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The Role of the Systems Analyst

Chapter Outline

- The Analyst as a Business Problem Solver
- Systems That Solve Business Problems
- Required Skills of the Systems Analyst
- Analysis-Related Careers

Learning Objectives

After reading this chapter, you should be able to:

- Explain the key role of a systems analyst in business
- Describe the various types of systems and technologies an analyst might use
- Explain the importance of technical skills, people skills, and business skills for an analyst
- Explain why ethical behavior is crucial for a systems analyst's career
- Describe various job titles in the field and places of employment where analysis and design work is done



OPENING CASE

A Systems Analyst at Consolidated Refineries

Mary Wright thought back about her two-year career as a programmer analyst. She had been asked to talk to visiting computer information system (CIS) students about life on the job. “It seems like yesterday that I finally graduated from college and loaded up a U-Haul to start my new job at Consolidated,” she began.

Consolidated Refineries is an independent petroleum refining company in west Texas. Consolidated buys crude oil from freelance petroleum producers and refines it into gasoline and other petroleum products for sale to independent distributors. Demand for refined petroleum products had been increasing rapidly, and Consolidated was producing at maximum capacity. Capacity planning systems and refining operations systems were particularly important computer information systems for Consolidated because careful planning and process monitoring resulted in increased production at reduced costs. This increasing demand and other competitive changes in the energy industry made information systems particularly important to Consolidated.

Mary continued her informal talk to visiting students. “At first, I did programming—mainly fixing things that end users wanted done. I completed some training on Java and object-oriented analysis to round out my experience. The job was pretty much what I had expected at first—until everything went crazy over the IPCS project.”

The Integrated Process Control System (IPCS) project was part of the company’s information systems plan drawn up the year before. Edward King, the CEO of Consolidated Refineries, had pushed for more strategic planning at the company from the beginning, including drawing up a five-year strategic plan for information systems. The IPCS development project was scheduled to begin in the third or fourth year of the plan, but suddenly, priorities changed. Demand for petroleum products had never been higher, and supplies of crude oil were becoming scarce. At the same time, political pressure was making price increases an unpopular option.

Something had to be done to increase production and reduce costs. It would be years before an additional refinery could be built, and additional crude oil supplies from new oil fields were years away. The only option for Consolidated’s growth and increased profits was to do a better job with the plants and supplies it had. So, top executives decided to make a major commitment to implementing the IPCS project, with the goal of radically improving capacity planning and process monitoring. Everyone at Consolidated also wanted access to this information anywhere and anytime.

“It seemed like the IPCS project was the only thing the company cared about,” continued Mary. “I was assigned to the project as the junior analyst assisting the project manager, so I got in on everything. Suddenly, I was in meeting after meeting, and I had to digest all kinds of information about refining and distribution, as if I were a petroleum engineer. I met with production supervisors, suppliers, and marketing managers to learn about the oil business—just as if I were taking business school courses. I traveled all over to visit oil fields and pipelines—including a four-day trip to Alaska on about two days’ notice! I interviewed technology vendors’ representatives and consultants who specialized in capacity planning and process control systems. I’ve been spending a lot of time at my computer too, writing reports, letters, and memos—not programming!”

“We’ve been working on the project for seven months now, and every time I turn around, Mr. King, our CEO, is saying something about how important the IPCS project is to the future of the company. He repeats the story to employees and to the stockholders. Mr. King attends many of our status meetings, and he even sat next to me the day I presented a list of key requirements for the system to the top management team.

“This isn’t at all the way I thought it would be.”

Overview

As Mary Wright’s story about Consolidated Refineries illustrates, information systems with strategic value are critical to the success of business organizations and their top executives. Most of the activities and tasks completed by a system developer, even a new graduate like Mary, involve much more than programming. Systems analysis is really more about understanding the business and its goals and strategies, defining requirements for information systems that support those goals and strategies, and supporting the business. It isn’t at all what most college students imagine it to be.

People today are attracted to information systems careers because information technology (IT) can have a dramatic impact on productivity and profits.

systems analysis the process of understanding and specifying in detail what the information system should accomplish

systems design the process of specifying in detail how the many components of the information system should be physically implemented

systems analyst a business professional who uses analysis and design techniques to solve business problems by using information technology

Most of you regularly use the latest technologies for online purchases and reservations, online auctions and customer support, and e-mail and wireless messaging. But it isn't the technology itself that increases productivity and profits; it is the people who develop information system solutions that harness the power of the technology that makes these benefits possible. The challenges are great because more and more people expect to have information systems that provide access to information anywhere and anytime.

The key to successful system development is thorough systems analysis and design to understand what the business requires from the information system. **Systems analysis** means understanding and specifying in detail what the information system should accomplish. **Systems design** means specifying in detail how the many components of the information system should be physically implemented. This text is about systems analysis and design techniques used by a **systems analyst**, a business professional who develops information systems.

This online chapter describes the world of the systems analyst—the nature of the work, the knowledge and skills that are important, and the types of systems and special projects an analyst works on. First, we define the analyst's work as problem solving for an organization, so the problem-solving process the analyst follows is described. Next, because most problems an analyst works on are solved in part by an information system, this chapter reviews the types of information systems that businesses use. A systems analyst is a business professional who requires extensive technical, business, and people knowledge and skills, so these skills are reviewed next. Then, we survey the variety of workplaces and positions in which analysis work is done. An analyst's work is really not at all the way most CIS students think it will be.

The Analyst as a Business Problem Solver

First and foremost, systems analysis and design is a practical field grounded in time-tested and rapidly evolving knowledge and techniques. Analysts must certainly know about computers and computer programs. They possess special skills and develop expertise in programming. But they must also bring to the job a fundamental curiosity to explore how things are done and the determination to make them work better.

