

other patterns. Different projects may emphasize different parts of the SDLC or approach the SDLC phases in different ways, but all projects have elements of these four phases.

For now, there are two important points to understand about the SDLC. First, you should get a general sense of the phases and steps that IS projects move through and some of the techniques that produce certain deliverables. In this section, we provide an overview of the phases, steps, and some of the techniques that are used to accomplish the steps. Second, it is important to understand that the SDLC is a process of *gradual refinement*. The deliverables produced in the analysis phase provide a general idea what the new system will do. These deliverables are used as input to the design phase, which then refines them to produce a set of deliverables that describes in much more detailed terms exactly how the system should be built. These deliverables in turn are used in the implementation phase to guide the creation of the actual system. Each phase refines and elaborates on the work done previously.

## Planning

The *planning phase* is the fundamental process of understanding *why* an information system should be built and determining how the project team will go about building it. It has two steps:

1. During *project initiation*, the system's business value to the organization is identified—how will it lower costs or increase revenues? Most ideas for new systems come from outside the IS area (from the marketing department, accounting department, etc.) in the form of a *system request*. A *system request* presents a brief summary of a business need, and it explains how a system that supports the need will create business value. The IS department works together with the person or department generating the request (called the *project sponsor*) to conduct a *feasibility analysis*. The *feasibility analysis* examines key aspects of the proposed project:
  - The technical feasibility (Can we build it?)
  - The economic feasibility (Will it provide business value?)
  - The organizational feasibility (If we build it, will it be used?)

The system request and feasibility analysis are presented to an information systems *approval committee* (sometimes called a *steering committee*), which decides whether the project should be undertaken.

2. Once the project is approved, it enters *project management*. During project management, the *project manager* creates a *work plan*, staffs the project, and puts techniques in place to help the project team control and direct the project through the entire SDLC. The deliverable for project management is a *project plan* that describes how the project team will go about developing the system.

## Analysis

The *analysis phase* answers the questions of *who* will use the system, *what* the system will do, and *where* and *when* it will be used. (See Figure 1-3.) During this phase, the project team investigates any current system(s), identifies improvement

opportunities, and develops a concept for the new system. This phase has three steps:

1. An *analysis strategy* is developed to guide the project team's efforts. Such a strategy usually includes a study of the current system (called the *as-is system*) and its problems, and envisioning ways to design a new system (called the *to-be system*).
2. The next step is *requirements gathering* (e.g., through interviews, group workshops, or questionnaires). The analysis of this information—in conjunction with input from the project sponsor and many other people—leads to the development of a concept for a new system. The system concept is then used as a basis to develop a set of business *analysis models* that describes how the business will operate if the new system were developed. The set typically includes models that represent the data and processes necessary to support the underlying business process.
3. The analyses, system concept, and models are combined into a document called the *system proposal*, which is presented to the project sponsor and other key decision makers (e.g., members of the approval committee) who will decide whether the project should continue to move forward.

The system proposal is the initial deliverable that describes what business requirements the new system should meet. Because it is really the first step in the design of the new system, some experts argue that it is inappropriate to use the term *analysis* as the name for this phase; some argue a better name would be *analysis and initial design*. Because most organizations continue to use the name *analysis* for this phase, we will use it in this book as well. It is important to remember, however, that the deliverable from the analysis phase is both an analysis and a high-level initial design for the new system.

## Design

The *design phase* decides *how* the system will operate in terms of the hardware, software, and network infrastructure that will be in place; the user interface, forms, and reports that will be used; and the specific programs, databases, and files that will be needed. Although most of the strategic decisions about the system are made in the development of the system concept during the analysis phase, the steps in the design phase determine exactly how the system will operate. The design phase has four steps:

1. The *design strategy* must be determined. This clarifies whether the system will be developed by the company's own programmers, whether its development will be outsourced to another firm (usually a consulting firm), or whether the company will buy an existing software package.
2. This leads to the development of the basic *architecture design* for the system that describes the hardware, software, and network infrastructure that will be used. In most cases, the system will add to or change the infrastructure that already exists in the organization. The *interface design* specifies how the users will move through the system (e.g., by navigation methods such as menus and on-screen buttons) and the forms and reports that the system will use.

3. The *database and file specifications* are developed. These define exactly what data will be stored and where they will be stored.
4. The analyst team develops the *program design*, which defines the programs that need to be written and exactly what each program will do.

This collection of deliverables (architecture design, interface design, database and file specifications, and program design) is the *system specification* that is used by the programming team for implementation. At the end of the design phase, the feasibility analysis and project plan are reexamined and revised, and another decision is made by the project sponsor and approval committee about whether to terminate the project or continue. (See Figure 1-3.)

## Implementation

The final phase in the SDLC is the *implementation phase*, during which the system is actually built (or purchased, in the case of a packaged software design and installed). This is the phase that usually gets the most attention, because for most systems it is the longest and most expensive single part of the development process. This phase has three steps:

1. System *construction* is the first step. The system is built and tested to ensure that it performs as designed. Since the cost of fixing bugs can be immense, testing is one of the most critical steps in implementation. Most organizations spend more time and attention on testing than on writing the programs in the first place.
2. The system is installed. *Installation* is the process by which the old system is turned off and the new one is turned on. There are several approaches that may be used to convert from the old to the new system. One of the most important aspects of conversion is the *training plan*, used to teach users how to use the new system and help manage the changes caused by the new system.
3. The analyst team establishes a *support plan* for the system. This plan usually includes a formal or informal post-implementation review, as well as a systematic way for identifying major and minor changes needed for the system.

## PROJECT IDENTIFICATION AND INITIATION

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Where do project ideas come from? A project is identified when someone in the organization identifies a *business need* to build a system. Examples of business needs include supporting a new marketing campaign, reaching out to a new type of customer, or improving interactions with suppliers. Sometimes, needs arise from some kind of “pain” within the organization, such as a drop in market share, poor customer service levels, unacceptable product defect rates, or increased competition. New business initiatives and strategies may be created and a system to support them is required, or a merger or acquisition may require systems to be integrated.

Business needs also can surface when the organization identifies unique and competitive ways of using IT. Many organizations keep an eye on *emerging technology*, which is technology that is still being developed and not yet viable for

widespread business use. For example, if companies stay abreast of technological advances such as cloud computing, RFID (radio frequency identification), or Web 2.0, they can develop business strategies that leverage the capabilities of these technologies and introduce them into the marketplace as a *first mover*. Ideally, companies can take advantage of this first mover position by making money and continuing to innovate while competitors trail behind.

Today, many new information system projects grow out of *business process management (BPM)* initiatives. BPM is a methodology used by organizations to continuously improve end-to-end business processes. Business process management can be applied to internal organizational processes and to processes spanning multiple business partners. By studying and improving their underlying business processes, organizations can achieve several important benefits, including:

- enhanced process agility, giving the organization the ability to adapt more rapidly and effectively to a changing business environment;
- improved process alignment with industry “best practices”; and
- increased process efficiencies as costs are identified and eliminated from process workflows.

BPM generally follows a continuous cycle of systematically creating, assessing, and altering business processes. Business analysts, with their in-depth business knowledge, play a particularly important role in business process management by:

1. defining and mapping the steps in a business process,
2. creating ways to improve on steps in the process that add value,
3. finding ways to eliminate or consolidate steps in the process that don’t add value,
4. creating or adjusting electronic workflows to match the improved process maps.

The last step is particularly relevant to our discussion since the need for information systems projects is frequently identified here. In fact, the automation of business processes (termed *Business Process Automation*), is the foundation of many information technology systems. In these situations, technology components are used to complement or substitute for manual information management processes with the intent of gaining cost efficiencies.

BPM practitioners recognize, however, that it is not always advisable to just “pave the cow paths” by simply adding automation to speed up existing processes (step 4 above). In many situations, *Business Process Improvement* results from studying the business processes, creating new, redesigned processes to improve the process workflows, and/or utilizing new technologies enabling new process structures (steps 2, 3, and 4 above). For example, could a retail store’s checkout process be redesigned along the lines of the EZPass toll collection system on highways? Could customers check out and pay with their mobile devices while clerks simply review the contents of the customer’s shopping bag?

