This chapter introduces the role of the systems analyst in information systems development projects. First, the fundamental four-stage systems development life cycle (planning, analysis, design, and implementation) is established as the basic framework for the information system (IS) development process. Next, ways in which organizations identify and initiate potential projects are discussed. The first steps in the process are to identify a project that will deliver value to the business and to create a system request that provides the basic information about the proposed system. Next, the analysts perform a feasibility analysis to determine the technical, economic, and organizational feasibility of the system.

OBJECTIVES

• Explain the role played in IS development by the systems analyst.
• Describe the fundamental systems development life cycle and its four phases.
• Explain how organizations identify IS development projects.
• Explain the importance of linking the IS to business needs.
• Be able to create a system request.
• Describe technical, economic, and organizational feasibility assessment.
• Be able to perform a feasibility analysis.

Introduction

The systems development life cycle (SDLC) is the process of determining how an information system (IS) can support business needs, designing the system, building it, and delivering it to users. If you have taken a programming class or have programmed on your own, you have probably experienced some success in developing small software applications. Creating high-quality IS that meet expectations and provide meaningful value to organizations is a much more complex endeavor, however.

Numerous studies over the years report that projects involving information technology experience failure rates from 30 to 70%. The definition of failure in these studies is often quite different, so the meaning of these statistics is hard to pin down. It is clear, though, that bringing an IS development project to a successful conclusion is difficult and many things need to be done right if we hope to achieve a positive outcome.

Although we would like to promote this book as a “silver bullet” that will keep you from experiencing failed IS projects, we must admit that such a silver bullet guaranteeing IS development success does not exist. Instead, this book will provide you with many fundamental concepts and practical techniques that you can use to improve the likelihood of success.

The systems analyst plays a key role in the SDLC, analyzing the business situation, identifying opportunities for improvements, and designing an IS to implement the improvements. Many systems analysts view their profession as one of the most interesting, exciting, and challenging jobs around. As a systems analyst, you will work as a team with a variety of people, including business and technical experts. You will feel the satisfaction of seeing systems that you designed and developed make a significant positive business impact, while knowing that your unique skills helped make that happen.

It is important to remember that the primary objective of the systems analyst is not to create a wonderful system. The primary goal is to create value for the organization, which for most companies means increasing profits. (Government agencies and not-for-profit organizations measure value differently.) Many failed projects were abandoned because the analysts tried to build a wonderful system without clearly understanding how the system would support the organization’s goals, improve business processes, and integrate with other IS to provide value. An investment in an IS is like any other investment, such as a new machine tool. The goal is not to acquire the tool, because the tool is simply a means to an end; the goal is to enable the organization to perform work better so that it can earn greater profits or serve its constituents more effectively.

This book introduces you to the fundamental skills needed by a systems analyst. This is a pragmatic book that discusses best practices in systems development; it does not present a general survey of systems development that exposes you to everything about the topic. By definition, systems analysts do things and challenge the current way that an organization works. To get the most out of this book, you will need to actively apply the ideas and concepts in the examples and in the “Your Turn” exercises that are presented throughout to your own systems development.


The Systems Analyst

The systems analyst plays a key role in IS development projects. The systems analyst works closely with all project team members so that the team develops the right system in an effective way. Systems analysts must understand how to apply technology to solve business problems. In addition, systems analysts may serve as change agents who identify the organizational improvements needed, design systems to implement those changes, and train and motivate others to use the systems.

Systems Analyst Skills

New IS introduce change to the organization and its people. Leading a successful organizational change effort is one of the most difficult jobs that someone can do. Understanding what to
The Systems Analyst and Information Systems Development

change, knowing how to change it, and convincing others of the need for change require a wide range of skills. These skills can be broken down into six major categories: technical, business, analytical, interpersonal, management, and ethical.

Analysts must have the technical skills to understand the organization’s existing technical environment, the new system’s technology foundation, and the way in which both can be fit into an integrated technical solution. Business skills are required to understand how IT can be applied to business situations and to ensure that IT delivers real business value. Analysts are continuous problem solvers at both the project and the organizational level, and they put their analytical skills to the test regularly.

Often, analysts need to communicate effectively, one-on-one with users and business managers (who often have little experience with technology), with programmers and other technical specialists (who often have more technical expertise than the analyst does), and with people from outsourcing firms and vendor organizations. They must be able to give presentations to large and small groups and to write reports. Not only do they need to have strong interpersonal abilities, but they also need to manage people with whom they work, and they must manage the pressure and risks associated with unclear situations.

Finally, analysts must deal fairly, honestly, and ethically with other project team members, managers, and system users. Analysts often deal with confidential information or information that, if shared with others, could cause harm (e.g., dissent among employees); it is important for analysts to maintain confidence and trust with all people.

Systems Analyst Roles

As organizations and technology have become more complex, most large organizations now build project teams that incorporate several analysts with different, but complementary roles. In smaller organizations, one person may play several of these roles. Here we briefly describe these roles and how they contribute to a systems development project.

The systems analyst role focuses on the IS issues surrounding the system. This person develops ideas and suggestions for ways that IT can support and improve business processes, helps design new business processes supported by IT, designs the new IS, and ensures that all IS standards are maintained. The systems analyst will have significant training and experience in analysis and design and in programming.

Spotlight on Ethics - 1

James is a systems analyst on a new account management system for Hometown National Bank. At a recent meeting with the project sponsor, James learned about some new ideas for the system that were not a part of the original project scope. Specifically, the bank’s marketing director has asked that some of the data that will be collected by the new system from customers who open new checking and savings accounts also be used as the basis of a marketing campaign for various loan products the bank offers.

James is uncomfortable with the request. He is not sure the bank has the right to use a person’s data for purposes other than the original intent. Who “owns” this data, the bank that collected it as a part of a customer opening an account, or the customer who the data describes? Should James insist that the customers give authorization to use “their” data in this way? Or should he say nothing and ignore the issue? Is it necessary (or appropriate) for a systems analyst to be an ethical watchdog in a systems development project? Why or why not?
The business analyst role focuses on the business issues surrounding the system. This person helps to identify the business value that the system will create, develops ideas for improving the business processes, and helps design new business processes and policies. The business analyst will have business training and experience, plus knowledge of analysis and design.

The requirements analyst role focuses on eliciting the requirements from the stakeholders associated with the new system. As more organizations recognize the critical role that complete and accurate requirements play in the ultimate success of the system, this specialty has gradually evolved. Requirements analysts understand the business well, are excellent communicators, and are highly skilled in an array of requirements elicitation techniques (discussed in Chapter 3).