Developing information systems isn't just about writing programs. Information systems are developed to solve problems for organizations, as the opening case study demonstrated, and a systems analyst is often thought of as a problem solver rather than a programmer. So, what kinds of problems does an analyst typically solve?

- Customers want to order products any time of the day or night. So, the problem is how to process those orders around the clock without adding to the selling cost.
- Production needs to plan very carefully the amount of each type of product to produce each week. So, the problem is how to estimate the dozens of parameters that affect production and then allow planners to explore different scenarios before committing to a specific plan.
- Suppliers want to minimize their inventory holding costs by shipping parts used in the manufacturing process in smaller daily batches. So, the problem is how to order in smaller lots and accept daily shipments to take advantage of supplier discounts.
- Marketing wants to better anticipate customer needs by tracking purchasing patterns and buyer trends. So, the problem is how to collect and analyze information on customer behavior that marketing can put to use.
- Management continually wants to know the current financial picture of the company, including profit and loss, cash flow, and stock market forecasts.

So, the problem is how to collect, analyze, and present all the financial information management wants.

- Employees demand more flexibility in their benefits programs, and management wants to build loyalty and morale. So, the problem is how to process transactions for flexible health plans, wellness programs, employee investment options, retirement accounts, and other benefit programs offered to employees.

Information system developers work on problems such as these—and many more. Some of these problems are large and strategically important. Some are much smaller, affecting fewer people but important in their own way. All programming for the information system that solves the business problem is important, but solving each of these problems involves more than programming.

How does an analyst solve problems? Systems analysis and design focuses on understanding the business problem and outlining the approach to be taken to solve it. **Figure A-1** shows a general approach to problem solving that can be adapted to solving business problems by using information technology. Obviously, part of the solution is a new information system, but that is just part of the story.

The analyst must first understand the problem and learn everything possible about it: who is involved, what business processes come into play, and what other systems would be affected by solving the problem. Then, the analyst needs to confirm for management that the benefits of solving the problem outweigh the costs. Sometimes, it would cost a fortune to solve the problem, so it might not be worth solving.

If solving the problem is feasible, the analyst defines in detail what is required to solve it: what specific objectives must be satisfied, what data needs to be stored and used, what processing must be done to the data, and what outputs must be produced. *What* needs to be done must be defined first. *How* it will be done isn't important yet.

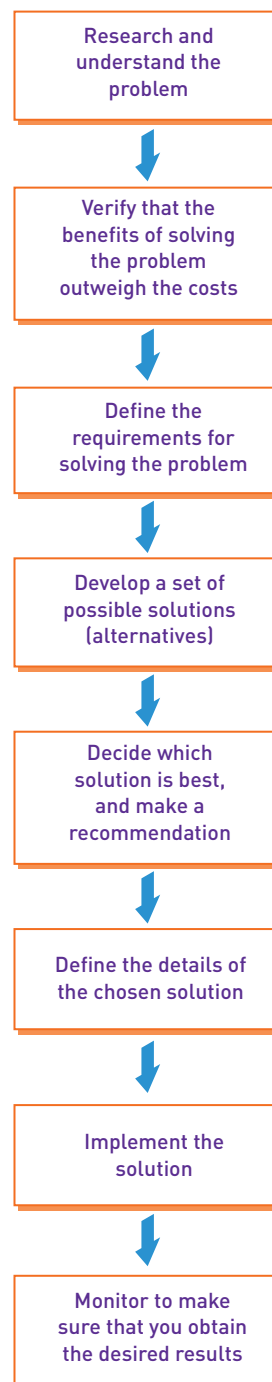
After detailed requirements are defined, the analyst develops a set of possible solutions. Each possible solution (an alternative) needs to be thought through carefully. Usually, an information system alternative is defined as a set of choices about physical components that make up an information system—*how* it will be done. Many choices must be made, involving questions such as these:

- What are the needed components?
- What technology should be used to build the different components?
- Where are the components located?
- How will components communicate over networks?
- How are components configured into a system?
- How will people interact with the system?
- Which components are custom made and which are purchased from vendors?
- Who should build the custom-made components?
- Who should assemble and support the components?

Many different alternatives must be considered, and the challenge is to select the best—that is, the solution with the fewest risks and most benefits. Alternatives for solving the problem must be cost effective, but they must also be consistent with the corporate strategic plan. Does the alternative contribute to the basic goals and objectives of the organization? Will it integrate seamlessly with other planned systems? Does it use technology that fits the strategic direction that management has defined? Will end users be receptive to it? Analysts must consider many factors and make tough decisions.

After the systems analyst has determined in consultation with management which alternative to recommend and management has approved the recommendation, the design details must be worked out. Here, the analyst is concerned

FIGURE A-1
The analyst's approach to problem solving



with creating a blueprint (design specifications) for how the new system will work. Systems design specifications describe the construction details of all parts of the system, including databases, user interfaces, networks, operating procedures, conversion plans, and, of course, program modules.

Thus far, we haven't mentioned programming, even though we are near the end of the steps outlined in Figure OS1-1. Inexperienced developers have a tendency to rush into programming without completing the earlier steps. Sometimes, early programming may be needed to evaluate technical feasibility or to help users understand how a completed system might look and behave. But most of the time, early programming results in wasted time and money because key system requirements or design constraints aren't well understood. Building a system based on incomplete or misunderstood requirements ensures

that the project will be overbudget, late, and will deliver a system that doesn't fully solve the problems it was intended to address. An information system can cost a lot of money to build and install—perhaps millions of dollars. It isn't unusual for dozens of programmers to work on programs to get a system up and running, and those programmers need to know exactly what the system is to accomplish; thus, detailed specifications are required. This text presents the tools and techniques an analyst uses during system development to create the detailed specifications. Some of these specifications are the result of systems analysis, and some are the result of systems design.

