



STOCK4B-RF/Getty Images

Introduction to Information Systems

CHAPTER OUTLINE

- 1.1** Why Should I Study Information Systems?
- 1.2** Overview of Computer-Based Information Systems
- 1.3** How Does IT Impact Organizations?
- 1.4** Importance of Information Systems to Society

LEARNING OBJECTIVES

- 1.1** Identify the reasons why being an informed user of information systems is important in today's world.
- 1.2** Describe the various types of computer-based information systems in an organization.
- 1.3** Discuss ways in which information technology can affect managers and nonmanagerial workers.
- 1.4** Identify positive and negative societal effects of the increased use of information technology.

Opening Case

MKT FanDuel

POM Founded in 2009, FanDuel (www.fanduel.com) operates a Web-based fantasy sports game. It is the largest company in the daily fantasy sports business. In May 2016, FanDuel was legal in 39 states, taking advantage of an exclusion in the 2006 Unlawful Internet Gambling Enforcement Act. This statute bans credit card issuers and banks from working with poker and sports-betting Web sites, effectively preventing U.S. customers from participating in those industries.

The law, however, exempts fantasy sports because they are considered a game of skill, not luck. To maintain legal status, the operator of a fantasy sports business must follow four rules: (1) publish prize amounts before the games begin, (2) make prize amounts independent of the number of players in the game, (3) level the playing field by allowing anyone in a league to draft any player they want, and (4) disregard point spreads and game scores.

FanDuel delivers simple and fast fantasy betting. After paying an entry fee, players become eligible to win daily cash payouts based on the statistical performance of athletes in games played

that day. Traditional fantasy sports often frustrate players because the experience lasts for an entire season. If a player drafts a bad team, then he or she is stuck with that team for several months. In addition, serious fantasy league players analyze large amounts of statistics, roster changes, and injury reports. Many casual players do not have time for such analyses. In contrast to these leagues, FanDuel allows customers to play for just a day, a weekend, or a week.

FanDuel lets players participate for free or bet up to \$5000 to draft a team of players in the National Football League (NFL), the National Basketball Association (NBA), Major League Baseball (MLB), and the National Hockey League (NHL), plus college football and basketball. Players can compete head-to-head against another individual or in a league with up to 125,000 teams. The winner is the one with the best player statistics, which translate into fantasy points. FanDuel takes an average of 9 percent of each prize.

MIS By May 2016, FanDuel claimed more than 1 million customers and operated in 39 states. However, the company was not yet profitable. It has to spend millions of dollars on computing power from Amazon Web Services to manage, as only one example, the increase in Web traffic just before Sunday's NFL kickoff. At that time, FanDuel must manage 150,000 simultaneous users, who make 250,000 roster changes per hour. The company also provides 15 million live scoring updates per minute during games, meaning that it must manage 6 terabytes of network traffic during game day. (A terabyte equals 1 trillion bytes.)

Professional sports have noted that FanDuel, with its easy-to-use app, appeals to young and mobile sports fans. Further, these fans have money at stake, so they are more inclined to watch games on television than they otherwise would be. An increase in viewers leads to an increase in advertising rates for the teams. In fact, in 2015 FanDuel signed multiyear sponsorship agreements with 15 NFL teams. These deals generally include stadium signage, radio and digital advertising, and other promotions. Interestingly, the NBA owns an equity stake in FanDuel.

Despite continued success, daily fantasy sports companies face a substantive problem. They can operate only as long as the federal government allows them to do so. The government could close the fantasy loophole in the 2006 statute at any time.

Significantly, the federal law does not give daily fantasy sports businesses immunity from state laws. In October 2015, New York Attorney General Eric Schneiderman launched an inquiry into FanDuel and its chief rival DraftKings. Shortly thereafter, he ruled that the two companies were operating illegally and issued a cease and desist order, ordering the two companies to stop taking bets in New York State.

