3,000 at the end of each year.

REQUIRED:
How much must Linda invest today so she will have enough to give Edward $3,000 at the end of each of the next four years assuming the investment will earn 6% interest?

LO 7: Calculate Present Value, Yearly Cash Flows, Single Rate
8-69. Alex Malpin is planning to spend the next three years doing research in China. An Asian studies research institute has agreed to pay Alex $20,000 at the end of each of the three years he is in China.

REQUIRED:
How much must be invested today to have enough to pay Alex $20,000 at the end of each of the next three years assuming the investment will earn 10% interest.

LO 7: Calculate Present Value, Yearly Cash Flows, Single Rate
8-70. Photo Factory is planning to purchase some photo processing equipment from Ace Equipment Company. The equipment will provide cash flow of $15,000 at the end of each of the next eight years.

REQUIRED:
How much should Photo Factory pay for the equipment assuming it will provide $15,000 at the end of each of the next eight years and Ace has promised that it will earn a return of exactly 14%?

Glossary:

capital investments Business expenditures in acquiring expensive assets that will be used for more than one year.

capital projects Another name for capital investments.

capital budgeting The planning and decision process for making investments in capital projects.

organizational goals The core beliefs and values of the company. They outline why the organization exists and are a combination of financial and nonfinancial goals.

mission statement A summary of the main goals of the organization.

core values What defines our perception of what is most important in life and also defines a sense of right and wrong, of just or unjust.

vision Management's dream for the company's future – the hope for where the company is going and how will it get there

strategy The plan of attack for furthering the company's vision and creating earnings.

balanced scorecard **A**n integrated set of performance measures organized around four distinct perspectives – financial, customer, internal, and innovation and learning

strategic plan A long-range plan that sets forth the actions a company will take to attain its organizational goals.

capital budget The budget that outlines how a company intends to allocate its scarce resources over a five-year, 10-year, or even longer time period.

operating budget The budget that plans a company's routine day-to-day business activities for one to five years.

capital assets Long-lived expensive items such as land, buildings, machinery, and equipment.

cost of capital The cost of obtaining financing from all available financing sources. Generally the rate of return required for capital investments.

cost of capital rate Another name for cost of capital.

required rate of return Another name for cost of capital.

hurdle rate Another name for cost of capital.

weighted average cost of capital The combined cost of debt financing and equity financing.

blended cost of capital Same thing as the weighted average cost of capital.

cost of debt capital The interest a company pays to its creditors.

cost of equity capital What equity investors give up when they invest in one company rather than another.

scarce resources A term describing the limited amount of money a company has to invest in capital projects.

net cash flows Cash inflow less cash outflow.

relevant net cash flows Future net cash flows that differ between or among the alternatives being considered.

time value of money The increase in the value of cash over time due to investment income.

discounting cash flows Determining the present value of cash to be received in the future.

net present value (NPV) The present value of all cash inflows associated with a proposed capital project minus the present value of all cash outflows associated with the proposed capital project.

profitability index A method used to rank acceptable proposed capital projects.

internal rate of return (lRR) The calculated expected percentage return promised by a proposed capital project.

real rate of return Another name for internal rate of return.

time-adjusted rate of return Another name for internal rate of return.

payback period A capital budgeting technique that measures the length of time a capital project must generate positive cash flows that equal the original investment in the project.

accounting rate of return The rate of return for a capital project based on the anticipated increase in accounting operating income due to the project. relative to the amount of capital investment required.

future value The value of a payment, or series of payments, at some future point in time calculated at some interest rate.

simple interest Interest calculated on the original principal amount invested only

compound interest Interest calculated on the original principal amount invested plus all previously earned interest.

annuity A stream of equal periodic cash flows.

present value The amount future cash flows are worth today based on an appropriate interest rate.

financial calculator A calculator that can provide an array of information regarding the time value of money including future and present values.