Although this text is oriented toward potential systems analysts, it also provides a good foundation for others who will deal with business problems that could be solved with the help of an information system. Managers throughout business must become more and more knowledgeable about using information technology to solve business problems. Many general business students take a systems analysis and design course to round out their background in two-year and four-year degree programs. Many graduate programs, such as master of business administration (MBA) and master of accountancy (MAcc) programs, have technology tracks with courses that use this book. Remember that systems analysis and design work isn't just about developing systems; it is really about solving business problems by using information technology. So, even though they never build information systems, managers need to gain expertise in these concepts to be effective in their jobs.

Systems That Solve Business Problems

We described the systems analyst as a business problem solver. We said that the solution to the problem is usually an information system. Before we talk about how you learn to be a systems analyst, let us quickly review some information systems concepts.

Information Systems

system a collection of interrelated components that function together to achieve some outcome

information system a collection of interrelated components that collect, process, store, and provide as output the information needed to complete business tasks

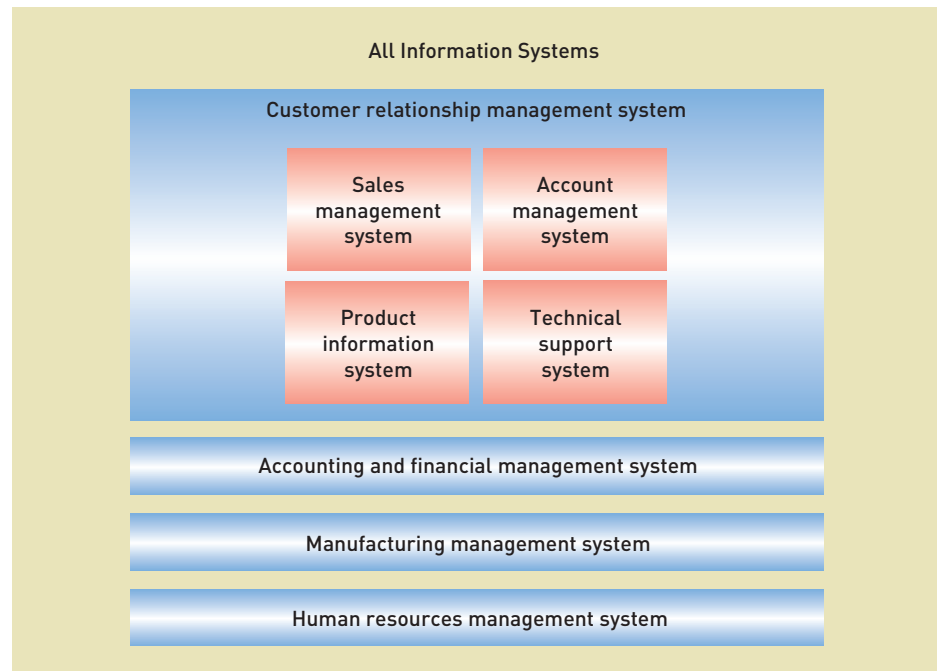
A **system** is a collection of interrelated components that function together to achieve some outcome. An **information system** is a collection of interrelated components that collect, process, store, and provide as output the information needed to complete a business task. Completing a business task is usually the “problem” we talked about earlier.

For example, a payroll system collects information on employees and their work, processes and stores that information, and then produces paychecks and payroll reports (among other things) for the organization. A sales management system collects information about customers, sales, products, and inventory levels. It enables customers and sales personnel to create and modify sales orders, select payment methods, and output sales information for such tasks as generating financial statements, computing bonuses, and scheduling production.

What are the interrelated components of an information system? You can think about components in several ways. Any system can have subsystems. A **subsystem** is a system that is part of another system, so subsystems might be one way to think about the components of a system. For example, a sales management system might be one subsystem of a customer relationship management (CRM) system. Another CRM subsystem might enable customers to view past and current orders, track order fulfillment and shipping, and modify their account information. A third CRM subsystem might maintain the product catalog database and provide Web-based access to product specifications and manuals. A fourth CRM subsystem might provide technical support via telephone and a Web site, with detailed tracking of customer support requests and related reporting to improve call center management and product quality. When looking at the business as a single system, the CRM system is only one

subsystem a system that is part of a larger system

FIGURE A-2
Information systems and subsystems



subsystem among others, including the accounting and financial management system, the manufacturing management system, and the human resources management system.

The view of a system as a collection of subsystems is very useful to the analyst. It enables the analyst to focus attention on a single area of a business or organization, a group of related areas, or the interfaces among areas. **Figure A-2** shows how one system can be divided, or decomposed, into subsystems, which in turn can be further decomposed into subsystems. This approach to dividing a system into components is referred to as **functional decomposition**.

Another way to think about the components of a system is to list the parts that interact. For example, an information system includes hardware, software, inputs, outputs, data, people, and procedures. This view is also very useful to the analyst. These interrelated components function together in a system, as shown in **Figure A-3**.

Every system has a boundary between it and its environment. Any inputs or outputs must cross the **system boundary**. Defining these inputs and outputs is an important part of systems analysis and design. In an information system, people are also key components, and these people do some of the system's work. So, there is another boundary that is important to a systems analyst: the **automation boundary**. On one side of the automation boundary is the automated part of the system, where work is done by computers. On the other side is the manual part of the system, where work is done by people (see **Figure A-4**).

Types of Information Systems

Because organizations perform many different types of activities, many types of information systems exist—all of which can be innovative and use the latest technologies. The types of information systems found in most businesses are shown in **Figure A-5**. You learned about these types of systems in your introductory information systems course, so we briefly review only the most common ones here.