The infrastructure analyst role focuses on technical issues surrounding the ways the system will interact with the organization’s technical infrastructure (hardware, software, networks, and databases). This person ensures that the new IS conforms to organizational standards and helps to identify infrastructure changes that will be needed to support the system. The infrastructure analyst will have significant training and experience in networking, database administration, and various hardware and software products. Over time, an experienced infrastructure analyst may assume the role of software architect, who takes a holistic view of the organization’s entire IT environment and guides application design decisions within that context.

The change management analyst role focuses on the people and management issues surrounding the system installation. This person ensures that adequate documentation and support are available to users, provides user training on the new system, and develops strategies to overcome resistance to change. The change management analyst will have significant training and experience in organizational behavior and specific expertise in change management.

The project manager role ensures that the project is completed on time and within budget and that the system delivers the expected value to the organization. The project manager is often a seasoned systems analyst who, through training and experience, has acquired specialized project management knowledge and skills. More will be said about the project manager in the next chapter.

The roles and the names used to describe them may vary from organization to organization. In addition, there is no single typical career path through these professional roles. Some people may enter the field as a more technically oriented programmer/analyst. Others may enter as a business-oriented functional specialist with an interest in applying IT to solve business problems. As shown in Figure 1-1, those who are interested in the broad field of IS development may follow a variety of paths during their career.

The Systems Development Life Cycle

In many ways, building an IS is similar to building a house. First, the owner describes the vision for the house to the developer. Second, this idea is transformed into sketches and drawings that are shown to the owner and refined (often, through several drawings, each improving on the
other) until the owner agrees that the pictures depict what he or she wants. Third, a set of detailed blueprints is developed that present much more detailed information about the house (e.g., the layout of rooms, placement of plumbing fixtures and electrical outlets). Finally, the house is built following the blueprints—and often with some changes and decisions made by the owner as the house is erected.

Building an IS using the SDLC follows a similar set of four fundamental phases: planning, analysis, design, and implementation (Figure 1-2). Each phase is itself composed of a series of steps, which rely on techniques that produce deliverables (specific documents and files that explain various elements of the system). Figure 1-3 provides more details on the steps, techniques, and deliverables that are included in each phase of the SDLC and outlines how these topics are covered in this textbook.

Figures 1-2 and 1-3 suggest that the SDLC phases proceed in a logical path from start to finish. In some projects, this is true. In many projects, however, the project team moves through the steps consecutively, incrementally, iteratively, or in 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.
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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 of 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 IS should be built and determining how the project team will go about building it. It has two steps:

1. **Project initiation** is the process of understanding why a new system is being developed. This involves analyzing the business need and determining how the project team will go about building it. It has two steps:
   - During **project initiation**, the system’s business value to the organization is identified—how will it contribute to the organization’s future success? Most ideas for new systems come from outside the IS area and are recorded on a system request. A **system request** presents a brief summary of a business need and explains how a system that addresses 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 **IS approval committee** (sometimes called a **steering committee**), which decides whether the project should be undertaken.

2. **Project management** is the process of overseeing and managing the project. During project management, the project manager creates a **workplan**, staffs the project, and puts techniques in place to help 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 (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. **Analysis strategy** is developed to guide the project team’s efforts. Such a strategy usually includes studying 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 techniques such as 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 explained through a set of **requirement**
The Systems Development Life Cycle

statements and a set of business analysis models that describe how the business will operate if the new system is developed. The analysis models represent user/system interactions and the data and processes needed to support the underlying business process.

3. The analyses, system concept, requirements, 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 describing the requirements the new system should satisfy. Some experts suggest this phase would be better named analysis and initial design, rather than analysis, since it really provides the first step in the new system design. Since 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 and install a prewritten 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 (Figure 1-3).

Implementation

The final phase in the SDLC is the implementation phase, during which the system is actually built (or purchased and installed if the design calls for a prewritten software package). This is the
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 should 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 **training**, during which users are taught to use the new system and help manage the resulting organizational changes.

3. The analyst team establishes a **support plan** for the system. This plan usually includes a formal or informal postimplementation review, as well as a systematic way for identifying major and minor changes needed for the system.

**Project Identification and Initiation**

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 in the early stages of widespread business use. For example, if companies stay abreast of technological advances such as cloud computing, mobile apps, or Big Data, 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 IS projects grow out of **business process management (BPM)** initiatives. BPM is a methodology used by organizations to continuously improve end-to-end business processes. BPM 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 BPM 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 do not 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 IS projects is frequently identified here. In fact, the automation of business processes [termed business process automation (BPA)] 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 (BPI) 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 BPI 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.

BPM may also reveal the need for the complete revamping of the organization’s business processes, termed business process 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 IS 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, IS need to affect the organization’s bottom line (in a positive way!).

When a strong business need for an IS 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

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**CONCEPTS IN ACTION 1-B**

**BPI on the Farm**

In the farming industry, grain is commonly loaded into large grain-hauling trucks by the driver parking under the grain bin, jumping out of the truck cab, signaling the grain bin operator to start filling, monitoring the fill level, signaling the bin operator to stop filling, jumping back into the truck cab, driving 3 feet forward, and repeating the cycle numerous times until the truck bed is full. This laborious process can be simplified by digitizing the process. Cameras and secure Wi-Fi can be installed on the grain bin. When a truck arrives, the driver can open an app on his smartphone from the truck cab. Through the app, the driver can initiate, monitor, and control the filling process without a grain bin operator and without leaving the truck. This real-world example illustrates BPI, the redesign of a business process with the right application of information technology, providing significant efficiency gains.

Adapted from: Nicole Laskowski, “Crowdsourcing is the new cloud computing—Get with it, CIOs,” searchcio.techtarget.com, accessed February 2014.
Implementing a Satellite Data Network

A major retail store 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?

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 (Figure 1-4). The sponsor describes the person who will serve as the primary contact 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 must 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. Any special circumstances that could affect the outcome of the project must be clearly identified.

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 IS 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 approved, the next step is to conduct a feasibility analysis.

**Applying the Concepts at DrönTeq**

Throughout the book, we will apply the concepts in each chapter to a fictitious company called DrönTeq. In this section, we illustrate the creation of a system request.
DrōnTeq is a fictitious technology company that develops numerous unmanned aerial vehicles, called drones, and drone technology for many purposes. DrōnTeq was established by two technology entrepreneurs, Eric Chen and Peter Lyons. The field of drone technology was evolving rapidly, and Eric and Peter quickly established DrōnTeq as a leading maker of commercial-grade drones with advanced sensors and imaging capabilities.

As a technology company, DrōnTeq invests heavily in research and development of its drone products. It also developed proprietary software capable of providing unique analyses of the data collected by the drone’s onboard sensors. The Sales department focuses primarily on drone sales and marketing to government and commercial entities. A new Client Services business unit has been formed within DrōnTeq, focusing on outsourced drone services. Carmella Herrera was named director of the Client Services business unit.