Exhibit A8-3. **Future Value of $1 Table**

Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
1	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110	1.120	1.130	1.140	1.150	1.160	1.170	1.180
2	1.061	1.082	1.103	1.124	1.145	1.166	1.188	1.210	1.232	1.254	1.277	1.300	1.323	1.346	1.369	1.392
3	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331	1.368	1.405	1.443	1.482	1.521	1.561	1.602	1.643
4	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464	1.518	1.574	1.630	1.689	1.749	1.811	1.874	1.939
5	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611	1.685	1.762	1.842	1.925	2.011	2.100	2.192	2.288
6	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772	1.870	1.974	2.082	2.195	2.313	2.436	2.565	2.700
7	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949	2.076	2.211	2.353	2.502	2.660	2.826	3.001	3.185
8	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144	2.305	2.476	2.658	2.853	3.059	3.278	3.511	3.759
9	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358	2.558	2.773	3.004	3.252	3.518	3.803	4.108	4.435
10	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594	2.839	3.106	3.395	3.707	4.046	4.411	4.807	5.234
11	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853	3.152	3.479	3.836	4.226	4.652	5.117	5.624	6.176
12	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138	3.498	3.896	4.335	4.818	5.350	5.936	6.580	7.288
13	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452	3.883	4.363	4.898	5.492	6.153	6.886	7.699	8.599
14	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797	4.310	4.887	5.535	6.261	7.076	7.988	9.007	10.147
15	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177	4.785	5.474	6.254	7.138	8.137	9.266	10.539	11.974
16	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595	5.311	6.130	7.067	8.137	9.358	10.748	12.330	14.129
17	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054	5.895	6.866	7.986	9.276	10.761	12.468	14.426	16.672
18	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560	6.544	7.690	9.024	10.575	12.375	14.463	16.879	19.673
19	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116	7.263	8.613	10.197	12.056	14.232	16.777	19.748	23.214
20	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.727	8.062	9.646	11.523	13.743	16.367	19.461	23.106	27.393
21	1.860	2.279	2.786	3.400	4.141	5.034	6.109	7.400	8.949	10.804	13.021	15.668	18.822	22.574	27.034	32.324
22	1.916	2.370	2.925	3.604	4.430	5.437	6.659	8.140	9.934	12.100	14.714	17.861	21.645	26.186	31.629	38.142
23	1.974	2.465	3.072	3.820	4.741	5.871	7.258	8.954	11.026	13.552	16.627	20.362	24.891	30.376	37.006	45.008
24	2.033	2.563	3.225	4.049	5.072	6.341	7.911	9.850	12.239	15.179	18.788	23.212	28.625	35.236	43.297	53.109
25	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.835	13.585	17.000	21.231	26.462	32.919	40.874	50.658	62.669