A **customer relationship management (CRM) system** incorporates processes that support marketing, sales, and service operations involving direct and indirect customer interaction. A **supply chain management (SCM) system**

functional decomposition dividing a system into components based on subsystems that are further divided into smaller subsystems

system boundary the separation between a system and its environment that inputs and outputs must cross

automation boundary the separation between the automated part of a system and the manual part of a system

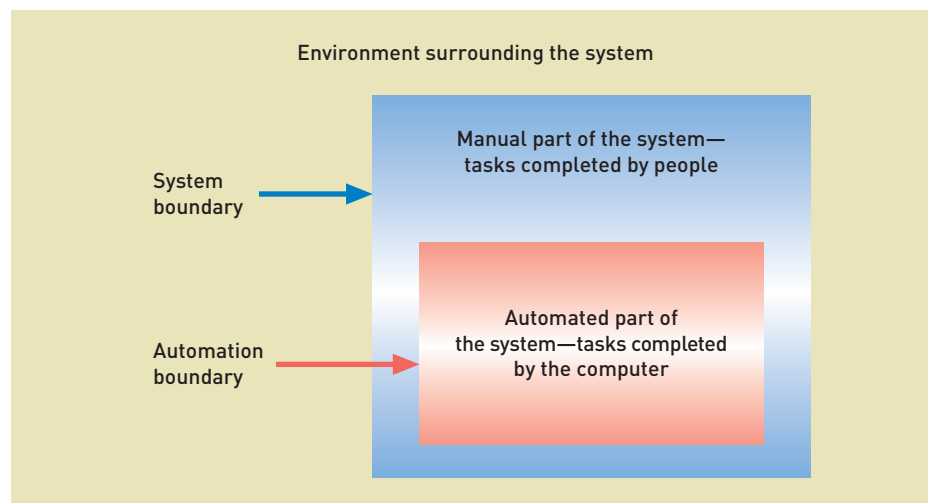
customer relationship management (CRM) system a system that supports marketing, sales, and service operations involving direct and indirect customer interaction

supply chain management (SCM) system a system that seamlessly integrates product development, product acquisition, manufacturing, and inventory management

FIGURE A-3
Information systems and components



FIGURE A-4
The system boundary versus the automation boundary



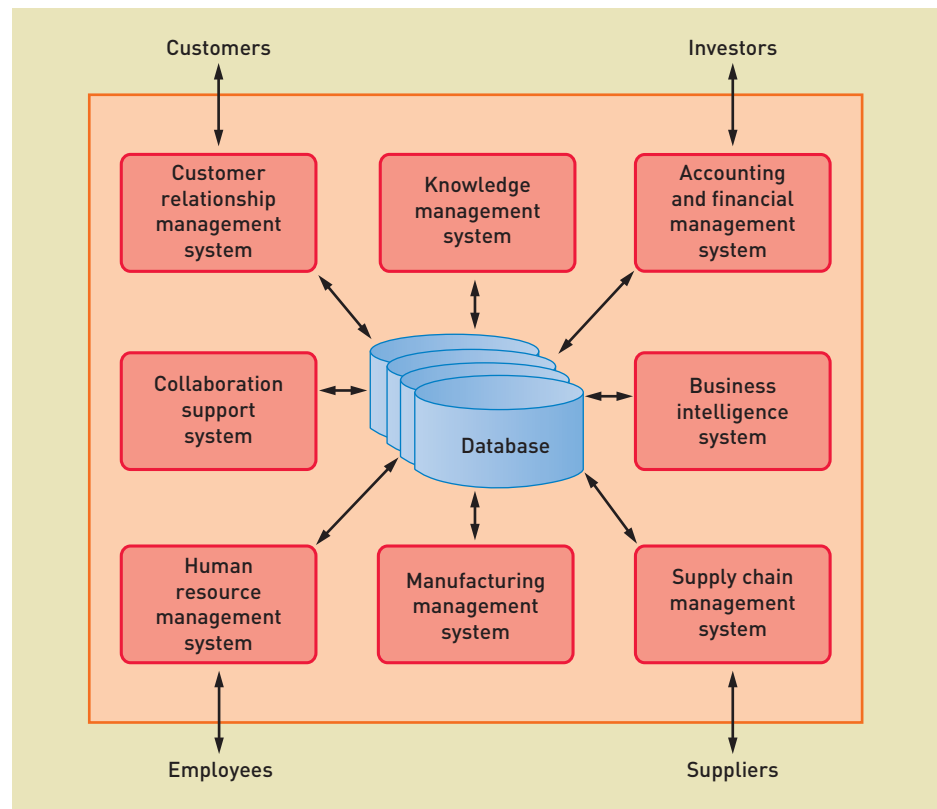
incorporates processes that seamlessly integrate product development, product acquisition, manufacturing, and inventory management. Both systems are important because they are part of the interface between the organization and key external entities. Both types of systems have had rapid changes over the last two decades, including expanded scope and functionality, significant application of Web-based technologies, and increased integration across organizational boundaries. For example, most modern organizations now manage sales and service via a single system, enable Web-based ordering and account management via consumer-oriented Web sites, and employ automated interfaces for business customers that directly connect one organization's SCM to other organizations' CRMs. Integration across organizational boundaries has increased the speed and efficiency of business transactions and enabled such modern business practices as just-in-time delivery of raw materials in manufacturing organizations and direct shipment from manufacturers to end users by third-party resellers.