FanDuel, which is based in New York, said that it would check the locations of its users to ensure that they submitted entries from states

where it is permitted to do so. Users who attempt to circumvent this decision could see their accounts terminated and FanDuel refuse to pay out any winnings.

On the other hand, DraftKings, which is based in Massachusetts, sent an e-mail to its New York customers assuring them that they could continue submitting entries. DraftKings told its New York customer that their right to play in New York will remain unchanged unless a New York court decides otherwise.

Interestingly, in the spring of 2016, FanDuel suspended contests on college sports in all states as part of a negotiation with the National Collegiate Athletic Association.

And the bottom line? The legal battle continues.

Sources: Compiled from D. Purdum, "DraftKings, FanDuel to Stop Offering College Fantasy Games," *ESPN.com*, March 31, 2016; M. Brown, "FanDuel Lays Off Workers as Legal Pressure Mounts," *Forbes*, January 20, 2016; R. Axon, "Facing Threat from N.Y. Attorney General, FanDuel Suspends Entries in State," *USA Today*, November 17, 2015; L. Baker, "FanDuel, DraftKings Vow to Fight New York's Halt on Bets," *Reuters*, November 12, 2015; D. Alba, "DraftKings and FanDuel Scandal Is a Cautionary Startup Tale," *Wired*, October 9, 2015; D. Roberts, "Are DraftKings and FanDuel Legal?" *Fortune*, September 24, 2015; K. Wagner, "DraftKings and FanDuel Are Battling over Your Favorite Teams," *www.recode.net*, July 17, 2015; R. Sandomir, "FanDuel and DraftKings, Leaders in Daily Fantasy Sports, Are Quickly Gaining Clout," *The New York Times*, July 13, 2015; S. Rodriguez, "Yahoo Enters World of Daily Fantasy Sports, Takes on DraftKings and FanDuel," *International Business Times*, July 8, 2015; B. Schrottenboer, "FanDuel Signs Deals with 15 NFL Teams, Escalating Daily Fantasy Integration," *USA Today*, April 21, 2015; D. Primack, "DraftKings and FanDuel Close in on Massive New Investments," *Fortune*, April 6, 2015; S. Ramachandran and Am Sharma, "Disney to Invest \$250 Million in Fantasy Site DraftKings," *The Wall Street Journal*, April 3, 2015; M. Kosoff, "Fantasy Sports Startup FanDuel May Soon Be Worth \$1 Billion," *Business Insider*, February 18, 2015; D. Heitner, "DraftKings Reports \$304 Million on Entry Fees in 2014," *Forbes*, January 22, 2015; S. Bertoni, "Fantasy Sports, Real Money," *Forbes*, January 19, 2015; B. Schrottenboer, "Fantasy Sports Debate: Gambling or Not Gambling?" *USA Today*, January 12, 2015; "The FanDuel Scam," *The Daily Roto*, December 19, 2014; D. Heitner, "Fantasy Sports Service, FanDuel, Secures \$11 Million Investment; Includes Money from Comcast Ventures," *Forbes*, January 30, 2013; www.fanduel.com, www.draftkings.com, accessed July 17, 2015.

Questions

1. Describe how information technology is essential to FanDuel's operations.
2. Discuss the nontechnological problems that FanDuel faces.
3. Describe FanDuel's information technology infrastructure. Now discuss possible technological problems that FanDuel might face.

Introduction

Before we proceed, we need to define information technology and information systems. **Information technology (IT)** refers to any computer-based tool that people use to work with information and to support the information and information-processing needs of an organization. An **information system (IS)** collects, processes, stores, analyzes, and disseminates information for a specific purpose.

IT has far-reaching effects on individuals, organizations, and our planet. Although this text is largely devoted to the many ways in which IT has transformed modern organizations, you will also learn about the significant impacts of IT on individuals and societies, the global economy, and our physical environment. In addition, IT is making our world smaller, enabling more

and more people to communicate, collaborate, and compete, thereby leveling the competitive playing field.