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

Interview with Don Hallacy, President, Technology Services, Sprint Corporation

The South Dakota Department of Labor, Workers’ Compensation division was sinking under a load of paper files. This state agency ascertains that employees are treated fairly when they are injured on the job. If a person (or company) called to see the status of an injury claim, the clerk 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 (i.e., the 415th person injured in 2008 would be in a file numbered 08-415). Few callers knew 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 injury requiring only 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

Begin a systems request for this project. Focus on stating the business need and the business requirements for this project. What is the value of this system?
Project Background
DrônTeq is a technology company and utilizes IS in a variety of ways. The new Client Services unit requires specialized IS support, however, to allow clients to request and receive drone services. In the business model of new business unit, licensed drone pilots contract with DrônTeq to fly a DrônTeq drone when requested by a client that is near the drone pilot. The drone pilot uses a current model DrônTeq drone, provided at a favorable lease rate, in return for providing prompt flight service when requested by a client. All client drone flight requests will be processed through DrônTeq’s website. Once a request is received, the request will be posted for all contracted drone pilots to see. Pilots will have a specific window of time in which to submit a bid to conduct the flight. An assignment algorithm will determine the “winning” bid after the bidding window closes and automatically notifies the pilots and the client of the results.

Many aspects of the Client Services business unit will require IS support, but the current focus is on the customer-facing aspects of receiving a client request for service and assigning the request to a contracted drone pilot. A project to create the required support for the new business unit has been proposed by Carmella Herrera.

System Request
At DrônTeq, new IS projects are reviewed and approved by an IS project steering committee that meets quarterly. The committee has representatives from IS as well as from other major areas of the business. Carmella’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 Carmella, and the business needs are to enable clients to request drone flight service and data analysis through the company website. Notice that the need does not focus on the technology associated with the project. The emphasis is on the business aspects: providing the means for clients to request drone flight service and data analysis and determining a drone pilot who will perform the service.

In the system request, the project sponsor focuses on describing his or her vision of the business requirements at a very high level. Carmella has expressed a clear vision of how this system will affect the new unit at DrônTeq: producing revenues from new drone pilot contracts

<table>
<thead>
<tr>
<th>System Request—Client Services Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Sponsor:</strong> Carmella Herrera, General Manager, Client Services Business Unit</td>
</tr>
</tbody>
</table>

**Business Need:** This project has been initiated to create the capability of clients requesting drone flight service and data analysis through the company website. The capability is an essential element in the business model of the newly formed Client Services business unit.

**Business Requirements:** Using this system from our company website, clients will be able to request specific drone flight services and data analysis. A request will be offered to any contracted DrônTeq drone pilots in the vicinity, who can submit bids during the bidding window. Once the bidding window closes, the pilot with the “winning” bid will be assigned the request.

**Business Value:** The Client Services business unit has been formed to enable clients who do not have a need for actual drone ownership to receive drone flight service and data analysis promptly and cost effectively. As a new business unit, we must estimate additional revenue from two streams: additional drone pilots who contract with DrônTeq and lease a drone; and clients who contract for specific drone flight service and data analysis.

Conservative estimates of tangible value to the business unit include

- $357,500 in revenue from new pilot contracts and drone leases
- $565,000 in revenue from drone flight service and data analysis

**Special Issues or Constraints:** The capabilities described in the Business Requirements are essential to the business model for the Client Services Business Unit. This project is necessary for the new business unit’s operations.

FIGURE 1-5
System request for DrônTeq.
and drone leases and enabling sales from clients requesting drone flight service and data analysis. Carmella recognized that this system will be essential in supporting the proposed business model of the new business unit.

The estimates of tangible value were difficult to develop, since this venture is completely new to DrönTeq. To prepare for this, Carmella had several of her staff members conduct surveys of commercial drone operators and several agribusiness interest groups (agricultural uses are a prime target for the Client Services business unit). The surveys also attempted to gauge the drone pilots’ and potential clients’ price sensitivity for these offerings.

From the survey results, Carmella 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.

For example, for revenue from new pilot contracts and drone leases,

\[
\text{Expected sales} = (500,000 \times 0.25) + (350,000 \times 0.60) + (150,000 \times 0.15)
\]

\[
= 125,000 + 210,000 + 22,500
\]

\[
= 357,500
\]

These projections are summarized in Figure 1-6.

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

Steering Committee Approval

Carmella presented the system request for the Client Services project to the DrönTeq IS project steering committee at its next meeting. Response to the request was uniformly positive. The strong support for the project by Eric and Peter, the company’s top executives, helped to spur the committee’s rapid approval of the project. Following approval of the system request, Jiang Tsiao, a senior systems analyst in the IS department, was assigned to work with Carmella 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 authorizes the systems analyst to prepare a more detailed business case to better understand the proposed IS project. Feasibility analysis guides the organization in determining whether to proceed with the project. Feasibility analysis also identifies the important risks.

<table>
<thead>
<tr>
<th>Revenue Projections</th>
<th>Pilot Contracts and Drone Leases</th>
<th>Client Requests for Drone Flight Service and Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-level estimate (prob. = 25%)</td>
<td>$500,000</td>
<td>$700,000</td>
</tr>
<tr>
<td>Medium-level estimate (prob. = 60%)</td>
<td>$350,000</td>
<td>$550,000</td>
</tr>
<tr>
<td>Low-level estimate (prob. = 15%)</td>
<td>$150,000</td>
<td>$400,000</td>
</tr>
<tr>
<td>Weighted average expected revenue</td>
<td>$357,500</td>
<td>$565,000</td>
</tr>
</tbody>
</table>
Feasibility Analysis

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 (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.

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.

Although we will discuss feasibility analysis now within the context of project initiation, most project teams revise the 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 issue 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?”

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 have limited knowledge of the application. If the project involves a new business innovation, neither the users nor the analysts may have any direct knowledge or experience of the proposed new application. In general, the development of new systems is riskier than extensions to an existing system, because existing systems tend to be better understood.

3 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?”

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### Technical Feasibility: Can We Build It?

- Familiarity with application: Less familiarity generates more risk.
- Familiarity with technology: Less familiarity generates more risk.
- Project size: Large projects have more risk.
- Compatibility: The harder it is to integrate the system with the company’s existing technology, the higher the risk will be.