Other systems that interface with external entities include **accounting and financial management (AFM) systems** and **human resource management (HRM) systems**. AFM systems record accounting information needed to produce financial statements and other reports used by investors and creditors.

accounting and financial management (AFM) system a system that records accounting information needed to produce financial statements and other reports used by investors and creditors

human resource management (HRM) system a system that supports such employee-related tasks as payroll, benefits, hiring, and training

FIGURE A-5
Types of information systems



manufacturing management system a system that controls internal production processes that turn raw materials into finished goods

knowledge management system (KMS) a system that supports the storage of and access to documents from all parts of the organization

collaboration support system (CSS) a system that enables geographically distributed personnel to collaborate on projects and tasks

business intelligence system a system that supports strategic planning and executive decision making

enterprise resource planning (ERP) a process in which an organization commits to using an integrated set of software packages for key information systems

AFM systems also include such financial functions as cash management, cash flow forecasting, and securities management. HRM systems include processes concerned with employees, such as payroll, health insurance, pensions, hiring, and training. AFM and HRM systems are partly governed by external regulations and must frequently interact with regulatory authorities in such areas as taxes, public financial markets, and occupational health and safety.

Organizations also have information systems with few or no interactions with external entities. A **manufacturing management system** controls internal production processes that turn raw materials into finished goods. A **knowledge management system (KMS)** supports the storage of and access to documents from all parts of the organization. It enables rapid communication of policies, procedures, and data and helps ensure continuity of knowledge despite changes in personnel assignments.

A **collaboration support system (CSS)** enables geographically distributed personnel to collaborate on projects and tasks. CSSs encompass a variety of technologies, including voice communications, videoconferencing, project management and scheduling tools, and Wiki technology that enables Web-based management of documents by project participants. A **business intelligence system** supports strategic planning and executive decision making. It enables users to organize internal and external data about customers, suppliers, competitors, and economic conditions for use in statistical analysis, simulations, and other forms of planning.

Today, many companies use **enterprise resource planning (ERP)** systems that incorporate most or all of the system types described previously in this section. Such software vendors as SAP, Oracle, and IBM offer comprehensive packages for companies in specific industries. To adopt an ERP solution, the company must carefully study its existing processes and information needs and then determine which ERP vendor provides the best match. ERP systems are so complex that an organization must often commit nearly everyone in the information systems department and throughout the organization to research

options. They are also very expensive—in initial costs and support costs. Extensive change is involved for management and for staff. After the decision is made to adopt an ERP system, it is very difficult to return to the old ways of doing business or to the old systems.

An important aspect of all types of information systems is data integration. For example, order data originally captured by the CRM system is needed by the SCM system to drive purchasing, the manufacturing management system to drive production scheduling, the AFM system for accounting and to help determine near-term financing requirements, and the business intelligence system to drive estimates of future sales and profitability. Data sharing among all these systems is made possible by **databases**—centrally managed collections of data that can store large amounts of information and make it accessible to many users and systems at the same time.

database a centrally managed collection of data that is accessible to many users and systems at the same time

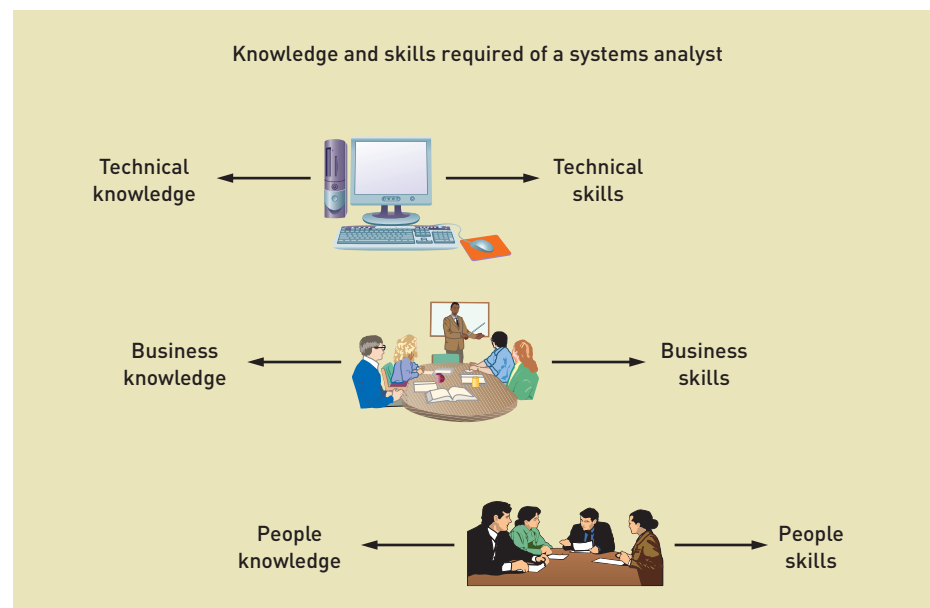
Required Skills of the Systems Analyst

Systems analysts (or any professionals doing systems analysis and design work) need a great variety of special skills. First, they need to be able to understand how to build information systems, which requires quite a bit of technical knowledge. Then, as discussed previously, they have to understand the business they are working for and how the business uses each of the types of systems. Finally, the analysts need to understand quite a bit about people and the way they work. People are the source of information about requirements, the labor that builds systems, and the ultimate users of the information system. **Figure A-6** summarizes the analyst's knowledge and skill requirements.

Technical Knowledge and Skills

It shouldn't be surprising that a systems analyst needs technical expertise. The scope, breadth, and depth of technology employed in medium- and large-scale organizations are vast. A company's "simple" online order-processing application might involve a system with thousands of users spread over hundreds of locations. The database might contain hundreds of tables with millions of records in each table. The system might have taken years to construct, cost millions of dollars, and be supported by global networks, hundreds of servers, and dozens of support staff. If the system fails for even an hour, the company could lose millions of dollars in sales and disrupt its entire supply chain. Such a system

FIGURE A-6
Required skills of the systems analyst



is a critical business resource, so the staffers that support and maintain it work in round-the-clock shifts and are on call day and night in case of a problem. The importance of technology to modern organizations can't be overstated.