When you graduate, you either will start your own business or you will work for an organization, whether it is public sector, private sector, for-profit, or not-for-profit. Your organization will have to survive and compete in an environment that has been radically transformed by information technology. This environment is global, massively interconnected, intensely competitive, 24/7/365, real-time, rapidly changing, and information-intensive. To compete successfully, your organization must use IT effectively.

As you read this chapter and this text, keep in mind that the information technologies you will learn about are important to businesses of all sizes. No matter what area of business you major in, what industry you work for, or the size of your company, you will benefit from learning about IT. Who knows? Maybe you will use the tools you learn about in this class to make your great idea a reality by becoming an entrepreneur and starting your own business! In fact, as you see in the chapter opening case and in chapter closing case 2, you can use information technology to help you start your own business.

The modern environment is intensely competitive not only for your organization, but for you as well. You must compete with human talent from around the world. Therefore, you will also have to make effective use of IT.

Accordingly, this chapter begins with a discussion of why you should become knowledgeable about IT. It also distinguishes among data, information, and knowledge, and it differentiates computer-based information systems from application programs. Finally, it considers the impacts of information systems on organizations and on society in general.

1.1

Why Should I Study Information Systems?

You are part of the most connected generation in history: You have grown up online; you are, quite literally, never out of touch; you use more information technologies (in the form of digital devices), for more tasks, and are bombarded with more information, than any generation in history. The *MIT Technology Review* refers to you as *Homo conexus*. Information technologies are so deeply embedded in your lives that your daily routines would be almost unrecognizable to a college student just 20 years ago.

Essentially, you practice continuous computing, surrounded by a movable information network. This network is created by constant cooperation between the digital devices you carry (for example, laptops, tablets, and smartphones); the wired and wireless networks that you access as you move about; and Web-based tools for finding information and communicating and collaborating with other people. Your network enables you to pull information about virtually anything from anywhere, at any time, and to push your own ideas back to the Web, from wherever you are, via a mobile device. Think of everything you do online, often with your smart phone: register for classes; take classes (and not just at your university); access class syllabi, information, PowerPoints, and lectures; research class papers and presentations; conduct banking; pay your bills; research, shop, and buy products from companies or other people; sell your “stuff”; search for, and apply for, jobs; make your travel reservations (hotel, airline, rental car); create your own blog and post your own podcasts and videocasts to it; design your own page on Facebook; make and upload videos to YouTube; take, edit, and print your own digital photographs; “burn” your own custom-music CDs and DVDs; use RSS feeds to create your personal electronic newspaper; text and tweet your friends and family throughout your day; send Snaps; and many other activities. (*Note:* If any of these terms are unfamiliar to you, don’t worry. You will learn about everything mentioned here in detail later in this text.)

The Informed User—You!

So, the question is: Why you should learn about information systems and information technologies? After all, you can comfortably use a computer (or other electronic devices) to perform

many activities, you have been surfing the Web for years, and you feel confident that you can manage any IT application that your organization's MIS department installs.

The answer lies in you becoming an **informed user**; that is, a person knowledgeable about information systems and information technology. There are several reasons why you should be an informed user.

MIS

In general, informed users tend to get more value from whatever technologies they use. You will enjoy many benefits from being an informed user of IT, including:

- You will benefit more from your organization's IT applications because you will understand what is “behind” those applications (see **Figure 1.1**). That is, what you see on your computer screen is brought to you by your MIS department, who are operating “behind” your screen.
- You will be in a position to enhance the quality of your organization's IT applications with your input.
- Even as a new graduate, you will quickly be in a position to recommend—and perhaps help select—the IT applications that your organization will use.
- Being an informed user will keep you abreast of both new information technologies and rapid developments in existing technologies. Remaining “on top of things” will help you to anticipate the impacts that “new and improved” technologies will have on your organization and to make recommendations on the adoption and use of these technologies.
- You will understand how using IT can improve your organization's performance and teamwork as well as your own productivity.
- If you have ideas of becoming an entrepreneur, then being an informed user will help you use IT when you start your own business.