### Economic Feasibility: Should We Build It?

- Development costs
- Annual operating costs
- Annual benefits (cost savings and/or increased revenues)
- Intangible benefits and costs

### Organizational Feasibility: If We Build It, Will They Come?

- Is the project strategically aligned with the business?
- Project champion(s)
- Senior management
- Users
- Other stakeholders

---

**FIGURE 1-7**

Feasibility analysis assessment factors. A template for this figure is available on the student website.
Familiarity with the technology is another important source of technical risk. When a system uses technology that has not been used before within the 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., a Big Data project using Hadoop). When the technology is not new but the organization lacks experience with it, technical risk is reduced somewhat, since outside expertise should be available from vendors and consultants.

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. Large systems are typically highly integrated with other systems, increasing project complexity.

Finally, project teams need to consider the compatibility of the new system with the technology that already exists in the organization. Systems are rarely 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 is considered “big”?)). One approach is to compare the project 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 current year) costing...
Feasibility Analysis

$100,000. Once the system is operational, benefits and on-going costs are projected over 3 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

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

Using the values in Figure 1-8, the ROI calculation is

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

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 2 years plus some fraction of the third year.

*(In the year in which Cumulative Cash Flow turns positive):*

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

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 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 3 years—you’ve been had! Assuming you could have invested those dollars at a 10% rate of return, you will be receiving the equivalent of $75 in today’s terms.

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

\[
PV = \frac{\text{Cash flow amount}}{(1 + \text{Rate of return})^n}, \text{where } n \text{ is the year in which the cash flow occurs.}
\]

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.

\[
PV = \frac{100}{(1 + 0.1)^3} = \frac{100}{1.331} = 75.13
\]

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.

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.

\[
NPV = \sum \text{PV of Total Benefits} - \sum \text{PV of Total Costs}
\]

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

List the tangible costs and benefits for the project. Include both one-time and recurring costs.

### Assign Values to Costs and Benefits

Work with business users and IT professionals to create numbers for each of the costs and benefits. Even intangibles should be valued if at all possible.

### Determine Cash Flow

Forecast what the costs and benefits will be over a certain period, usually, 3–5 years. Apply a growth rate to the values, if necessary.

### Assess Project’s Economic Value

Evaluate the project’s expected returns in comparison to its costs. Use one or more of the following evaluation techniques:

- **Return on Investment (ROI)**
  
  Calculate the rate of return earned on the money invested in the project, using the ROI formula.

- **Break-Even Point (BEP)**
  
  Find the year in which the cumulative project benefits exceed cumulative project costs. Apply the break-even formula, using figures for that year. This calculation measures how long it will take for the system to produce benefits that cover its costs.

- **Net Present Value (NPV)**
  
  Restate all costs and benefits in today’s dollar terms (present value), using an appropriate discount rate. Determine whether the total present value of benefits is greater than or less than the total present value of costs.

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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. 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 cloud vendor fees. Operational costs are usually thought of as ongoing costs. As you can see from the list of Operational Costs in Figure 1-11, it is important to include every relevant cost factor over the life of the system, so that we estimate the **Total Cost of Ownership (TCO)**.

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 have not 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 DrönTeq staff developed expected values for projected revenue. 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 us assume that the improvement in customer service will decrease the number of customer complaints by 10% each year over 3 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.
Feasibility Analysis

2019, and all benefits and operational costs are assumed to begin when the system is implemented at the start of 2020, and continue through 2023. 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.

Determine Cash Flow

A formal cost–benefit analysis usually contains costs and benefits over a selected number of years (usually, 3–5 years) to show cash flow over time (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 4 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 the overall benefits and costs.

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased sales</td>
<td>500,000</td>
<td>530,000</td>
<td>561,800</td>
<td>595,508</td>
<td></td>
<td>2,187,308</td>
</tr>
<tr>
<td>Reduction in customer complaint calls*</td>
<td>70,000</td>
<td>70,000</td>
<td>70,000</td>
<td>70,000</td>
<td></td>
<td>280,000</td>
</tr>
<tr>
<td>Reduced inventory costs</td>
<td>68,000</td>
<td>68,000</td>
<td>68,000</td>
<td>68,000</td>
<td></td>
<td>272,000</td>
</tr>
<tr>
<td><strong>Total Benefits</strong>b</td>
<td>638,000</td>
<td>668,000</td>
<td>699,800</td>
<td>733,508</td>
<td></td>
<td>2,739,308</td>
</tr>
<tr>
<td><strong>Development Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 servers @ $125,000</td>
<td>250,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>250,000</td>
</tr>
<tr>
<td>Printer</td>
<td>100,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>100,000</td>
</tr>
<tr>
<td>Software licenses</td>
<td>34,825</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>34,825</td>
</tr>
<tr>
<td>Server software</td>
<td>10,945</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>10,945</td>
</tr>
<tr>
<td>Development labor</td>
<td>1,236,525</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>1,236,525</td>
</tr>
<tr>
<td><strong>Total Development Costs</strong></td>
<td>1,632,295</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>1,632,295</td>
</tr>
<tr>
<td><strong>Operational Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
<td></td>
<td>200,000</td>
</tr>
<tr>
<td>Software</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td></td>
<td>80,000</td>
</tr>
<tr>
<td>Operational labor</td>
<td>115,000</td>
<td>119,600</td>
<td>124,384</td>
<td>129,359</td>
<td></td>
<td>488,343</td>
</tr>
<tr>
<td><strong>Total Operational Costs</strong></td>
<td>185,000</td>
<td>189,600</td>
<td>194,384</td>
<td>199,359</td>
<td></td>
<td>768,343</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>1,632,295</td>
<td>185,000</td>
<td>189,600</td>
<td>194,384</td>
<td></td>
<td>2,400,638</td>
</tr>
<tr>
<td><strong>Total Benefits – Total Costs</strong></td>
<td>(1,632,295)</td>
<td>453,000</td>
<td>478,400</td>
<td>505,149</td>
<td></td>
<td>338,670</td>
</tr>
<tr>
<td><strong>Cumulative Net Cash Flow</strong></td>
<td>(1,632,295)</td>
<td>(1,179,295)</td>
<td>(700,895)</td>
<td>(195,479)</td>
<td></td>
<td>338,670</td>
</tr>
<tr>
<td>Return on Investment (ROI)</td>
<td>14.1%</td>
<td>(338,670/2,400,638)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break-Even Point</td>
<td>3.37 years</td>
<td>(3 years of negative cumulative cash flow + [534,149 − 338,670/534,149 = 0.37])</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Customer service values are based on reduced costs of handling customer complaint phone calls.

bAn 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.
CONCEPTS IN ACTION I-D  Intangible Value at Carlson Hospitality

I conducted a case study at Carlson Hospitality, a global leader in hospitality services, encompassing more than 1,300 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 Weiser

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

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.

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 feasibility analysis issue is 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?”