Even if an analyst isn't involved in such activities as programming, network design, or hardware configuration, it is still crucial to have an understanding of different types of technology: what they are used for, how they work, and how they are evolving. No one person can be an expert at all types of technology; there are technical specialists to consult for the details. But a systems analyst should understand the fundamentals about the following:

- Computers and how they work
- File, database, and storage hardware and software
- Input and output hardware and software
- Computer networks and protocols
- Programming languages, operating systems, and utilities
- Communication and collaboration technology such as digital telephones, videoconferencing, and Web-based document management systems

Just as an organization's business environment continually changes, so does the technology used for its information systems. The rapid change in technology often drives other needed changes. Thus, all participants in information system development should upgrade their knowledge and skills continually. Those who don't will be left behind.

A systems analyst also needs to know a lot about tools and techniques for developing systems. **Tools** are software products that are used to develop analysis and design specifications and completed system components. Some tools used in system development include:

- Such software packages as Intuit QuickBooks, Microsoft Access, and Adobe Dreamweaver that can be used to implement small systems or develop subsystems
- Integrated development environments (IDEs), such as Oracle JDeveloper and Microsoft Visual Studio, that support program development, database design, software testing, and system deployment
- Computer-aided visual modeling tools, such as Rational XDE Modeler, Visible Analyst, and Embarcadero Describe, that help analysts create, store, modify, and manage system specifications and sometimes generate programs, databases, Web-based interfaces, and other software components
- Automated testing tools, configuration management tools, software library management tools, documentation support tools, project management tools, and so on

Techniques are strategies for completing specific system development activities. How do you plan and manage a system development project? How do you define requirements? How do you design user interactions by using design principles and best practices? How do you complete implementation and testing? How do you install and support a new information system? Much of this text explains how to use specific techniques for project planning, defining requirements, and designing system components. But it also covers some aspects of implementation and support. Some examples of techniques include:

- Project planning techniques
- Cost/benefit analysis techniques
- Interviewing techniques
- Requirements modeling techniques
- Architectural design techniques
- Network configuration techniques
- Database design techniques

tools a software application that assists developers in creating models or other components required for a project

techniques strategies for completing specific system development activities

Business Knowledge and Skills

Other knowledge and skills that are crucial for an analyst include those that apply to understanding business organizations in general. After all, the problem to be solved is a business problem. What does the analyst need to know? The following are examples:

- What business functions do organizations perform?
- How are organizations structured?
- How are organizations managed?
- What type of work goes on in organizations (finance, manufacturing, marketing, customer service, and so on)?

Systems analysts benefit from a fairly broad understanding of businesses in general, so they typically study business administration in college. In fact, computer information systems (CIS) or management information systems (MIS) majors are often included in a School of Business for that reason. The accounting, marketing, management, and operations courses taken in a CIS or MIS degree program serve a very important purpose of preparing the graduate for the workplace. Such project management techniques as planning, scheduling, budgeting, feasibility analysis, and management reporting are particularly important.

Systems analysts also need to understand the type of organization for which they work. Some analysts specialize in a specific industry for their entire career—perhaps in manufacturing, retailing, financial services, or aerospace. The reason for this business focus is simple: It takes a long time to understand the problems of a specific industry. An analyst with deep understanding of a specific industry can solve complex problems for companies in the industry.

Familiarity with a specific company also provides important guidance on system needs and changes. Often, just knowing the people who work for a company and understanding subtleties of the company culture can make a big difference in the effectiveness of an analyst. It takes years of experience working for a company to really understand what is going on. The more an analyst knows about how an organization works, the more effective he or she can be. Some specifics the analyst needs to know about the company include:

- What the specific organization does
- What makes it successful
- What its strategies and plans are
- What its traditions and values are

People Knowledge and Skills

Interpersonal skills are perhaps the analyst's most important skills because analysts rely on others, including managers, users, programmers, technical specialists, customers, and vendors, to take a system from initial idea to final implementation. The analyst is a translator for all project participants, translating business objectives into functional requirements, user needs into system specifications, and technical jargon and details into terms that nontechnical personnel can easily understand. The analyst must be an effective communicator in many contexts, including conversations, interviews, technical reviews, and formal presentations.

Required interpersonal skills go well beyond oral and written communication. For example, the analyst must develop rapport with users who may be resistant to change, negotiate with management for such resources as budget, time, and personnel, and manage development personnel with many different skills, capabilities, and attitudes. The analyst must be an effective teacher, mentor, confidant, collaborator, manager, and leader, shifting easily among those roles many times over the course of a typical work day. In an increasing

multinational environment, the analyst must effectively interact with people of diverse backgrounds, customs, and beliefs.

All these interpersonal skills are critical to project success. The wrong system is acquired or constructed when business and user requirements are misunderstood or ignored. Projects fail without support from managers, users, and development staff. Critical subsystems don't interact correctly when technical specifications are incorrectly communicated or documented. The development team can't adapt to new information and change without effective feedback among all project participants.

A Few Words about Integrity and Ethics

One aspect of a career in information systems that students often underestimate is the importance of personal integrity and ethics. A systems analyst is asked to look into problems that involve information from many different parts of an organization. Especially if it involves individual employees, the information might be private, such as salary, health, and job performance. The analyst must have the integrity to keep this information private.

The problems the analyst works on can also involve confidential corporate information, including proprietary information about products or planned products, strategic plans or tactics, and even top secret information involving government military contracts. Sometimes, a company's security processes or specific security systems can be involved in the analyst's work. Analysts are expected to uphold the highest ethical standards when it comes to private proprietary information—whether the analysts are employees or outside consultants.