Projects with a goal of business process improvement make moderate changes to the organization’s operations, and can improve efficiency (i.e., doing things right) and improve effectiveness (i.e., doing the right things). These types of projects involve more risk than business process automation projects since more significant changes are made to the organization’s operations.

Business Process Management may also reveal the need for the complete revamping of the organization’s business processes, termed *Business Process*

**CONCEPTS****1-B SUCCESS FROM FAILURE . . . EVENTUALLY****IN ACTION**

A project to streamline the work of the Commonwealth of Massachusetts Senate and House of Representatives ended in failure. Ed Bell, veteran CIO from the financial services industry, was hired as a consultant to assess the failed project and advise how to proceed.

After studying the situation, Bell recommended stepping back and re-thinking the entire situation. Bell embarked on a project that would create a platform for the future and integrate all the workflow processes of the Massachusetts Senate and House. Having just experienced a project failure, legislative leaders and their staffs were more open-minded to the changes Bell proposed. Bell emphasized educating the senior leadership team on what IT does, what a software development life cycle is, what the roles of a project involve, and stressed that "we

are in this together, or we fail together." In addition, it was a time of relative political harmony—both the House and Senate got along.

Via an intranet, the new system provides workflow alerts and to-do lists, so legislators know what is required of them as bills pass through the legislative process. There is also a completely revamped public website that will enable the public to stay informed of legislative action nearly real time.

Bell recognized that the legislative process is built on relationships and connections. His vision for the system was not to try and change the way the legislative process works, but to complement it.

Linda Tucci, "Business process automation for the business' sake." SearchCIO.com, Sept. 30, 2010.

*Reengineering (BPR).* BPR means changing the fundamental way in which the organization operates—"obliterating" the current way of doing business and making major changes to take advantage of new ideas and new technology. As you might expect, BPR projects involve substantial risk due to the significant organizational and operational changes that result. Top management support and careful management are critical in these fairly rare types of projects.

Both IT people (i.e., the information systems experts) and business people (i.e., the subject matter experts) should work closely together to find ways for technology to support business needs. In this way, organizations can leverage the exciting technologies available while ensuring that projects are based upon real business objectives such as increasing sales, improving customer service, and decreasing operating expenses. Ultimately, information systems need to affect the organization's bottom line (in a positive way!).

When a strong business need for an information system is recognized, often as a result of BPM, a person (or group) who has an interest in the system's success typically steps forward. We call this person (or group) the *project sponsor*. Often, the project sponsor develops the initial vision of the new system. The project sponsor works throughout the SDLC to make sure that the project is moving in the right direction from the perspective of the business and serves as the primary point of contact for the project team. Usually, the sponsor of the project is from a business function such as marketing, accounting, or finance; however, members of the IT area also can sponsor or cosponsor a project.

The size or scope of the project often determines the kind of sponsor who is involved. A small, departmental system might be sponsored by a single manager; however, a large, organizational initiative might be sponsored by the entire senior management team and even the CEO. If a project is primarily technical in nature (e.g., improvements to the existing IT infrastructure or research into the viability of an emerging technology), then sponsorship from IT is appropriate. When projects

## YOUR TURN

## 1-2 IMPLEMENTING A SATELLITE DATA NETWORK

A major retail store recently spent \$24 million dollars on a large private satellite communication system that provides state-of-the-art voice, data, and video transmission between stores and regional headquarters. When an item gets sold, the scanner software updates the inventory system in real time. As a result, store transactions are passed on to regional and national headquarters instantly, which keeps inventory records up to date. One of the store's major competitors has an older system in which transactions are uploaded at the end of a business day. The first company feels that its method of instant communication and feedback allows it to react more quickly to changes in the market, giving the company a competitive advantage. For example, if an early winter snowstorm causes stores across the upper

Midwest to start selling high-end (and high-profit) snow throwers quite quickly, the company's nearest warehouse can prepare next-day shipments to maintain a good inventory balance, while the competitor may not move quite as quickly and thus lose out on such quick inventory turnover.

## QUESTIONS:

1. Do you think a \$24 million investment in a private satellite communication system could be justified by a cost-benefit analysis? Could this be done with a standard communication line (with encryption)?
2. How might the competitor attempt to close the "information gap" in this example?

have great importance to the business, yet are technically complex, joint sponsorship by both the business and IT functions may be necessary.

The business need drives the high-level *business requirements* for the system. Business requirements describe the reasons for developing the system and outline the benefits it will provide the organization. These requirements need to be explained at a high level so that the approval committee and, ultimately, the project team understand what the business expects from the final product. Business requirements summarize the features and capabilities the information system will have to include, such as the ability to collect customer orders online or the ability for suppliers to receive inventory information as orders are placed and sales are made.

The project sponsor has the insights needed to determine the *business value* that will be gained from the system, in both tangible and intangible ways. *Tangible value* can be quantified and measured easily (e.g., 2% reduction in operating costs). An *intangible* value results from an intuitive belief that the system provides important, but hard-to-measure, benefits to the organization (e.g., improved customer service, a better competitive position).

Once the project sponsor identifies a project that meets an important business need and he or she can identify the business requirements and business value of the system, it is time to formally initiate the project. In most organizations, project initiation begins by preparing a *system request*.

### System Request

A *system request* is a document that describes the business reasons for building a system and the value that the system is expected to provide. The project sponsor usually completes this form as part of a formal system project selection process within the organization. Most system requests include five elements: project sponsor, business need, business requirements, business value, and special issues. (See Figure 1-4.) The *sponsor* describes the person who will serve as the primary contact

Element	Description	Examples
Project Sponsor	The person who initiates the project and who serves as the primary point of contact for the project on the business side	Several members of the finance department Vice president of marketing IT manager Steering committee CIO CEO
Business Need	The business-related reason for initiating the system	Increase sales Improve market share Improve access to information Improve customer service Decrease product defects Streamline supply acquisition processes
Business Requirements	The business capabilities that the system will provide	Provide online access to information Capture customer demographic information Include product search capabilities Produce management reports Include online user support
Business Value	The benefits that the system will create for the organization	3% increase in sales 1% increase in market share Reduction in headcount by 5*FTEs \$200,000 cost savings from decreased supply costs \$150,000 savings from removal of existing system
Special Issues or Constraints	Issues that are relevant to the implementation of the system that need to be known by the approval committee	Government-mandated deadline for May 30 System needed in time for the Christmas holiday season Top-level security clearance needed by project team to work with data

\* = Full-time equivalent

**FIGURE 1-4**

Elements of the System Request Form

## CONCEPTS

### IN ACTION

## 1-C INTERVIEW WITH DON HALLACY, PRESIDENT, TECHNOLOGY SERVICES, SPRINT CORPORATION

At Sprint, network projects originate from two vantage points—IT and the business units. IT projects usually address infrastructure and support needs. The business-unit projects typically begin after a business need is identified locally, and a business group informally collaborates with IT regarding how a solution can be delivered to meet customer expectations.

Once an idea is developed, a more formal request process begins, and an analysis team is assigned to investigate and validate the opportunity. This team includes members from the user community and IT, and they scope out at a high level what the project will do; create estimates

for technology, training, and development costs; and create a business case. This business case contains the economic value added and the net present value of the project.

Of course, not all projects undergo this rigorous process. The larger projects require more time to be allocated to the analysis team. It is important to remain flexible and not let the process consume the organization. At the beginning of each budgetary year, specific capital expenditures are allocated for operational improvements and maintenance. Moreover, this money is set aside to fund quick projects that deliver immediate value without going through the traditional approval process. *Don Hallacy*

for the project, and the *business need* presents the reasons prompting the project. The *business requirements* of the project refer to the business capabilities that the system will need to have, and the *business value* describes the benefits that the organization should expect from the system. *Special issues* are included on the document as a catchall category for other information that should be considered in assessing the project. For example, the project may need to be completed by a specific deadline. Project teams need to be aware of any special circumstances that could affect the outcome of the system.

The completed system request is submitted to the *approval committee* for consideration. This approval committee could be a company steering committee that meets regularly to make information systems decisions, a senior executive who has control of organizational resources, or any other decision-making body that governs the use of business resources. The committee reviews the system request and makes an initial determination, based on the information provided, of whether to investigate the proposed project or not. If so, the next step is to conduct a feasibility analysis.