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. 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, organizational management, and system users (Figure 1-14), but systems sometimes affect other stakeholders as well. For example, a change to a purchasing system will probably affect the firm’s supply chain partners.

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 to the project by conveying its importance to other 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 the rest of the organization the belief that the system will make a valuable contribution and that necessary resources will be made available. Ideally, the 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, the system. In general, the most important stakeholders in the introduction of a new system are the project champion, organizational management, and system users (Figure 1-14), but systems sometimes affect other stakeholders as well. For example, a change to a purchasing system will probably affect the firm’s supply chain partners.

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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, the

### Figure 1-13

**Cost–benefit analysis—discounted cash flow method.**

<table>
<thead>
<tr>
<th>Benefits</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased sales</td>
<td>500,000</td>
<td>530,000</td>
<td>561,800</td>
<td>595,508</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction in customer complaint calls</td>
<td>70,000</td>
<td>70,000</td>
<td>70,000</td>
<td>70,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced inventory costs</td>
<td>68,000</td>
<td>68,000</td>
<td>68,000</td>
<td>68,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Benefits</strong></td>
<td><strong>638,000</strong></td>
<td><strong>668,000</strong></td>
<td><strong>699,800</strong></td>
<td><strong>733,508</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present Value Total Benefits</td>
<td>601,887</td>
<td>594,518</td>
<td>587,566</td>
<td>581,007</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Development Costs</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Servers @ $125,000</td>
<td>250,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Printer</td>
<td>100,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Software licenses</td>
<td>34,825</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Server software</td>
<td>10,945</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Development labor</td>
<td>1,236,525</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total Development Costs</strong></td>
<td><strong>1,632,295</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td><strong>2,364,978</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operational Costs</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational labor</td>
<td>115,000</td>
<td>119,600</td>
<td>124,384</td>
<td>129,359</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Operational Costs</strong></td>
<td><strong>185,000</strong></td>
<td><strong>189,600</strong></td>
<td><strong>194,384</strong></td>
<td><strong>199,359</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td><strong>1,632,295</strong></td>
<td><strong>185,000</strong></td>
<td><strong>189,600</strong></td>
<td><strong>194,384</strong></td>
<td><strong>199,359</strong></td>
<td><strong>2,296,686</strong></td>
</tr>
<tr>
<td>Present Value Total Costs</td>
<td><strong>1,632,295</strong></td>
<td><strong>174,528</strong></td>
<td><strong>168,743</strong></td>
<td><strong>163,209</strong></td>
<td><strong>157,911</strong></td>
<td><strong>2,296,686</strong></td>
</tr>
<tr>
<td><strong>NPV (PV Total Benefits – PV Total Costs)</strong></td>
<td>68,292</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Customer service values are based on reduced costs of handling customer complaint phone calls.*

*An important yet intangible benefit will be the ability to offer services that our competitors currently offer.*
The final product rarely meets 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 third column in Figure 1-14 suggests that actions can be taken that influence organizational feasibility. When the organizational feasibility assessment reveals high risks, the team members should employ actions like these to overcome the organizational feasibility concerns.

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 throughout the project at points where the project team makes...
Applying the Concepts at DrônTeq

The steering committee met and placed the Client Services project high on its list of projects. The next step was for Carmella and Jiang 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 provided additional detail and supporting documentation.

As shown in Figure 1-15, the project is somewhat risky from a technical perspective. DrônTeq has experience with the technology that will be used, but the proposed application has some unfamiliar elements. User involvement will be important. Project size is moderate and the system should be very compatible with the existing infrastructure.

The economic feasibility analysis includes the assumptions that Carmella 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 $558,000. This is a very rough estimate, as Jiang has had to make some assumptions about the amount of time it will take to design and program the system. Nonetheless, the Client Services project appears to be very strong economically.

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 managers throughout the organization, customers, and drone pilots. Organizational managers are supportive of the new Client Services business unit. The Sales department may lose some drone sales if prospective drone purchasers choose to use the drone flight services rather than buy and operate a drone themselves. Customer acceptance of the drone flight service product will depend, in part, on the quality, simplicity, and speed of the user interface of the system that enables quick and easy flight requests. Pilot recruitment and retention will require the system to be quick and easy to use and provide a fair and consistent bidding and flight assignment mechanism.

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?
Client Services Project Executive Summary

Carmella Herrera and Jiang Tsaio created the following feasibility analysis for the DrönTeq Client Services Project. The System Request is attached, along with the detailed feasibility study. The highlights of the feasibility analysis are as follows:

Technical Feasibility

The Client Services project is feasible technically, although there is some risk.

DrönTeq's risk regarding familiarity with a customer-facing drone service request system is moderate.

- The Sales Department uses a customer-facing system to allow customers to configure and place orders for commercial drone purchases. This system was developed by the DrönTeq IS department.
- The Client Service business model contains an unfamiliar element—the use of a bidding approach to obtain offers from pilots and determine the winning bid based on multiple factors.
- Business user involvement will be essential.

DrönTeq's risk regarding familiarity with the technology is low.

- The IT department has extensive knowledge of the current Web-based customer order system and the databases and Internet technology it uses.
- The technology used in the proposed Client Services Project will be very similar to existing systems.

The project size is considered moderately low.

- Project scope has been deliberately limited to the front-end of this overall system: customer request, pilot notification, pilot bidding, and flight assignment.
- The project team will likely consist of five or fewer people.

The compatibility with DrönTeq's existing technical infrastructure should be good.

- An Internet infrastructure is already in place at corporate headquarters.
- The system will be based on existing technology infrastructure currently supporting the Sales Department.

Economic Feasibility

A cost–benefit analysis was performed; see the attached spreadsheet for details (provided in Appendix 1A). Conservative estimates show that the Client Services project has a good chance of enhancing the company's bottom line.

ROI over 3 years: 43%
NPV over 3 years: $675,818
Break-even occurs after 1.62 years

Intangible Costs and Benefits

Enhanced competitive position through expansion of our drone brand into the drone flight service market. Clients who don’t wish to own and operate their own drones will still have a convenient and cost–effective way to receive the benefits provided from our drone flights and data analysis services.

Organizational Feasibility

From an organizational perspective, this project has moderately high risk.

- Top management support: The top executives of the company strongly support the project.
- Project champion: Carmella Hererra is a respected and knowledgeable business executive.
- Organizational management: Overall, managers throughout DrönTeq support the creation of the new business unit. The Sales department, however, may experience some drone sales loss as some prospective customers choose to purchase drone flight services rather than purchase and operate drones themselves.
- Customers: Customers will expect a user interface that is clear and simple to use. Customers will want to enter basic facts one time and have those facts stored securely. This will enable them to request repeat flight services quickly and easily. Customers will expect prompt response and accurate status information on all flight service requests. Without these features, customers may be unwilling to use this service.
- Pilots: Pilots will depend on this system to provide notification of potential drone flights, bid on flights, and receive flight assignments; therefore, pilots will demand a system that is quick and easy to use and that embodies a fair and consistent bidding and flight assignment mechanism. Otherwise, pilots will reject the business model of the Client Services business unit and the venture's success is doubtful.