Ethics and integrity also include follow-through on commitments, dealing directly with mistakes and gaps in relevant knowledge and skills, and practicing open and honest communication. Because an analyst is a pivotal member of the development team, his or her lack of follow-through or task completion can cause problems that reverberate throughout the project. No one can be highly skilled in every aspect of system development across all application areas and organizational contexts. An analyst must take honest stock of his or her strengths, weaknesses, and performance as well as ask for needed help and resources and be ready to provide the same to others. The analyst must also balance organizational privacy needs and the reluctance of some project participants to provide complete information with the improved outcomes that arise from the free exchange of information and ideas. It is a difficult balance to strike but one that is critical to project success.

Analysis-Related Careers

Employment in the fields of information systems and computer technology spans a wide variety of skills, organizations, and roles. Rapid changes in technology, business practices, and the structure of the global economy have changed related jobs. Typical information system graduates of the late 20th century were employed as programmer analysts. Job tasks consisted primarily of programming, with some analysis and design. As employees moved “up the ladder,” the mix of activities changed, the breadth and importance of analysis and design activities increased, and supervisory responsibilities for maintenance and development project teams were gradually added. Employees typically worked within a dedicated information systems department of a business or government organization or for a company that developed and maintained information systems under contract to other organizations. The “career ladder” was usually well defined, and skills were easily transferred among jobs.

The employment picture is much more complex in the 21st century. The number of programmer analysts employed by “brick and mortar” companies has decreased due to increased productivity and outsourcing. Many software

development jobs have shifted to companies that produce and sell ERP software, and many of those companies have moved some or all operations out of North America and Western Europe to India, China, and countries of the old Soviet bloc. Given the significant changes that have occurred, is there really a need for analysis and design skills and are there any related jobs in North America and Western Europe?

The answer is yes, but the number and nature of the jobs, their titles, and the organizations that fill those positions are much more complex than in the past. Despite the widespread use of ERP software, many businesses still have smaller in-house development staffs that concentrate on areas of strategic importance, competitive advantage, and unique firm requirements. In-house development, including analysis and design, is especially common in security-sensitive industries, national defense, and research and development in national laboratories. Thus, the employment of analysts and software developers within traditional industries continues but at a slower pace than in the past.

Changes in software development, technology, and business practices have created many new career opportunities for analysts, including:

- Sales and support of ERP software
- Business analysts for user organizations
- Auditing, compliance, and security
- Web development

Companies that produce and sell ERP software have become a significant part of the information systems employment picture. Large companies, such as SAP, Oracle, and IBM, have significant ERP market share, although there are many smaller and more specialized competitors. Selling and supporting ERP software require many analysis and design skills. ERP systems are complex combinations of hardware and software components. Determining the component mix that best matches a particular customer and deploying and supporting that solution requires considerable analysis and design skills. Thus, the job of account representative for many ERP firms requires considerable skills in analysis and sometimes in design. In addition, ERP firms employ many analysts and designers to support account representatives and to continually improve their products to match changing technology and customer needs.

User organizations in “line areas,” such as finance, customer service, and logistics, often employ personnel with significant analysis and design responsibilities. These employees evaluate changing business needs, redesign business processes to better satisfy those needs, and research, evaluate, purchase, deploy, and support new technology to support the redesigned processes. They often work closely with ERP firms and act as user representatives and contract managers for their employers. Although such a position entails many different skills, analysis and design skills are essential. Unlike traditional programmer analyst jobs, these positions are difficult to outsource and less likely to be moved offshore, although they are often globally distributed in large multinational organizations.

Accounting is an area of rapid job growth for information systems professionals, especially within large accounting and auditing firms and within the accounting and internal audit staffs of their clients. The Sarbanes-Oxley Act in the United States—and similar legislation and regulation in other countries—requires publicly traded companies to continually evaluate the adequacy of their financial reporting and internal control systems. Auditors must also certify the adequacy of business processes and evaluate whether the firm is at risk of near-term failure due to financial, legal, market, or other problems. Because businesses rely heavily on automated systems to support business processes and financial reporting, accountants and auditors work closely with technical personnel who understand those systems. The core skill set required for those jobs is analysis and design. Employees with experience and skills in accounting and information systems are in high demand.

As Web technology has permeated modern organizations, the demand for employees with related skills has skyrocketed. Most medium- and large-scale organizations have in-house staffers that develop and maintain Web sites, build Web-based application software, and serve as internal Web consultants to other parts of the organization. Many consulting firms specialize in developing and maintaining a Web presence for other organizations. Analysis and design skills are an important part of developing and maintaining Web-based applications and Web presence. To employ such systems to maximal advantage, developers must analyze business needs and design appropriate systems deployed with appropriate technology.

As you have probably surmised by now, career opportunities for analysts and people with significant analysis and design skills are as varied as the related job titles and descriptions. Here are some job titles you might encounter:

- Programmer analyst
- Business systems analyst
- System liaison
- End-user analyst
- Business consultant
- Systems consultant
- Systems support analyst
- Systems designer
- Software engineer
- System architect
- Web architect
- Webmaster
- Web developer

Sometimes, systems analysts might also be called project leaders or project managers. Be prepared to hear all kinds of titles for people who are involved in analysis and design work.

In sum, the career prospects for analysts are bright, but the nature of related jobs, their location, and the typical career development path for analysts and other information system professionals has changed significantly over the last two decades. As in many other areas of the economy, large numbers of employees doing similar tasks for a single company is no longer the norm. Similar tasks are now more automated and more dispersed, resulting in jobs in a greater variety of organizations with broader responsibilities and rapidly changing requirements. Analysis and design skills are at the core of many of these new jobs. Employees who can understand business processes, user needs, and the technology that supports those processes and needs are in high demand. Continuing penetration of information technology into every aspect of modern organizations ensures that demand will be strong far into the future.

Chapter Summary

A systems analyst is someone who solves business problems by using information systems technology. Problem solving means looking into the problem in great detail, understanding everything about the problem, generating several alternatives for solving the problem, and then picking the best solution. Information systems are usually part of the solution, and information systems development is much more than writing programs.