Going further, managing the IS function within an organization is no longer the exclusive responsibility of the IS department. Rather, users now play key roles in every step of this process. The overall objective in this text is to provide you with the necessary information to contribute immediately to managing the IS function in your organization. In short, the goal is to help you become a very informed user!

IT Offers Career Opportunities

MIS

Because IT is vital to the operation of modern businesses, it offers many employment opportunities. The demand for traditional IT staff—programmers, business analysts, systems analysts, and designers—is substantial. In addition, many well-paid jobs exist in areas such as the Internet and electronic commerce (e-commerce), mobile commerce (m-commerce), network security, telecommunications, and multimedia design.

FIGURE 1.1 IT skills open many doors because IT is so widely used.



The IS field includes the people in various organizations who design and build information systems, the people who use those systems, and the people responsible for managing those systems. At the top of the list is the chief information officer (CIO).

The CIO is the executive who is in charge of the IS function. In most modern organizations, the CIO works with the chief executive officer (CEO), the chief financial officer (CFO), and other senior executives. Therefore, he or she actively participates in the organization's strategic planning process. In today's digital environment, the IS function has become increasingly strategic within organizations. As a result, although most CIOs still rise from the IS department, a growing number are coming up through the ranks in the business units (e.g., marketing, finance). Regardless of your major, you could become the CIO of your organization one day. This is another reason to be an informed user of information systems!

Table 1.1 provides a list of IT jobs, along with a description of each one. For further details about careers in IT, see www.computerworld.com/careertopics/careers and www.monster.com.

Career opportunities in IS are strong and are projected to remain strong over the next ten years. In fact, the *U.S. News & World Report* listed its "25 best jobs of 2015," *Money* listed its "best jobs in America for 2015," and *Forbes* listed its "10 best jobs" for 2015. Let's take a look at these rankings. (Note that the rankings differ because the magazines used different criteria in their

TABLE 1.1 Information Technology Jobs

Position	Job Description
Chief Information Officer	Highest-ranking IS manager; responsible for all strategic planning in the organization
IS Director	Manages all systems throughout the organization and the day-to-day operations of the entire IS organization
Information Center Manager	Manages IS services such as help desks, hot lines, training, and consulting
Applications Development Manager	Coordinates and manages new systems development projects
Project Manager	Manages a particular new systems development project
Systems Manager	Manages a particular existing system
Operations Manager	Supervises the day-to-day operations of the data and/or computer center
Programming Manager	Coordinates all applications programming efforts
Systems Analyst	Interfaces between users and programmers; determines information requirements and technical specifications for new applications
Business Analyst	Focuses on designing solutions for business problems; interfaces closely with users to demonstrate how IT can be used innovatively
Systems Programmer	Creates the computer code for developing new systems software or maintaining existing systems software
Applications Programmer	Creates the computer code for developing new applications or maintaining existing applications
Emerging Technologies Manager	Forecasts technology trends; evaluates and experiments with new technologies
Network Manager	Coordinates and manages the organization's voice and data networks
Database Administrator	Manages the organization's databases and oversees the use of database-management software
Auditing or Computer Security Manager	Oversees the ethical and legal use of information systems
Webmaster	Manages the organization's Web site
Web Designer	Creates Web sites and pages

research.) As you can see, jobs suited for MIS majors rank extremely high in all three lists. The magazines with their job rankings are as follows:

U.S. News & World Report (out of 25)

- #3 Software Developer
- #7 Computer System Analyst
- #8 Information Security Analyst
- #11 Web Developer
- #21 IT Manager

Money

- #1 Software Architect
- #2 Video Game Designer
- #8 Database Developer
- #9 Information Assurance (Security) Analyst
- #11 Clinical Applications Specialist (IT in healthcare)
- #14 User Experience Designer
- #17 IT Program Manager

Forbes (out of 10)

- #8 Software Engineer
- #10 Computer Systems Analyst

Not only do IS careers offer strong job growth, but the pay is excellent as well. The Bureau of Labor Statistics, an agency within the Department of Labor that is responsible for tracking and analyzing trends relating to the labor market, notes that the median salary in 2015 for “computer and information systems managers” was approximately \$130,000, and predicted that the profession would grow by an average of 15 percent per year through 2022.