### Applying the Concepts at Tune Source

Throughout the book, we will apply the concepts in each chapter to a fictitious company called Tune Source. For example, in this section, we will illustrate the creation of a system request. Tune Source is a company headquartered in southern California. Tune Source is the brainchild of three entrepreneurs with ties to the music industry: John Margolis, Megan Taylor, and Phil Cooper. Originally, John and Phil partnered to open a number of brick and mortar stores in southern California specializing in hard-to-find and classic jazz, rock, country, and folk recordings. Megan soon was

YOUR  
TURN

### 1-3 Too Much Paper, Part 1

The South Dakota Department of Labor, Workers' Compensation division was sinking under a load of paper files. As a state agency which ascertains that employees are treated fairly when they are injured on the job, the agency had a plethora of paper files and filing cabinets. If a person (or company) called to see the status of an injury claim, the clerk who received the call would have to take a message, get the paper file, review the status, and call the person back. Files were stored in huge filing cabinets and were entered by year and case number (for example, the 415th person injured in 2008 would be in a file numbered 08-415). But most callers did not remember the file number and would give their name and address and the date of injury. The clerk would look in a spiral notebook for the last name around the date that was given—and then find the file number to retrieve the folder. Some folders

were small—possibly documenting a minor cut or minor injury, and the employee was back to work after a brief treatment period. Other folders could be very large, with numerous medical reports from several doctors verifying the extent of a serious injury and treatment (such as an arm amputation). A digital solution was suggested—reports could be submitted online via a secure website. Medical reports could be submitted electronically, either as a pdf file or as a faxed digital file. This solution would also mean that the clerk taking the phone call could query the database by the person's name and access the information in a matter of seconds.

**QUESTION:**

Prepare a systems request for this project. Fill in as much as you can on the basis of the information provided.

invited to join the partnership because of her contacts and knowledge of classical music. Tune Source quickly became known as the place to go to find rare audio recordings. Annual sales last year were \$40 million with annual growth at about 3%–5% per year.

**Background** John, Megan, and Phil, like many others in the music industry, watched with alarm the rise of music-sharing websites like Napster, as music consumers shared digital audio files without paying for them, denying artists and record labels royalties associated with sales. Once the legal battle over copyright infringement was resolved and Napster was shut down, the partners set about establishing agreements with a variety of industry partners in order to offer a legitimate digital music download resource for customers in their market niche. Phil has asked Carly Edwards, a rising star in the Tune Source marketing department, to spearhead the digital music download project.

Tune Source currently has a website that enables customers to search for and purchase CDs. This site was initially developed by an Internet consulting firm and is hosted by a prominent local Internet Service Provider (ISP) in Los Angeles. The IT department at Tune Source has become experienced with Internet technology as it has worked with the ISP to maintain the site.

**System Request** At Tune Source, new IT projects are reviewed and approved by a project steering committee that meets quarterly. The committee has representatives from IT as well as from the major areas of the business. Carly's first step was to prepare a system request for the committee.

Figure 1-5 shows the system request she prepared. The project sponsor is Carly, and the business needs are to increase sales and provide a music download capability demanded by a very competitive marketplace. Notice that the need does not focus on the technology associated with the project. The emphasis is on the business aspects: increasing sales and maintaining a competitive position in the company's market.

In the system request, the project sponsor focuses on describing his or her vision of the business requirements at a very high level. Carly has expressed a clear vision of how this system will affect Tune Source: sales of individual music downloads, revenue from customer subscriptions, sales from cross-selling of CDs, and sales of music download gift cards. Carly acknowledges customer demand for this capability and also recognizes the need to respond to this demand in order to retain the business of its loyal customer base.

The estimates of tangible value were difficult to develop, since this venture is completely new to Tune Source. To prepare for this, Carly had several of her staff members conduct both an in-store customer survey and an online customer survey to assess the customers' interest in individual music downloads, subscription programs, and gift cards. The surveys also attempted to gauge the customers' price sensitivity for these offerings.

From the survey results, Carly and her staff developed a range of sales projections for the various revenue streams: a high-level estimate, a medium-level estimate, and low-level estimate. They also developed probability assessments for each of these outcomes, settling on a 25% likelihood for the high-level estimate, a 60% likelihood for the medium-level estimate, and a 15% likelihood for the low-level estimate. Based on the sales projections and the probability estimates, a weighted average estimated sales figure was computed for each revenue stream.

System Request—Digital Music Download Project	
<b>Project Sponsor:</b> Carly Edwards, Assistant Vice President, Marketing	
<b>Business Need:</b> This project has been initiated to increase sales by creating the capability of selling digital music downloads to customers through kiosks in our stores, and over the Internet using our website.	
<b>Business Requirements:</b> Using the Web or in-store kiosks, customers will be able to search for and purchase digital music downloads. The specific functionality that the system should have includes the following: <ul style="list-style-type: none"> <li>• Search for music in our digital music archive.</li> <li>• Listen to music samples.</li> <li>• Purchase individual downloads at a fixed fee per download.</li> <li>• Establish a customer subscription account permitting unlimited downloads for a monthly fee.</li> <li>• Purchase music download gift cards.</li> </ul>	
<b>Business Value:</b> We expect that Tune Source will increase sales by enabling existing customers to purchase specific digital music tracks and by reaching new customers who are interested in our unique archive of rare and hard-to-find music. We expect to gain a new revenue stream from customer subscriptions to our download services. We expect some increase in cross-selling, as customers who have downloaded a track or two of a CD decide to purchase the entire CD in a store or through our website. We also expect a new revenue stream from the sale of music download gift cards.	
Conservative estimates of tangible value to the company include the following: <ul style="list-style-type: none"> <li>• \$757,500 in sales from individual music downloads</li> <li>• \$950,000 in sales from customer subscriptions</li> <li>• \$205,000 in additional in-store or website CD sales</li> <li>• \$153,000 in sales from music download gift cards</li> </ul>	
<b>Special Issues or Constraints:</b> <ul style="list-style-type: none"> <li>• The marketing department views this as a strategic system. The ability to offer digital music downloads is critical in order to remain competitive in our market niche. Our music archive of rare and hard-to-find music is an asset that is currently underutilized.</li> <li>• Many of our current loyal customers have been requesting this capability, and we need to provide this service or face the loss of these customers' business.</li> <li>• Because customers have a number of music download options available to them elsewhere, we need to bring this system to market as soon as possible.</li> </ul>	

**FIGURE 1-5**  
System Request for Tune Source

YOUR  
TURN

#### 1-4 CREATE A SYSTEM REQUEST

Think about your own university or college and choose an idea that could improve student satisfaction with the course enrollment process. Currently, can students enroll for classes from anywhere? How long does it take? Are directions simple to follow? Is online help available?

Next, think about how technology can help support your idea. Would you need completely new technology? Can the current system be changed?

##### QUESTION:

Create a system request that you could give to the administration that explains the sponsor, business need, business requirements, and potential value of the project. Include any constraints or issues that should be considered.

**FIGURE 1-6**  
Sales Projections for Tune Source  
Digital Music Download Project

	Sales Projections			
	Individual Downloads	Subscriptions	Cross-Selling of CDs	Gift Cards
High-level estimate (prob. = 25%)	\$900,000	\$1,100,000	\$250,000	\$180,000
Medium-level estimate (prob. = 60%)	750,000	950,000	200,000	150,000
Low-level estimate (prob. = 15%)	550,000	700,000	150,000	120,000
Weighted average expected sales	\$757,500	\$950,000	\$205,000	\$153,000

For example, for individual downloads,

$$\begin{aligned} \text{Expected sales} &= (900,000 * .25) + (750,000 * .60) + (550,000 * .15) \\ &= 225,000 + 450,000 + 82,500 \\ &= 757,500 \end{aligned}$$

These projections are summarized in Figure 1-6.