A system is a collection of interrelated components that function together to achieve some outcome. Information systems, like other systems, contain components, and an information systems outcome is the solution to a business problem. Information systems components can be thought of as subsystems that interact or as hardware, software, inputs, outputs, data, people, and procedures. Many different types of systems solve

organizational problems, including customer relationship management systems, supply chain management systems, human resource management systems, manufacturing management systems, accounting and financial management systems, and purchased software that integrates these systems—often referred to as enterprise resource planning systems. In addition, organizations use collaboration support systems and business intelligence systems.

A systems analyst needs broad knowledge and a variety of skills, including technical, business, and

people knowledge and skills. Integrity and ethical behavior are crucial to the success of the analyst. Analysts encounter a variety of technologies that often change rapidly. Systems analysis and design work is done by people with a variety of job titles—not only systems analyst but programmer analyst, systems consultant, systems engineer, and Web developer, among others. Analysts also work for consulting firms, as independent contractors, and for companies that produce software packages.

Key Terms

accounting and financial management (AFM) systems 8

automation boundary 7

business intelligence system 9

collaboration support system (CSS) 9

customer relationship management (CRM) system 7

databases 10

enterprise resource planning (ERP) 9

functional decomposition 7

human resource management (HRM) systems 8

information system 6

knowledge management system (KMS) 9

manufacturing management system 9

subsystem 6

supply chain management (SCM) system 7

system 6

system boundary 7

systems analysis 3

systems analyst 3

systems design 3

techniques 11

tools 11

Review Questions

1. Give an example of a business problem.
2. What are the main steps to follow when solving a problem?
3. Define *system*.
4. Define *information system*.
5. What types of information systems are found in most organizations?
6. List the six fundamental technologies an analyst needs to understand.
7. List four types of tools the analyst needs to use to develop systems.
8. List five types of techniques used during system development.
9. What are some of the things an analyst needs to understand about businesses and organizations in general?
10. What are some of the things an analyst needs to understand about people?
11. List 10 job titles that involve analysis and design work.

Problems and Exercises

1. Describe a business problem your university has that you would like to see solved. How can information technology help solve it?
2. Describe how you would go about solving a problem you face. Is the approach taken by a systems analyst, as described in the text, any different?
3. Many different types of information systems were described in this chapter. Give an example of each type of system that might be used by a university.
4. What is the difference between technical skills and business skills? Explain how a computer science graduate might be strong in one area and weak in



- another. Discuss how the preparation for a CIS or MIS graduate is different from that for a computer science graduate.
5. Explain why an analyst needs to understand how people think, how they learn, how they react to change, how they communicate, and how they work.
 6. Who needs greater integrity to be successful: a salesperson or a systems analyst? Or does every working professional need integrity and ethical behavior to be successful? Discuss.
 7. Explain why developing a small information system for use by a single department requires different skills than developing a large information system with many internal and external users.
 8. How might working for a consulting firm for a variety of companies make it difficult for the consultant to understand the business problem a particular company faces? What might be easier for the consultant to understand about a business problem?
 9. Explain why a strategic information systems planning project must involve people outside the information systems department. Why would a consulting firm be called in to help organize the project?
 10. Explain why a commitment to enterprise resource planning (ERP) would be very difficult to undo after it has been made.
 11. It is important to understand the nature of the business you work for as an analyst. Contact some information systems developers and ask them about their employers. Do they seem to know a lot about the nature of the business? If so, how did the developers gain that knowledge; for example, was it through self-study, formal training or course work, or on-the-job training via participation in system development projects? What are the developers' plans for the future; for example, do the plans involve more training, more courses, or working on projects in specific business areas?
 12. Think about the type of position you want (for example, working for a specific company, working for a consulting firm, or working for a software vendor). Do some research on each job by looking at companies' recruiting brochures or Web sites. What do they indicate are the key skills they look for in a new hire? Are there any noticeable differences between consulting firms and the other organizations?

Case Study

Association for Information Technology Professionals Meeting

"I'll tell you exactly what I look for when I interview a new college grad," Alice Adams volunteered. Alice, a system development manager at a local bank, was talking with several professional acquaintances at a monthly dinner meeting of the Association for Information Technology Professionals (AITP). AITP provides opportunities for information systems professionals to get together occasionally and share experiences. Usually, a few dozen professionals from information systems departments at a variety of companies attend the monthly meetings.

"When I interview students, I look for problem-solving skills," continued Alice. "Every student I interview claims to know all about Java and .NET and Dreamweaver and XYZ or whatever the latest development package is. But I always ask interviewees one thing: 'How do you generally approach solving problems?' And then I want to know if they have even thought much about banks like mine and financial services generally, so I ask 'What would you say are the greatest problems facing the banking industry these days?'"

Jim Parsons, a database administrator for the local hospital, laughed. "Yes, I know what you mean. It really

impresses me if they seem to appreciate how a hospital functions and what the problems are for us—how information technology can help solve some of our problems. It is the ability to see the big picture that really gets my attention."

"Yeah, I'm with you," added Sam Young, the manager of marketing systems for a retail store chain. "I am not that impressed with the specific technical skills an applicant has. I assume they have the aptitude and some skills. I do want to know how well they can communicate. I do want to know how much they know about the nature of our business. I do want to know how interested they are in retail stores and the problems we face."

"Exactly," confirmed Alice.

1. Do you agree with Alice and the others about the importance of problem-solving skills? Industry-specific insight? Communication skills? Discuss.
2. Should you research how a hospital is managed before interviewing for a position with an information systems manager at a hospital? Discuss.
3. In terms of your career, do you think it really makes a difference whether you work for a bank, a hospital, or a retail chain? Or is an information systems job going to be the same no matter where you work? Discuss.