Managing Information Resources

Managing information systems in modern organizations is a difficult, complex task. Several factors contribute to this complexity. First, information systems have enormous strategic value to organizations. Firms rely on them so heavily that, in some cases, when these systems are not working (even for a short time), the firm cannot function. (This situation is called “being hostage to information systems.”) Second, information systems are very expensive to acquire, operate, and maintain.

A third factor contributing to the difficulty in managing information systems is the evolution of the management information systems (MIS) function within the organization. When businesses first began to use computers in the early 1950s, the MIS department “owned” the only computing resource in the organization, the mainframe. At that time, end users did not interact directly with the mainframe.

In contrast, in the modern organization, computers are located in all departments, and almost all employees use computers in their work. This situation, known as *end user computing*, has led to a partnership between the MIS department and the end users. The MIS department now acts as more of a consultant to end users, viewing them as customers. In fact, the main function of the MIS department is to use IT to solve end users’ business problems.

As a result of these developments, the responsibility for managing information resources is now divided between the MIS department and the end users. This arrangement raises several important questions: Which resources are managed by whom? What is the role of the MIS department, its structure, and its place within the organization? What is the appropriate relationship between the MIS department and the end users? Regardless of who is doing what, it is essential that the MIS department and the end users work in close cooperation.

There is no standard way to divide responsibility for developing and maintaining information resources between the MIS department and the end users. Instead, that division depends on several factors: the size and nature of the organization, the amount and type of IT resources, the organization's attitudes toward computing, the attitudes of top management toward computing, the maturity level of the technology, the amount and nature of outsourced IT work, and even the countries in which the company operates. Generally speaking, the MIS department is responsible for corporate-level and shared resources, and the end users are responsible for departmental resources. **Table 1.2** identifies both the traditional functions and various new, consultative functions of the MIS department.

TABLE 1.2 The Changing Role of the Information Systems Department

Traditional Functions of the MIS Department

Managing systems development and systems project management

- As an end user, you will have critical input into the systems development process. You will learn about systems development in Chapter 13.

Managing computer operations, including the computer center

Staffing, training, and developing IS skills

Providing technical services

Infrastructure planning, development, and control

- As an end user, you will provide critical input about the IS infrastructure needs of your department.

New (Consultative) Functions of the MIS Department

Initiating and designing specific strategic information systems

- As an end user, your information needs will often mandate the development of new strategic information systems.

You will decide which strategic systems you need (because you know your business needs better than the MIS department does), and you will provide input into developing these systems.

Incorporating the Internet and electronic commerce into the business

- As an end user, you will be primarily responsible for effectively using the Internet and electronic commerce in your business. You will work with the MIS department to accomplish this task.

Managing system integration including the Internet, intranets, and extranets

- As an end user, your business needs will determine how you want to use the Internet, your corporate intranets, and extranets to accomplish your goals. You will be primarily responsible for advising the MIS department on the most effective use of the Internet, your corporate intranets, and extranets.

Educating the non-MIS managers about IT

- Your department will be primarily responsible for advising the MIS department on how best to educate and train your employees about IT.

Educating the MIS staff about the business

- Communication between the MIS department and the business units is a two-way street. You will be responsible for educating the MIS staff on your business, its needs, and its goals.

Partnering with business-unit executives

- Essentially, you will be in a partnership with the MIS department. You will be responsible for seeing that this partnership is one "between equals" and ensuring its success.