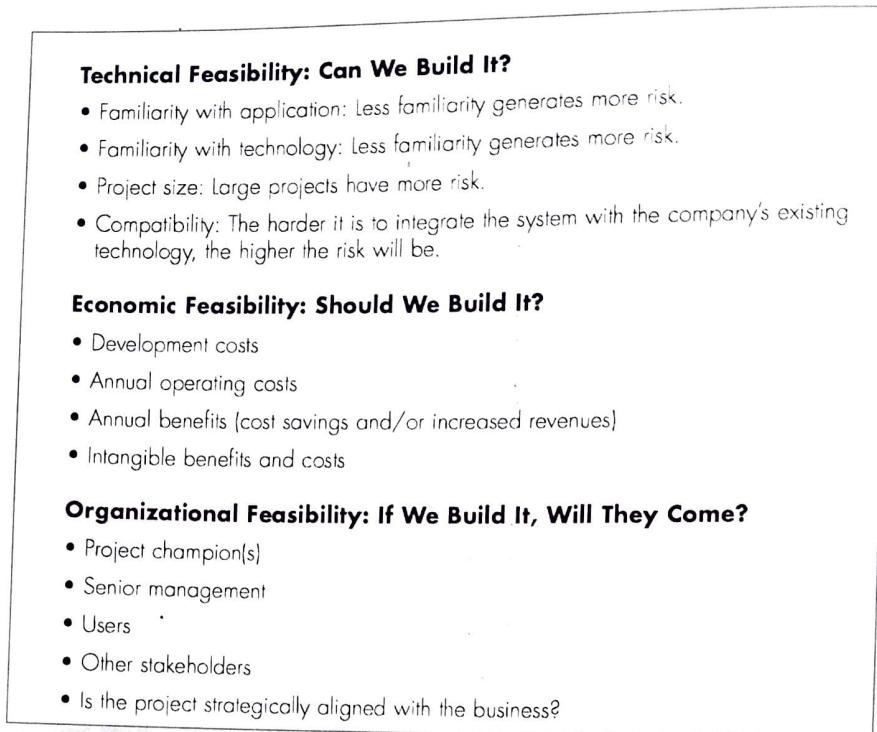
After analyzing the survey results, Carly and her staff were confident that the sales projections and probability estimates were as accurate as they could make them this early in the project. The completed system request is shown in Figure 1-5.

**Steering Committee Approval** Carly Edwards presented the system request for the digital music download project to the Tune Source project steering committee at its next meeting. Response to the request was uniformly positive. The strong interest in the project by John, Megan, and Phil, the company's top executives, helped to spur the committee's rapid approval of the project. Following approval of the system request, Jason Wells, a senior systems analyst in the IT department, was assigned to work with Carly to develop a preliminary feasibility analysis for the project.

## FEASIBILITY ANALYSIS

Once the need for the system and its business requirements have been defined, the approval committee may authorize the systems analyst to prepare a more detailed business case to better understand the proposed information system project. *Feasibility analysis* guides the organization in determining whether to proceed with the project. Feasibility analysis also identifies the important *risks* associated with the project that must be managed if the project is approved. As with the system request, each organization has its own process and format for the feasibility analysis, but most include techniques to assess three areas: technical feasibility, economic feasibility, and organizational feasibility (see Figure 1-7). The results of evaluating these three feasibility factors are combined into a *feasibility study* deliverable that is submitted to the approval committee at the end of project initiation.

You might wonder at the omission of the element of time as a risk factor for the project. While the time available for a project can certainly be a concern, we consider time to be a project management issue. We will discuss project management strategies that can be used when time is tight in Chapter 2.



**FIGURE 1-7**  
Feasibility Analysis Assessment Factors

Although we will discuss feasibility analysis now within the context of project initiation, most project teams will revise their feasibility study throughout the SDLC and revisit its contents at various checkpoints during the project. If at any point the project's risks and limitations outweigh its benefits, the project team may decide to cancel the project or make substantial revisions.

### Technical Feasibility

The first technique in the feasibility analysis is to assess the *technical feasibility* of the project, the extent to which the system can be successfully designed, developed, and installed by the IT group. Technical feasibility analysis is, in essence, a *technical risk analysis* that strives to answer the question: “*Can we build it?*”<sup>7</sup>

Many risks can endanger the successful completion of the project. First and foremost is the users' and analysts' *familiarity with the application*. When analysts are unfamiliar with the business application area, they have a greater chance of misunderstanding the users or missing opportunities for improvement. The risks increase dramatically when the users themselves are less familiar with an application, such as with the development of a system to support a new business innovation (e.g., Microsoft starting up a new Internet dating service). In general, the development of new systems is riskier than extensions to an existing system, because existing systems tend to be better understood.

*Familiarity with the technology* is another important source of technical risk. When a system will use technology that has not been used before *within the*

<sup>7</sup> We use the words “build it” in the broadest sense. Organizations can also choose to buy a commercial software package and install it, in which case the question might be “Can we select the right package and successfully install it?”

*organization*, there is a greater chance that problems and delays will occur because of the need to learn how to use the technology. Risk increases dramatically when the technology itself is new (e.g., web development using Ajax).

*Project size* is an important consideration, whether measured as the number of people on the development team, the length of time it will take to complete the project, or the number of distinct features in the system. Larger projects present more risk, because they are more complicated to manage and because there is a greater chance that some important system requirements will be overlooked or misunderstood. The extent to which the project is highly integrated with other systems (which is typical of large systems) can cause problems, because complexity is increased when many systems must work together.

Finally, project teams need to consider the *compatibility* of the new system with the technology that already exists in the organization. Systems rarely are built in a vacuum—they are built in organizations that have numerous systems already in place. New technology and applications need to be able to integrate with the existing environment for many reasons. They may rely on data from existing systems, they may produce data that feed other applications, and they may have to use the company's existing communications infrastructure. A new CRM system, for example, has little value if it does not use customer data found across the organization in existing sales systems, marketing applications, and customer service systems.

The assessment of a project's technical feasibility is not cut and dried, because in many cases, some interpretation of the underlying conditions is needed (e.g., how large does a project need to grow before it becomes less feasible?). One approach is to compare the project under consideration with prior projects undertaken by the organization. Another option is to consult with experienced IT professionals in the organization or with external IT consultants; often, they will be able to judge whether a project is feasible from a technical perspective.

## Economic Feasibility

The second element of a feasibility analysis is to perform an *economic feasibility* analysis (also called a *cost-benefit analysis*). This attempts to answer the question “*Should we build the system?*” Economic feasibility is determined by identifying costs and benefits associated with the system, assigning values to them, calculating future cash flows, and measuring the financial worthiness of the project. As a result of this analysis, the financial opportunities and risks of the project can be understood. Keep in mind that organizations have limited capital resources and multiple projects will be competing for funding. The more expensive the project, the more rigorous and detailed the analysis should be. Before illustrating this process with a detailed example, we first introduce the framework we will apply to evaluate project investments and the common assessment measures that are used.

**Cash Flow Analysis and Measures** IT projects commonly involve an initial investment that produces a stream of benefits over time, along with some ongoing support costs. Therefore, the value of the project must be measured over time. Cash flows, both inflows and outflows, are estimated over some future period. Then, these cash flows are evaluated using several techniques to judge whether the projected benefits justify incurring the costs.

A very basic cash flow projection is shown in Figure 1-8 to demonstrate these evaluation techniques. In this simple example, a system is developed in Year 0 (the

**FIGURE 1-8**  
Simple Cash Flow Projection

	Year 0	Year 1	Year 2	Year 3	Total
Total Benefits		45,000	50,000	57,000	152,000
Total Costs	100,000	10,000	12,000	16,000	138,000
③ Net Benefits (Total Benefits – Total Costs)	(100,000)	35,000	38,000	41,000	14,000
④ Cumulative Net Cash Flow	(100,000)	(65,000)	(27,000)	14,000	

current year) costing \$100,000. Once the system is operational, benefits and ongoing costs are projected over three years. In row 3 of this figure, net benefits are computed by subtracting each year's total costs from its total benefits. Finally, in row 4, we have computed a cumulative total of the net cash flows.