Exhibit A8-4. **Future Value of an Annuity of $1 Table**

Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.030	2.040	2.050	2.060	2.070	2.080	2.090	2.100	2.110	2.120	2.130	2.140	2.150	2.160	2.170	2.180
3	3.091	3.122	3.153	3.184	3.215	3.246	3.278	3.310	3.342	3.374	3.407	3.440	3.473	3.506	3.539	3.572
4	4.184	4.246	4.310	4.375	4.440	4.506	4.573	4.641	4.710	4.779	4.850	4.921	4.993	5.066	5.141	5.215
5	5.309	5.416	5.526	5.637	5.751	5.867	5.985	6.105	6.228	6.353	6.480	6.610	6.742	6.877	7.014	7.154
6	6.468	6.633	6.802	6.975	7.153	7.336	7.523	7.716	7.913	8.115	8.323	8.536	8.754	8.977	9.207	9.442
7	7.662	7.898	8.142	8.394	8.654	8.923	9.200	9.487	9.783	10.089	10.405	10.730	11.067	11.414	11.772	12.142
8	8.892	9.214	9.549	9.897	10.260	10.637	11.028	11.436	11.859	12.300	12.757	13.233	13.727	14.240	14.773	15.327
9	10.159	10.583	11.027	11.491	11.978	12.488	13.021	13.579	14.164	14.776	15.416	16.085	16.786	17.519	18.285	19.086
10	11.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937	16.722	17.549	18.420	19.337	20.304	21.321	22.393	23.521
11	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531	19.561	20.655	21.814	23.045	24.349	25.733	27.200	28.755
12	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.384	22.713	24.133	25.650	27.271	29.002	30.850	32.824	34.931
13	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523	26.212	28.029	29.985	32.089	34.352	36.786	39.404	42.219
14	17.086	18.292	19.599	21.015	22.550	24.215	26.019	27.975	30.095	32.393	34.883	37.581	40.505	43.672	47.103	50.818
15	18.599	20.024	21.579	23.276	25.129	27.152	29.361	31.772	34.405	37.280	40.417	43.842	47.580	51.660	56.110	60.965
16	20.157	21.825	23.657	25.673	27.888	30.324	33.003	35.950	39.190	42.753	46.672	50.980	55.717	60.925	66.649	72.939
17	21.762	23.698	25.840	28.213	30.840	33.750	36.974	40.545	44.501	48.884	53.739	59.118	65.075	71.673	78.979	87.068
18	23.414	25.645	28.132	30.906	33.999	37.450	41.301	45.599	50.396	55.750	61.725	68.394	75.836	84.141	93.406	103.740
19	25.117	27.671	30.539	33.760	37.379	41.446	46.018	51.159	56.939	63.440	70.749	78.969	88.212	98.603	110.285	123.414
20	26.870	29.778	33.066	36.786	40.995	45.762	51.160	57.275	64.203	72.052	80.947	91.025	102.444	115.380	130.033	146.628
21	28.676	31.969	35.719	39.993	44.865	50.423	56.765	64.002	72.265	81.699	92.470	104.768	118.810	134.841	153.139	174.021
22	30.537	34.248	38.505	43.392	49.006	55.457	62.873	71.403	81.214	92.503	105.491	120.436	137.632	157.415	180.172	206.345
23	32.453	36.618	41.430	46.996	53.436	60.893	69.532	79.543	91.148	104.603	120.205	138.297	159.276	183.601	211.801	244.487
24	34.426	39.083	44.502	50.816	58.177	66.765	76.790	88.497	102.174	118.155	136.831	158.659	184.168	213.978	248.808	289.494
25	36.459	41.646	47.727	54.865	63.249	73.106	84.701	98.347	114.413	133.334	155.620	181.871	212.793	249.214	292.105	342.603

Exhibit A8-5. **Present Value of $1 Table**

Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
1	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847
2	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718
3	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609
4	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516
5	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437
6	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370
7	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314
8	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266
9	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225
10	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191
11	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162
12	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137
13	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116
14	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099
15	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084
16	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071
17	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060
18	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051
19	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043
20	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037
21	0.538	0.439	0.359	0.294	0.242	0.199	0.164	0.135	0.112	0.093	0.077	0.064	0.053	0.044	0.037	0.031
22	0.522	0.422	0.342	0.278	0.226	0.184	0.150	0.123	0.101	0.083	0.068	0.056	0.046	0.038	0.032	0.026
23	0.507	0.406	0.326	0.262	0.211	0.170	0.138	0.112	0.091	0.074	0.060	0.049	0.040	0.033	0.027	0.022
24	0.492	0.390	0.310	0.247	0.197	0.158	0.126	0.102	0.082	0.066	0.053	0.043	0.035	0.028	0.023	0.019
25	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092	0.074	0.059	0.047	0.038	0.030	0.024	0.020	0.016

Exhibit A8-10. **Present Value of an Annuity of $1 Table**

Period	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
1	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847
2	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566
3	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174
4	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690
5	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127
6	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498
7	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812
8	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078
9	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303
10	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494
11	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656
12	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793
13	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910
14	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008
15	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092
16	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162
17	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222
18	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273
19	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316
20	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353
21	15.415	14.029	12.821	11.764	10.836	10.017	9.292	8.649	8.075	7.562	7.102	6.687	6.312	5.973	5.665	5.384
22	15.937	14.451	13.163	12.042	11.061	10.201	9.442	8.772	8.176	7.645	7.170	6.743	6.359	6.011	5.696	5.410
23	16.444	14.857	13.489	12.303	11.272	10.371	9.580	8.883	8.266	7.718	7.230	6.792	6.399	6.044	5.723	5.432
24	16.936	15.247	13.799	12.550	11.469	10.529	9.707	8.985	8.348	7.784	7.283	6.835	6.434	6.073	5.746	5.451
25	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077	8.422	7.843	7.330	6.873	6.464	6.097	5.766	5.467

[i] Source: Best Buy Corporation, January 2009.

[ii] Source: Best Buy Website, January 2009