Additional Comments

- The top executives view this as a strategic system. This system will allow us to extend our drone services to a new audience. Our marketing research tells us this market is strong and we believe the services will be well accepted.
- To enhance acceptance of the new service, the introduction of the system should coincide with the agricultural growing season since agricultural users are a primary audience.
CHAPTER REVIEW

After reading and studying this chapter, you should be able to:
• Explain the role of the systems analyst in the process of developing IS.
• Discuss the skills needed to be a successful systems analyst.
• List and explain the four primary phases of the SDLC.
• Explain the ways that projects are identified and initiated.
• Explain why it is important to ensure that a proposed IS will add value to the organization.
• Describe the purpose of the systems request and explain the contents of its four main sections.

KEY TERMS

Analysis models  Cash flow analysis  Feasibility analysis  Phase
Analysis phase  Champion  Feasibility study  Planning phase
Analysis strategy  Change management analyst  First mover  Program design
Approval committee  Compatibility  Gradual refinement  Project design
Architecture design  Construction  Implementation phase  Project management
As-is system  Cost–benefit analysis  Infrastructure analyst  Project manager
Break-even point  Database and file specifications  Installation  Project plan
Business analyst  Deliverable  Intangible benefits  Project size
Business need  Design phase  Intangible costs  Project sponsor
Business process automation (BPA)  Design strategy  Intangible value  Requirements analyst
Business process improvement (BPI)  Development costs  Interface design  Software architect
Business process management (BPM)  Economic feasibility  Net present value (NPV)  Special issues
Business process reengineering (BPR)  Emerging technology  Operational costs  Stakeholder
Business requirements  Familiarity with technology  Organizational feasibility  Stakeholder analysis
Business value  Familiarity with the application  Organizational management  Steering committee

QUESTIONS

1. List and describe the six general skills all project team members should have.
2. What are the major roles on a project team?
3. Compare and contrast the role of a systems analyst, business analyst, and infrastructure analyst.
4. Compare and contrast the role of requirements analyst, change management analyst, and project manager.
5. Describe the major phases in the systems development life cycle (SDLC).
6. Describe the principal steps in the planning phase. What are the major deliverables?
7. Describe the principal steps in the analysis phase. What are the major deliverables?
8. Describe the principal steps in the design phase. What are the major deliverables?
9. Describe the principal steps in the implementation phase. What are the major deliverables?
10. Which phase in the SDLC is the most important?
11. What does gradual refinement mean in the context of SDLC?
12. Describe the four steps of BPM. Why do companies adopt BPM as a management strategy?
13. Compare and contrast BPA, BPI, and BPR. Which is most risky? Which has the greatest potential value?
14. Give three examples of business needs for a system.
15. Describe the roles of the project sponsor and the approval committee.
16. What is the purpose of an approval committee? Who is usually on this committee?

17. Why should the system request be created by a businessperson as opposed to an IS professional?

18. What is the difference between intangible value and tangible value? Give three examples of each.

19. What are the purposes of the system request and the feasibility analysis? How are they used in the project selection process?

20. Describe two special issues that may be important to list on a system request.

21. Describe the three dimensions of feasibility analysis.

22. What factors are used to determine project size?

23. Describe a “risky” project in terms of technical feasibility. Describe a project that would not be considered risky.

24. What are the steps for assessing economic feasibility? Describe each step.

25. List two intangible benefits. Describe how these benefits can be quantified.

26. List two tangible benefits and two operational costs for a system. How would you determine the values that should be assigned to each item?

27. Explain how an expected value can be calculated for a cost or benefit. When would this be done?

28. Explain the net present value and return on investment for a cost–benefit analysis. Why would these calculations be used?

29. What is the break-even point for the project? How is it calculated?

30. What is stakeholder analysis? Discuss three stakeholders that would be relevant for most projects.

**EXERCISES**

A. Go to www.bls.gov and perform a search for “systems analyst.” What is the employment outlook for this career? Compare and contrast the skills listed with the skills that were presented in this chapter.

B. Think about your ideal analyst position. Write a job posting to hire someone for that position. What requirements would the job have? What skills and experience would be required? How would applicants demonstrate that they have the appropriate skills and experience?

C. Locate a news article in an IT trade website (e.g., Computerworld.com, InformationWeek.com) about an organization that is implementing a new computer system. Describe the tangible and intangible values that the organization seeks from the new system.

D. Car dealers have realized how profitable it can be to sell automobiles by using the Web. Pretend that you work for a local car dealership that is part of a large chain such as CarMax. Create a system request that you might use to develop a Web-based sales system. Remember to list special issues that are relevant to the project.

E. 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?

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.

F. Think about the idea that you developed in Exercise E to improve your university or college course enrollment process. List three things that influence the technical feasibility of the system, the economic feasibility of the system, and the organizational feasibility of the system. How can you learn more about the issues that affect the three kinds of feasibility?

G. Amazon.com was very successful when it decided to extend its offerings beyond books to many other products. Amazon.com was unable to compete successfully with eBay.com’s auction site, however, and eventually abandoned its own auction site. What feasibility factors probably had the most significance in this failure? Explain.

H. Interview someone who works in a large organization, and ask him or her to describe the approval process that exists for proposed new development projects. What do they think about the process? What are the problems? What are the benefits?

I. Reread the “Your Turn 1-2” (Implementing a Satellite Data Network). Create a list of the stakeholders that should be considered in a stakeholder analysis of this project.
MINICASES

1. Megan Simpson, manager of western regional sales at the Whitefield Company, requested that the IS department develop a sales force communication and tracking system that would enable her to better keep up with her sales staff. Megan wanted to be able to post messages to her team on many topics, including sales tips and strategies, update them on the firm’s products, and point out changes in the competitive environment. She also wanted her team to be able to post responses to her posts plus their own ideas, update their schedules, and share their sales success stories.

Unfortunately, due to the massive backlog of work facing the Whitefield Company’s IS department, her request was given a low priority. After 6 months of inaction by the IS department, Megan decided to take matters into her own hands. Following the advice of friends, Megan set up a Word Press site to use as a sales force communication and tracking system.