Two of the common methods for evaluating a project's worth can now be determined. Each of these calculations will be explained here:

**Return on Investment** The return on investment (ROI) is a calculation that measures the average rate of return earned on the money invested in the project. ROI is a simple calculation that divides the project's net benefits (total benefits – total costs) by the total costs. The ROI formula is:

$$\text{ROI} = \frac{\text{Total Benefits} - \text{Total Costs}}{\text{Total Costs}}$$

$$\text{ROI} = \frac{152,000 - 138,000}{138,000} = \frac{14,000}{138,000} = 10.14\%$$

A high ROI suggests that the project's benefits far outweigh the project's cost, although exactly what constitutes a "high" ROI is unclear. ROI is commonly used in practice; however, it is hard to interpret and should not be used as the only measure of a project's worth.

**Break-Even Point** Another common approach to measuring a project's worth is the break-even point. The *break-even point* (also called the *payback method*) is defined as the number of years it takes a firm to recover its original investment in the project from net cash flows. As shown in row 4 of Figure 1-8, the project's cumulative cash flow figure becomes positive during Year 3, so the initial investment is "paid back" over two years plus some fraction of the third year.

$$\text{BEP} = \frac{\text{Number of years of negative cash flow}}{\text{That year's Net Cash Flow}} + \frac{\text{That year's Net Cash Flow} - \text{That year's Cumulative Cash Flow}}{\text{That year's Net Cash Flow}}$$

Using the values in Figure 1-8, the BEP calculation is:

$$\text{BEP} = 2 + \frac{41,000 - 14,000}{41,000} = 2 + \frac{28,000}{41,000} = 2.68 \text{ years}$$

The break-even point is intuitively easy to understand and does give an indication of a project's liquidity, or the speed at which the project generates cash returns. Also, projects that produce higher returns early in the project's life are thought to be less risky, since we can anticipate near-term events with more accuracy than we can long-term events. The break-even point ignores cash flows that occur after the break-even point has been reached; therefore, it is biased against longer-term projects.

**Discounted Cash Flow Technique** The simple cash flow projection shown in Figure 1-8, and the return on investment and break-even point calculations all share the weakness of not recognizing the time value of money. In these analyses, the timing of cash flows is ignored. A dollar in Year 3 of the project is considered to be exactly equivalent to a dollar received in Year 1.

Discounted cash flows are used to compare the present value of all cash inflows and outflows for the project in today's dollar terms. The key to understanding present values is to recognize that if you had a dollar today, you could invest it and receive some rate of return on your investment. Therefore, a dollar received in the future is worth less than a dollar received today, since you forgo that potential return. If you have a friend who owes you \$100 today, but instead gives you that \$100 in three years—you've been had! Assuming you could have invested that dollar at a 10% rate of return, you'll be receiving the equivalent of \$75 in today's terms.

The basic formula to convert a future cash flow to its present value is:

$$PV = \frac{\text{Cash flow amount}}{(1 + \text{rate of return})^n} \quad \text{where } n \text{ is the year in which the cash flow occurs.}$$

The rate of return used in the present value calculation is sometimes called the required rate of return, or the cost of obtaining the capital needed to fund the project. Many organizations will have determined the appropriate rate of return to use when analyzing IT investments. The systems analyst should consult with the organization's finance department.

Using our previous illustration, \$100 received in 3 years with a required rate of return of 10% has a PV of \$75.13.

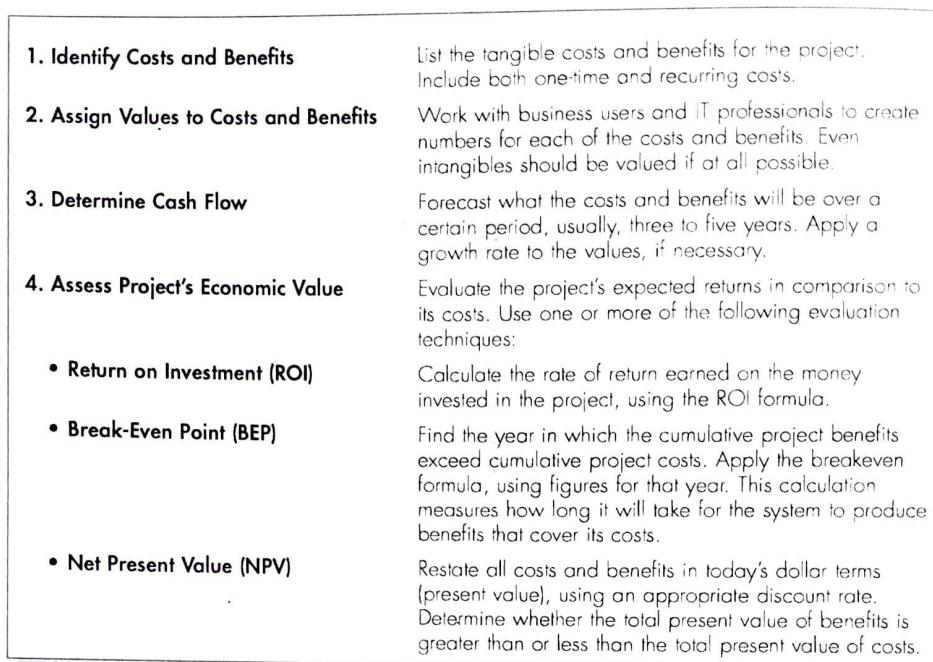
$$PV = \frac{100}{(1 + .10)^3} = \frac{100}{1.331} = 75.13$$

In Figure 1-9, the present value of the projected benefits and costs shown in Figure 1-8 have been calculated using a 10% required rate of return.

	Year 0	Year 1	Year 2	Year 3	Total
Total Benefits	45,000	50,000	55,000		
PV of Total Benefits	40,909	41,322	42,825	125,056	
Total Costs	100,000	10,000	12,000	16,000	
PV of Total Costs	100,000	9,091	9,917	12,021	131,029

**FIGURE 1-9**  
Discounted Cash Flow Projection

**FIGURE 1-10**  
Steps to Conduct an Economic Feasibility Analysis



**Net Present Value (NPV)** The NPV is simply the difference between the total present value of the benefits and the total present value of the costs.

$$\begin{aligned} \text{NPV} &= \sum \text{PV of Total Benefits} - \sum \text{PV of Total Costs} \\ &= \$125,056 - \$131,029 = (\$5,973) \end{aligned}$$

As long as the NPV is greater than zero, the project is considered economically acceptable. Unfortunately for this project, the NPV is less than zero, indicating that for a required rate of return of 10%, this project should not be accepted. The required rate of return would have to be something less than 6.65% before this project returns a positive NPV. This example illustrates the fact that sometimes the “naïve” techniques of ROI and BEP find that the project appears acceptable, but the more rigorous and financially correct NPV technique finds the project is actually unacceptable.

Figure 1-10 reviews the steps involved in performing an economic feasibility analysis. Each step will be illustrated by an example in the upcoming sections.

**Identify Costs and Benefits** The systems analyst's first task when developing an economic feasibility analysis is to identify the kinds of costs and benefits the system will have and list them along the left-hand column of a spreadsheet. Figure 1-11 lists examples of costs and benefits that may be included. The costs and benefits can be broken down into four categories: (1) development costs, (2) operational costs, (3) tangible benefits, and (4) intangibles. *Development costs* are those tangible expenses that are incurred during the creation of the system, such as salaries for the project team, hardware and software expenses, consultant fees, training, and office space and equipment. Development costs are usually thought of as one-time costs.

<b>Development Costs</b>		<b>Operational Costs</b>	
Development team salaries		Software upgrades	
Consultant fees		Software licensing fees	
<b>Tangible Benefits</b>		<b>Intangible Benefits</b>	
Increased sales		Increased market share	
Reductions in staff		Increased brand recognition	
Reductions in inventory		Higher quality products	
Reductions in IT costs		Improved customer service	
Better supplier prices		Better supplier relations	

**FIGURE 1-11**  
Example of Costs and Benefits  
for Economic Feasibility

*Operational costs* are those tangible costs that are required to operate the system, such as the salaries for operations staff, software licensing fees, equipment upgrades, and communications charges. Operational costs are usually thought of as ongoing costs.

*Tangible benefits* include revenue that the system enables the organization to collect, such as increased sales. In addition, the system may enable the organization to avoid certain costs, leading to another type of tangible benefit: cost savings. For example, if the system produces a reduction in needed staff, lower salary costs result. Similarly, a reduction in required inventory levels due to the new system produces lower inventory costs. In these examples, the reduction in costs is a tangible benefit of the new system.

Of course, a project also can affect the organization's bottom line by reaping *intangible benefits* or incurring *intangible costs*. Intangible costs and benefits are more difficult to incorporate into the economic feasibility analysis because they are based on intuition and belief rather than on "hard numbers." Nonetheless, they should be listed in the spreadsheet along with the tangible items.

**Assign Values to Costs and Benefits** Once the types of costs and benefits have been identified, the analyst needs to assign specific dollar values to them. This may seem impossible—How can someone quantify costs and benefits that haven't happened yet? And how can those predictions be realistic? Although this task is very difficult, you have to do the best you can to come up with reasonable numbers for all of the costs and benefits. Only then can the approval committee make an informed decision about whether or not to move ahead with the project.

The most effective strategy for estimating costs and benefits is to rely on the people who have the best understanding of them. For example, costs and benefits that are related to the technology or the project itself can be provided by the company's IT group or external consultants, and business users can develop the numbers associated with the business (e.g., sales projections, order levels). The company also can

consider past projects, industry reports, and vendor information, although these sources probably will be a bit less accurate. Likely, all of the estimates will be revised as the project proceeds.

If predicting a specific value for a cost or benefit is proving difficult, it may be useful to estimate a range of values for the cost or benefit and then assign a likelihood (probability) estimate to each value. With this information, an *expected value* for the cost or benefit can be calculated. Recall the calculations shown in Figure 1-6 in which the Tune Source marketing staff developed expected values for projected sales. As more information is learned during the project, the value estimates and the probability estimates can be revised, resulting in a revised expected value for the cost or benefit.

What about the *intangible* benefits and costs? Sometimes, it is acceptable to list intangible benefits, such as improved customer service, without assigning a dollar value. Other times, estimates have to be made regarding how much an intangible benefit is "worth." We suggest that you quantify intangible costs or benefits if at all possible. If you do not, how will you know if they have been realized? Suppose that a system claims to improve customer service. This benefit is intangible, but let's assume that the improvement in customer service will decrease the number of customer complaints by 10% each year over three years and that \$200,000 is currently spent on phone charges and phone operators who handle complaint calls. Suddenly, we have some very tangible numbers with which to set goals and measure the originally intangible benefit.

A detailed cost–benefit analysis is shown in Figure 1-12. In this example, benefits accrue because the project is expected to increase sales, reduce customer complaint calls, and lower inventory costs. For simplicity, all development costs are assumed to occur in the current year 2012, and all benefits and operational costs are assumed to begin when the system is implemented at the start of 2013, and continue through 2016. Notice that the customer service intangible benefit has been quantified, based on a decrease in customer complaint phone calls. The intangible benefit of being able to offer services that competitors currently offer was not quantified, but it was listed so that the approval committee will consider the benefit when assessing the system's economic feasibility.

## CONCEPTS

### 1-D INTANGIBLE VALUE AT CARLSON HOSPITALITY

#### IN ACTION

I conducted a case study at Carlson Hospitality, a global leader in hospitality services, encompassing more than 1300 hotel, resort, restaurant, and cruise ship operations in 79 countries. One of its brands, Radisson Hotels & Resorts, researched guest stay information and guest satisfaction surveys. The company was able to quantify how much of a guest's lifetime value can be attributed to his or her perception of the stay experience. As a result, Radisson knows how much of the collective future value of the enterprise is at stake, given the perceived

quality of the stay experience. Using this model, Radisson can confidently show that a 10% increase in customer satisfaction among the 10% of highest quality customers will capture a one-point market share for the brand. Each point in market share for the Radisson brand is worth \$20 million in additional revenue. *Barbara Wixom*

#### QUESTION:

How can a project team use this information to help determine the economic feasibility of a system?

	2012	2013	2014	2015	2016	Total
<b>Benefits</b>						
Increased sales		500,000	530,000	561,800	595,508	2,187,308
Reduction in customer complaint calls <sup>a</sup>		70,000	70,000	70,000	70,000	280,000
Reduced inventory costs		68,000	68,000	68,000	68,000	272,000
	<b>638,000</b>	<b>668,000</b>	<b>699,800</b>	<b>733,508</b>	<b>2,739,308</b>	
<b>Total Benefits<sup>b</sup></b>						
<b>Development Costs</b>						
2 servers @ \$125,000	250,000	0	0	0	0	250,000
Printer	100,000	0	0	0	0	100,000
Software licenses	34,825	0	0	0	0	34,825
Server software	10,945	0	0	0	0	10,945
Development labor	1,236,525	0	0	0	0	1,236,525
	<b>1,632,295</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,632,295</b>
<b>Total Development Costs</b>						
<b>Operational Costs</b>						
Hardware		50,000	50,000	50,000	50,000	200,000
Software		20,000	20,000	20,000	20,000	80,000
Operational labor		115,000	119,600	124,384	129,359	488,343
	<b>185,000</b>	<b>189,600</b>	<b>194,384</b>	<b>199,359</b>	<b>768,343</b>	
<b>Total Operational Costs</b>	<b>1,632,295</b>	<b>185,000</b>	<b>189,600</b>	<b>194,384</b>	<b>199,359</b>	<b>2,400,638</b>
<b>Total Costs</b>	<b>(1,632,295)</b>	<b>453,000</b>	<b>478,400</b>	<b>505,416</b>	<b>534,149</b>	<b>338,670</b>
<b>Total Benefits – Total Costs</b>	<b>(1,632,295)</b>	<b>(1,179,295)</b>	<b>(700,895)</b>	<b>(195,479)</b>	<b>338,670</b>	
<b>Cumulative Net Cash Flow</b>						
Return on Investment (ROI)	14.1%	(338,670/2,400,638)				
Break-even Point	3.37 years	[3 years of negative cumulative cash flow + [534,149 – 338,670]/534,149 = .37]				

<sup>a</sup> Customer service values are based on reduced costs of handling customer complaint phone calls.  
<sup>b</sup> An important yet intangible benefit will be the ability to offer services that our competitors currently offer.

**FIGURE 1-12**  
Cost-Benefit Analysis—Simple Cash Flow Method

**Determine Cash Flow** A formal cost-benefit analysis usually contains costs and benefits over a selected number of years (usually, three to five years) to show cash flow over time. (See Figures 1-8 and 1-12.) For example, Figure 1-12 lists the same amount for customer complaint calls, inventory costs, hardware, and software for all four years. Often, amounts are augmented by some rate of growth to adjust for inflation or business improvements, as shown by the 6% increase that is added to the sales numbers in the sample spreadsheet. Similarly, labor costs are assumed to increase at a 4% rate each year. Finally, totals are added to determine what the overall benefits and costs.

**Determine ROI** Figure 1-12 includes the ROI calculation for our example project. This project's ROI is calculated to be 14.1%.

**Determine BEP** Figure 1-12 also includes the BEP calculation for our example project. This project's BEP is calculated to be 3.37 years.

	2012	2013	2014	2015	2016	Total
<b>Benefits</b>						
Increased sales		500,000	530,000	561,800	595,508	
Reduction in customer complaint calls <sup>a</sup>		70,000	70,000	70,000	70,000	
Reduced inventory costs		68,000	68,000	68,000	68,000	
<b>Total Benefits<sup>b</sup></b>	<b>638,000</b>	<b>668,000</b>	<b>699,800</b>	<b>733,508</b>		
<b>Present Value Total Benefits</b>	<b>601,887</b>	<b>594,518</b>	<b>587,566</b>	<b>581,007</b>	<b>2,364,978</b>	
<b>Development Costs</b>						
2 Servers @ \$125,000	250,000	0	0	0	0	
Printer	100,000	0	0	0	0	
Software licenses	34,825	0	0	0	0	
Server software	10,945	0	0	0	0	
Development labor	1,236,525	0	0	0	0	
<b>Total Development Costs</b>	<b>1,632,295</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<b>Operational Costs</b>						
Hardware		50,000	50,000	50,000	50,000	
Software		20,000	20,000	20,000	20,000	
Operational labor		115,000	119,600	124,384	129,359	
<b>Total Operational Costs</b>	<b>185,000</b>	<b>189,600</b>	<b>194,384</b>	<b>199,359</b>		
<b>Total Costs</b>	<b>1,632,295</b>	<b>185,000</b>	<b>189,600</b>	<b>194,384</b>	<b>199,359</b>	
<b>Present Value Total Costs</b>	<b>1,632,295</b>	<b>174,528</b>	<b>168,743</b>	<b>163,209</b>	<b>157,911</b>	<b>2,296,686</b>
<b>NPV (PV Total Benefits – PV Total Costs)</b>						<b>68,292</b>

<sup>a</sup> Customer service values are based on reduced costs of handling customer complaint phone calls.  
<sup>b</sup> An important yet intangible benefit will be the ability to offer services that our competitors currently offer.