Although it took longer than expected, Megan’s site has been “completed” for about 6 weeks. It still has many features that do not work very well, and some functions lead to dead ends. Members of the sales force initially were quite interested in the system. They quickly discovered, however, that the system was confusing and didn’t seem to provide many benefits, so their interest quickly waned. Megan’s assistant is so mistrustful of the scheduling information posted on the site that she has secretly gone back to using her old paper-based system of tracking the sales staff’s activities, since it is much more reliable.

Over dinner one evening, Megan complained to a systems analyst friend, “I don’t know what went wrong with this project. It seemed pretty simple to me. The IS guys gave me some suggestions for how I should approach this project, but it seemed like such an elaborate set of steps and tasks. I didn’t think all that really applied to this small system. I just thought I’d set up the basics for the system and then tweak it around until I got what I wanted without all the fuss and bother of the approach the IS guys were pushing. I mean, doesn’t that just apply to their big, expensive system projects?”

To understand where Megan went wrong, apply what you know about the SDLC to answer the following questions:

A. Planning:
   i. What is the purpose of the Planning Phase for a project such as this?
   ii. What are the typical outcomes of the Planning Phase?
   iii. How did not doing this step affect Megan’s project outcome?

B. Analysis:
   i. What is the purpose of the Analysis Phase?
   ii. What is the key outcome produced during the Analysis Phase?
   iii. In what ways do you think this project was hurt by not going through a typical Analysis Phase?

C. Design:
   i. What is the purpose of the Design Phase?
   ii. How do you think this project could have been improved by going through a typical Design Phase?
   iii. Do you think Megan’s assistant and sales force members could have helped at all during the design phase? If so, how?

D. Implementation:
   i. What type of work is done in the Implementation Phase for a project like this?
   ii. What is usually done during the Implementation Phase to ensure that the users of the system are satisfied with it?
   iii. Megan’s approach to “construction” was to throw something together and “tweak it around.” How do you think that approach contributed to the problems she is now experiencing with her project?

2. The Amberssen Specialty Company is a chain of 12 retail stores that sell a variety of imported gift items, gourmet chocolates, cheeses, and wines in the Toronto area. Amberssen has an IS staff of three people who have created a simple, but effective, IS of networked point-of-sale registers at the stores, and a centralized accounting system at the company headquarters. Harry Hilman, the head of Amberssen’s IS group, has just received the following memo from Bill Amberssen, Sales Director (and son of Amberssen’s founder):

   "Harry—It’s time Amberssen Specialty launched itself on the Internet. Many of our competitors are already there, selling to customers without the expense of a retail storefront, and we should be there too. I project that we could double or triple our annual revenues by selling our products on the Internet. I’d like to have this ready by Thanksgiving, in time for the prime holiday gift-shopping season. Bill"

   After pondering this memo for several days, Harry scheduled a meeting with Bill so that he could clarify Bill’s vision of this venture. Using the standard content of a system request as your guide, prepare a list of questions that Harry needs to have answered about this project.

3. The Decker Company maintains a fleet of 10 service trucks and crew which provides a variety of plumbing, heating, and cooling repair services to residential customers. Currently, it takes on average about 6 hours before a service team responds to a service request. Each truck and crew averages 12 service
calls per week, and the average revenue earned per service call is $150. Each truck is in service 50 weeks per year. Due to the difficulty in scheduling and routing, there is considerable slack time for each truck and crew during a typical week.

In an effort to more efficiently schedule the trucks and crew and improve their productivity, Decker management is evaluating the purchase of a prewritten routing and scheduling software package. The benefits of the system will include reduced response time to service requests and more productive service teams, but management is having trouble quantifying these benefits.

One approach is to make an estimate of how much service response time will decrease with the new system, which then can be used to project the increase in the number of service calls made each week. For example, if the system permits the average service response time to fall to 4 hours, the management believes that each truck will be able to make 16 service calls per week on average—an increase of 4 calls per week. With each truck making 4 additional calls per week and the average revenue per call at $150, the revenue increase per truck per week is $600 \cdot (4 \times 150). With 10 trucks in service 50 weeks per year, the average annual revenue increase will be $300,000 \cdot (600 \times 10 \times 50).

The Decker Company management is unsure whether the new system will enable response time to fall to 4 hours on average, or will be some other number. Therefore, management has developed the following range of outcomes that may be possible outcomes of the new system, along with probability estimates of each outcome occurring:

<table>
<thead>
<tr>
<th>New Response Time</th>
<th># Calls/Truck/Week</th>
<th>Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 hours</td>
<td>20</td>
<td>20%</td>
</tr>
<tr>
<td>3 hours</td>
<td>18</td>
<td>30%</td>
</tr>
<tr>
<td>4 hours</td>
<td>16</td>
<td>50%</td>
</tr>
</tbody>
</table>

Given these figures, prepare a spreadsheet model that computes the expected value of the annual revenues to be produced by this new system.

4. Martin is working to develop a preliminary cost–benefit analysis for a new client-server system. He has identified a number of cost factors and values for the new system, summarized in the following tables:

<table>
<thead>
<tr>
<th>Development Costs—Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Systems Analysts</td>
</tr>
<tr>
<td>4 Programmer Analysts</td>
</tr>
<tr>
<td>1 GUI Designer</td>
</tr>
<tr>
<td>1 Telecommunications Specialist</td>
</tr>
<tr>
<td>1 System Architect</td>
</tr>
<tr>
<td>1 Database Specialist</td>
</tr>
<tr>
<td>1 System Librarian</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Development Costs—Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Oracle training registration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Development Costs—New Hardware and Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Development server</td>
</tr>
<tr>
<td>1 Server software (OS, misc.)</td>
</tr>
<tr>
<td>1 DBMS server software</td>
</tr>
<tr>
<td>7 DBMS client software</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Operating Costs—Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Programmer Analysts</td>
</tr>
<tr>
<td>1 System Librarian</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Operating Costs—Hardware, Software, and Misc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Maintenance agreement for server</td>
</tr>
<tr>
<td>1 Maintenance agreement for server</td>
</tr>
<tr>
<td>DBMS software</td>
</tr>
<tr>
<td>Preprinted forms @ $.22/form</td>
</tr>
</tbody>
</table>

The benefits of the new system are expected to come from two sources: increased sales and lower inventory levels. Sales are expected to increase by $30,000 in the first year of the system’s operation and will grow at a rate of 10% each year thereafter. Savings from lower inventory levels are expected to be $15,000 per year for each year of the project’s life.

Using a format similar to the spreadsheets in this chapter, develop a spreadsheet that summarizes this project’s cash flow, assuming a 4-year useful life after the project is developed. Compute the present value of the cash flows, using an interest rate of 9%.