**FIGURE 1-13**  
Cost-Benefit Analysis—Discounted Cash Flow Method

**Determine NPV** In Figure 1-13, the present value of the costs and benefits has been calculated and added to our example spreadsheet, using a 6% rate of return. The NPV is simply the difference between the total present value of the benefits and the total present value of the costs. As long as the NPV is greater than zero, the project is considered economically viable. In this example, since NPV is \$68,292, the project should be accepted from an economic feasibility perspective.

### Organizational Feasibility

The final technique used for feasibility analysis is to assess the *organizational feasibility* of the system: how well the system ultimately will be accepted by its users and incorporated into the ongoing operations of the organization. There are many organizational factors that can have an impact on the project, and seasoned developers know that organizational feasibility can be the most difficult feasibility dimension to assess. In essence, an organizational feasibility analysis attempts to answer the question “If we build it, will they come?”

**CONCEPTS****IN ACTION****1-E RETURN ON INVESTMENT**

Many companies are undergoing *server virtualization*. This is the concept of putting multiple "virtual" servers onto one physical device. The pay-offs can be significant: fewer servers, less electricity, less generated heat, less air conditioning, less infrastructure and administration costs, increased flexibility, less physical presence (that is, smaller server rooms), faster maintenance of servers, and more. There are costs, of course, such as licensing the virtualization software, labor costs in establishing the virtual servers onto a physical device, labor costs in updating tables, and access. But determining

the return on investment can be a challenge. Some companies have lost money on server virtualization, while most would say that they have gained a positive return on investment but have not really quantified the results.

**QUESTIONS:**

1. How might a company really determine the return on investment for server virtualization?
2. Is this a project that a systems analyst might be involved in? Why or why not?

One way to assess the organizational feasibility of the project is to understand how well the goals of the project align with business objectives. *Strategic alignment* is the fit between the project and business strategy—the greater the alignment, the less risky the project will be, from an organizational feasibility perspective. For example, if the marketing department has decided to become more customer focused, then a CRM project that produces integrated customer information would have strong strategic alignment with marketing's goal. Many projects fail if the IT department alone initiates them and there is little or no alignment with business-unit or organizational strategies.

A second way to assess organizational feasibility is to conduct a *stakeholder analysis*.<sup>8</sup> A *stakeholder* is a person, group, or organization that can affect (or can be affected by) a new system. In general, the most important stakeholders in the introduction of a new system are the project champion, system users, and organizational management (see Figure 1-14), but systems sometimes affect other stakeholders as well. For example, the IS department can be a stakeholder of a system because IS jobs or roles may be changed significantly after the system's implementation. One key stakeholder—outside of the champion, users, and management—in Microsoft's project that embedded Internet Explorer as a standard part of Windows was the U.S. Department of Justice.

The *champion* is a high-level executive and is usually, but not always, the project sponsor who created the system request. The champion supports the project by providing time and resources (e.g., money) and by giving political support within the organization by communicating the importance of the system to other organizational decision makers. More than one champion is preferable because if the champion leaves the organization, the support could leave as well.

While champions provide day-to-day support for the system, *organizational management* also needs to support the project. Such management support conveys to

<sup>8</sup> A good book on stakeholder analysis that presents a series of stakeholder analysis techniques is R. O. Mason and I. I. Mitroff, *Challenging Strategic Planning Assumptions: Theory, Cases, and Techniques*, New York: John Wiley & Sons, 1981.

	Role	To Enhance Organizational Feasibility
<b>Champion</b>	A champion: <ul style="list-style-type: none"> <li>• Initiates the project</li> <li>• Promotes the project</li> <li>• Allocates his or her time to the project</li> <li>• Provides resources</li> </ul>	<ul style="list-style-type: none"> <li>• Make a presentation about the objectives of the project and the proposed benefits to those executives who will benefit directly from the system.</li> <li>• Create a prototype of the system to demonstrate its potential value.</li> </ul>
<b>Organizational Management</b>	Organizational managers: <ul style="list-style-type: none"> <li>• Know about the project</li> <li>• Budget enough money for the project</li> <li>• Encourage users to accept and use the system</li> </ul>	<ul style="list-style-type: none"> <li>• Make a presentation to management about the objectives of the project and the proposed benefits.</li> <li>• Market the benefits of the system, using memos and organizational newsletters.</li> <li>• Encourage the champion to talk about the project with his or her peers.</li> </ul>
<b>System Users</b>	Users: <ul style="list-style-type: none"> <li>• Make decisions that influence the project</li> <li>• Perform hands-on activities for the project</li> <li>• Ultimately determine whether the project is successful by using or not using the system</li> </ul>	<ul style="list-style-type: none"> <li>• Assign users official roles on the project team.</li> <li>• Assign users specific tasks to perform, with clear deadlines.</li> <li>• Ask for feedback from users regularly (e.g., at weekly meetings).</li> </ul>

**FIGURE 1-14**  
Important Stakeholders for Organizational Feasibility

the rest of the organization the belief that the system will make a valuable contribution and that necessary resources will be made available. Ideally, management should encourage people in the organization to use the system and to accept the many changes that the system will likely create.

A third important set of stakeholders is the *system users* who ultimately will use the system once it has been installed in the organization. Too often, the project team meets with users at the beginning of a project and then disappears until after the system is created. In this situation, rarely does the final product meet the expectations and needs of those who are supposed to use it, because needs change and users become savvier as the project progresses. User participation should be promoted throughout the development process to make sure that the final system will be accepted and used, by getting users actively involved in the development of the system (e.g., performing tasks, providing feedback, and making decisions).

The final feasibility study helps organizations make wiser investments regarding IS because it forces project teams to consider technical, economic, and organizational factors that can affect their projects. It protects IT professionals from criticism by keeping the business units educated about decisions and positioned as the leaders in the decision-making process. Remember—the feasibility study should be revised several times during the project at points where the project team makes critical decisions about the system (e.g., before the design begins). The final feasibility study can be used to support and explain the critical choices that are made throughout the SDLC.

### Applying the Concepts at Tune Source

The steering committee met and placed the digital music download project high on its list of projects.

**YOUR  
TURN****1-5 Too Much Paper, Part 2**

Review the description of the South Dakota workers' compensation project in Your Turn 1-3. There were legal hurdles to implementing a digital solution to handle workers' compensation claims. One hurdle was that the previous paper method had physical signatures from employees signing off that they had received treatment or that the doctor had signed off on medical treatment performed. How could such permissions be preserved and duplicated digitally?

In addition, some clerks were afraid that the digital solution might not work. What if they could not find an electronic file on the computer? What if a hard drive

crashed or the files were accidentally deleted? What if they could not retrieve the electronic file?

**QUESTIONS:**

1. What legal issues might arise from having only "digital signatures" or only electronic/paper copies of documents instead of physical documents? How do these issues affect the project's feasibility?
2. In terms of organizational feasibility and adoption, what might an analyst do to convince these clerks to adopt and use the new technology?

The next step was for Carly and Jason to develop the feasibility analysis. Figure 1-15 presents the executive summary page of the feasibility study: The report itself was about 10 pages long, and it provided additional detail and supporting documentation.

As shown in Figure 1-15, the project is somewhat risky from a technical perspective. Tune Source has minimal experience with the proposed application and the technology. One solution may be to hire a consultant to work with the IT department and to offer guidance.

The economic feasibility analysis includes the assumptions that Carly made in the system request. The summary spreadsheet that led to the values in the feasibility analysis has been included in Appendix 1A. Development costs are expected to be about \$280,000. This is a very rough estimate, as Jason has had to make some assumptions about the amount of time it will take to design and program the system. Nonetheless, the digital music download system appears to be very strong economically.

**YOUR  
TURN****1-6 Create a Feasibility Analysis**

Think about the idea that you developed in "Your Turn 1-4" to improve your university or college course enrollment process.

**QUESTIONS:**

1. List three things that influence the technical feasibility of the system.

2. List three things that influence the economic feasibility of the system.
3. List three things that influence the organizational feasibility of the system.
4. How can you learn more about the issues that affect the three kinds of feasibility?

### Digital Music Download Project Executive Summary

Carly Edwards and Jason Wells created the following feasibility analysis for the Tune Source Digital Music Download Project. The System Request is attached, along with the detailed feasibility study. The highlights of the feasibility analysis are as follows.

#### Technical Feasibility

The Digital Music Download system is feasible technically, although there is some risk.

*Tune Source's risk regarding familiarity with music download applications is moderately high.*

- The Marketing Department has little experience with a subscription-based business model.
- The IT department has strong knowledge of the company's existing Web-based CD sales system, but it has not worked with music downloads or customer subscriptions.
- Numerous music download sites exist on the Internet.

*Tune Source's risk regarding familiarity with the technology is moderately low.*

- The IT department has knowledge of the current Web-based order entry system and the databases and Internet technology it uses.
- The IT department has no direct knowledge of the technology required to store and deliver digital music downloads; however, many of the technical issues will be the responsibility of the ISP.
- Consultants are readily available to provide help in this area.

*The project size is considered medium risk.*

- The project team will likely consist of 10 or fewer people.
- Business user involvement will be required.
- The project time frame is somewhat critical, since the system is needed to maintain our competitive position in the market.

*The compatibility with Tune Source's existing technical infrastructure should be good.*

- An Internet infrastructure is already in place at the retail stores and corporate headquarters.
- The ISP should be able to scale its services to accommodate the new Digital Music Download system.

#### Economic Feasibility

A cost-benefit analysis was performed; see attached spreadsheet for details (provided in Appendix 1A). Conservative estimates show that the Digital Music Download system has a good chance of significantly enhancing the company's bottom line.

ROI over 3 years: 280%

NPV over 3 years: \$4,180,431

Break-even occurs after 0.17 years

#### Intangible Costs and Benefits

Improved customer satisfaction.

Enhanced competitive position through expansion of our brand into the music download market.

#### Organizational Feasibility

From an organizational perspective, this project has low risk. The top executives of the company have a strong interest in the project, and the project champion, Carly Edwards, is a respected and knowledgeable marketing executive.

The users of the system, Internet consumers and in-store kiosk users, are expected to appreciate the entry of Tune Source into the music download arena. Management at the stores may have some concern about lost CD sales; however, since customers have so many other options available for music downloads, this system may prevent our losing those customers to other digital music sources and may provide us with the opportunity to cross-sell those customers from our CD inventory.

#### Additional comments:

- The Marketing Department views this as a strategic system. This system will allow us to leverage our music archive and our well-established market position to establish a presence in the digital music download business. Our customers have been requesting such a capability, and we believe it will be well accepted.
- We should consider hiring a consultant with expertise in similar applications to assist with the project.
- We will need new staff to operate the system and potentially to provide customer service for subscribers and gift-card holders.

**FIGURE 1-15**  
Feasibility Analysis Executive Summary for Tune Source

The organizational feasibility is presented in Figure 1-15. There is a strong champion, well placed in the organization, to support the project. The project originated in the business or functional side of the company, not the IS department, and support for the project among the senior management team is strong.

Additional stakeholders in the project are the management team responsible for the operations of the traditional stores and the store managers. They should be quite supportive, given the added service that they now can offer. Carly and Jason need to make sure that they are included in the development of the system so that they can appropriately incorporate it into their business processes.

## SUMMARY

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### Systems Analyst Skills and Specializations

The systems analyst is a key person in the development of information systems. The systems analyst helps to analyze the business situation, identify opportunities for improvements, and design an information system that adds value to the organization. The systems analyst serves as a change agent, and this complex responsibility requires a wide range of skills, including technical, business, analytical, interpersonal, management, and ethical. In some organizations, systems analysts may develop a specialization such as business analyst, requirements analyst, infrastructure analyst, change management analyst, or project manager.

### The System Development Life Cycle

All system development projects follow essentially the same fundamental process called the system development life cycle (SDLC). The SDLC starts with a planning phase in which the project team identifies the business value of the system, conducts a feasibility analysis, and plans the project. The second phase is the analysis phase, in which the team develops an analysis strategy, gathers information, and builds a set of analysis models. In the next phase, the design phase, the team develops the design strategy, the physical design, architecture design, interface design, database and file specifications, and program design. In the final phase, implementation, the system is built, installed, and maintained.

### Project Identification and Initiation

Projects are identified when someone recognizes a business need that can be satisfied through the use of information technology. Project initiation is the point at which an organization creates and assesses the original goals and expectations for a new system. The first step in the process is to identify the business value for the system by developing a system request that provides basic information about the proposed system. Next, the analysts perform a feasibility analysis to determine the technical, economic, and organizational feasibility of the system.

### System Request

The business value for an information system is identified and then described in a system request. This form contains the project's sponsor, business need, business requirements, and business value of the information system, along with any other issues or constraints that are important to the project. The document is submitted to an approval committee who determines whether the project would be a wise investment of the organization's time and resources.

### Feasibility Analysis

A feasibility analysis is then used to provide more detail about the risks associated with the proposed system, and it includes technical, economic, and organizational feasibilities. The technical feasibility focuses on whether the system *can* be built, by

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examining the risks associated with the users' and analysts' familiarity with the application, familiarity with the technology, project size, and compatibility with existing systems. The economic feasibility addresses whether the system *should* be built. It includes a cost–benefit analysis of development costs, operational costs, tangible benefits, and intangible costs and benefits. Finally, the organizational feasibility analysis assesses how well the system will be accepted by its users and incorporated into the ongoing operations of the organization. The strategic alignment of the project and a stakeholder analysis can be used to assess this feasibility dimension.

### KEY TERMS

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Analysis models	Design strategy	Project manager
Analysis phase	Development costs	Project plan
Analysis strategy	Economic feasibility	Project size
Approval committee	Emerging technology	Project sponsor
Architecture design	Familiarity with technology	Requirements analyst
As-is system	Familiarity with the application	Software architect
Break-even analysis	Feasibility analysis	Special issues
Business analyst	Feasibility study	Stakeholder
Business need	First mover	Stakeholder analysis
Business process automation (BPA)	Functionality	Steering committee
Business process improvement (BPI)	Gradual refinement	Step
Business process management (BPM)	Implementation phase	Strategic alignment
Business process reengineering (BPR)	Infrastructure analyst	Support plan
Business requirements	Installation	System proposal
Business value	Intangible benefits	System request
Cash-flow method	Intangible costs	System specification
Champion	Intangible value	System users
Change management analyst	Interface design	Systems analyst
Compatibility	Net present value (NPV)	Systems development life cycle (SDLC)
Construction	Operation costs	Tangible benefits
Cost–benefit analysis	Organizational feasibility	Tangible value
Database and file specifications	Organizational management	Technical feasibility
Deliverable	Payback method	Technique
Design phase	Phase	To-be system
	Planning phase	Training plan
	Program design	Work plan
	Project initiation	
	Project management	

### QUESTIONS

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- What are the six general skills all project team members should have?
- What are the major roles on a project team?
- Compare and contrast the role of a systems analyst, business analyst, and infrastructure analyst.
- Compare and contrast phases, steps, techniques, and deliverables.
- Describe the major phases in the systems development life cycle (SDLC).
- Describe the principal steps in the planning phase. What are the major deliverables?
- Describe the principal steps in the analysis phase. What are the major deliverables?