What is the NPV for this project? What is the ROI for this project? What is the break-even point? Should this project be accepted by the approval committee?
### APPENDIX 1A: DETAILED ECONOMIC FEASIBILITY ANALYSIS FOR DRÔNTEQ

Figure 1A-1 contains the summary spreadsheet for the DrônTeq Client Services project. As shown, Carmella’s initial sales projections are used for the first year’s revenues. Revenues are projected to grow 10% in the second year and 8% in the third year.

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue from new pilot contracts and drone leases</td>
<td>357,500</td>
<td>393,250</td>
<td>424,710</td>
<td>1,175,460</td>
<td></td>
</tr>
<tr>
<td>Sales from drone flight service and data analysis</td>
<td>565,000</td>
<td>621,500</td>
<td>671,220</td>
<td>1,857,720</td>
<td></td>
</tr>
<tr>
<td><strong>Total Benefits</strong></td>
<td>922,500</td>
<td>1,014,750</td>
<td>1,095,930</td>
<td>3,033,180</td>
<td></td>
</tr>
<tr>
<td><strong>Present Value Total Benefits</strong></td>
<td>846,330</td>
<td>854,095</td>
<td>846,259</td>
<td>2,546,684</td>
<td></td>
</tr>
<tr>
<td><strong>Development Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor–Analysis and Design</td>
<td>300,000</td>
<td></td>
<td></td>
<td>300,000</td>
<td></td>
</tr>
<tr>
<td>Labor–Implementation</td>
<td>175,000</td>
<td></td>
<td></td>
<td>175,000</td>
<td></td>
</tr>
<tr>
<td>Office space and equipment</td>
<td>8,000</td>
<td></td>
<td></td>
<td>8,000</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>25,000</td>
<td></td>
<td></td>
<td>25,000</td>
<td></td>
</tr>
<tr>
<td>Hardware</td>
<td>50,000</td>
<td></td>
<td></td>
<td>50,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Development Costs</strong></td>
<td>558,000</td>
<td></td>
<td></td>
<td>558,000</td>
<td></td>
</tr>
<tr>
<td><strong>Operational Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor–Webmaster</td>
<td>85,000</td>
<td>89,250</td>
<td>93,713</td>
<td>267,963</td>
<td></td>
</tr>
<tr>
<td>Labor–Network technician</td>
<td>60,000</td>
<td>63,000</td>
<td>66,150</td>
<td>189,150</td>
<td></td>
</tr>
<tr>
<td>Labor–Computer operations</td>
<td>50,000</td>
<td>52,500</td>
<td>55,125</td>
<td>157,625</td>
<td></td>
</tr>
<tr>
<td>Labor–Business manager</td>
<td>60,000</td>
<td>63,000</td>
<td>66,150</td>
<td>189,150</td>
<td></td>
</tr>
<tr>
<td>Labor–Assistant manager</td>
<td>45,000</td>
<td>47,250</td>
<td>49,613</td>
<td>141,863</td>
<td></td>
</tr>
<tr>
<td>Labor–IS maintenance developers (3)</td>
<td>120,000</td>
<td>126,000</td>
<td>132,300</td>
<td>378,300</td>
<td></td>
</tr>
<tr>
<td>Software upgrades</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>Software licenses</td>
<td>8,000</td>
<td>8,000</td>
<td>8,000</td>
<td>24,000</td>
<td></td>
</tr>
<tr>
<td>Hardware upgrades</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>User training and support</td>
<td>8,000</td>
<td>8,400</td>
<td>8,820</td>
<td>25,220</td>
<td></td>
</tr>
<tr>
<td>Additional ISP charges</td>
<td>15,000</td>
<td>15,750</td>
<td>16,538</td>
<td>47,288</td>
<td></td>
</tr>
<tr>
<td>Marketing expenses</td>
<td>30,000</td>
<td>31,500</td>
<td>33,075</td>
<td>94,575</td>
<td></td>
</tr>
<tr>
<td><strong>Total Operational Costs</strong></td>
<td>496,000</td>
<td>519,650</td>
<td>544,483</td>
<td>1,560,133</td>
<td></td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>558,000</td>
<td>496,000</td>
<td>519,650</td>
<td>544,483</td>
<td>2,118,133</td>
</tr>
<tr>
<td><strong>Total Benefits – Total Costs</strong></td>
<td>-558,000</td>
<td>426,500</td>
<td>495,100</td>
<td>551,447</td>
<td>915,047</td>
</tr>
<tr>
<td><strong>Cumulative New Cash Flow</strong></td>
<td>-558,000</td>
<td>-131,500</td>
<td>363,600</td>
<td>915,047</td>
<td></td>
</tr>
<tr>
<td><strong>Present Value Total Costs</strong></td>
<td>558,000</td>
<td>455,046</td>
<td>437,379</td>
<td>420,441</td>
<td>1,870,866</td>
</tr>
<tr>
<td>Return on Investment (ROI)</td>
<td>43%</td>
<td>(3,033,180 – 2,118,133) / 2,118,133</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break-even Point</td>
<td>1.27 years</td>
<td>Costs are fully recovered in the second year; [495,100 – 363,600] / 495,100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPV (PV Total Benefits – PV Total Costs)</td>
<td>675,818</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Intangible Costs and Benefits**

Intangible Cost: Effective drone flight service option may reduce the demand for actual drone sales

Intangible Benefit: Enhanced competitive position through expansion of our drone brand into the drone flight service market

FIGURE 1A-1 Economic feasibility analysis for DrônTeq.
Cost projections are based on Jiang’s assumptions about the time it will take to develop the system and the resources that will be required. Operating costs have a considerable new labor component because a new business unit is being created, requiring additional staff.*

Figure 1A-1 incorporates several of the financial analysis techniques we have discussed. The rows marked A and C summarize the annual benefits and costs, respectively. The row marked D shows the yearly net benefits (total benefits – total costs). The ROI calculation shows that this project is expected to return 43% on the investment, calculated by dividing the difference between total benefits in row A and total costs in row C by the total costs in row C.

Row E shows the cumulative cash flow for the project, and this is used to determine the breakeven point. As seen in Figure 1A-1, the project fully recovers its costs in the second year, since the cumulative net cash flow becomes positive in the second year. It takes about 0.27 of the second year before the costs are recovered.

The row marked B computes the present value of each year’s total benefits, and the row marked F computes the present value of each year’s total costs. A 9% required rate of return was used in these calculations. These values are used in the NPV calculation. The total present value of costs is subtracted from the total present value of benefits, and the result is $675,818, indicating the strong financial viability of this investment.

This spreadsheet shows that this project can add significant business value even if the underlying assumptions prove to be overly optimistic.

* Some of the salary information may seem high to you. Keep in mind that most companies use a “full cost” model for estimating salary cost in which all benefits (e.g., health insurance, retirement, payroll taxes) are included in salaries when estimating costs.