(Continued)

Managing outsourcing

- Outsourcing is driven by business needs. Therefore, the outsourcing decision resides largely with the business units (i.e., with you). The MIS department, working closely with you, will advise you on technical issues such as communications bandwidth, security, as well as other issues.

Proactively using business and technical knowledge to seed innovative ideas about IT

- Your business needs often will drive innovative ideas about how to effectively use information systems to accomplish your goals. The best way to bring these innovative uses of IS to life is to partner closely with your MIS department. Such close partnerships have amazing synergies!

Creating business alliances with business partners

- The needs of your business unit will drive these alliances, typically along your supply chain. Again, your MIS department will act as your advisor on various issues, including hardware and software compatibility, implementing extranets, communications, and security.

So, where do the end users come in? Take a close look at Table 1.2. Under the traditional MIS functions, you will see two functions for which you provide vital input: managing systems development and infrastructure planning. Under the consultative MIS functions, in contrast, you exercise the primary responsibility for each function, while the MIS department acts as your advisor.

Before you go on...

1. Rate yourself as an informed user. (Be honest; this isn't a test!)
2. Explain the benefits of being an informed user of information systems.
3. Discuss the various career opportunities offered in the IT field.

Apply the Concept 1.1

LEARNING OBJECTIVE 1.1 Identify the reasons why being an informed user of information systems is important in today's world.

STEP 1: Background (Here is what you are learning.)

Section 1.1 discussed how businesses are utilizing modern technologies to become more productive by connecting to their customers, suppliers, partners, and other parties. Those connections, however, do not exist simply to support the businesses. Do you realize how connected *you* are? Computers and information systems have become an essential feature of our everyday lives. Most of you have a cell phone within reach and have looked at it within the past 5 minutes. No longer is a phone just a phone; rather, it is your connection to family, friends, shopping, driving directions, entertainment (games, movies, music, etc.), and much more.

When you embark on your career, you likely will have to interface with information systems to post transactions and search for or record information. Accomplishing these tasks will require you to

work effectively with computers, regardless of the industry you find yourself employed in.

STEP 2: Activity (Here is what you do.)

Visit the Web sites of three local businesses: a bank, a dentist, and a retail shop. Examine their information to see if you can determine what types of information systems they use to support their operations. It is likely that you will find some similarities and differences among the three. Also, see if they have any open positions. If they do, what technical skills do these positions require? Summarize your findings in a paragraph or two.

STEP 3: Assignment (Here is what you turn in.)

Based on your research, identify five reasons why it is important for you to be an informed user of information technology. Reference your summarized findings to support your reasoning. Submit this list to your instructor, but also keep it in mind. You have just looked into the real world (your local world, in fact) and identified a reason for taking this course!

1.2 Overview of Computer-Based Information Systems

Organizations refer to their management information systems functional area by several names, including the MIS Department, the Information Systems (IS) Department, the Information Technology (IT) Department, and the Information Services Department. Regardless of the name, however, this functional area deals with the planning for—and the development, management, and use of—information technology tools to help people perform all the tasks related to information processing and management. Recall that **information technology** relates to any computer-based tool that people use to work with information and to support the information and information-processing needs of an organization.

As previously stated, an **information system** collects, processes, stores, analyzes, and disseminates information for a specific purpose. The purpose of information systems has been defined as getting the right information to the right people, at the right time, in the right amount, and in the right format. Because information systems are intended to supply useful information, we need to differentiate between information and two closely related terms: data and knowledge (see **Figure 1.2**).

Data items refer to an elementary description of things, events, activities, and transactions that are recorded, classified, and stored but are not organized to convey any specific meaning. Data items can be numbers, letters, figures, sounds, and images. Examples of data items are collections of numbers (e.g., 3.11, 2.96, 3.95, 1.99, 2.08) and characters (e.g., B, A, C, A, B, D, F, C).

Information refers to data that have been organized so that they have meaning and value to the recipient. For example, a grade point average (GPA) by itself is data, but a student's name coupled with his or her GPA is information. The recipient interprets the meaning and draws

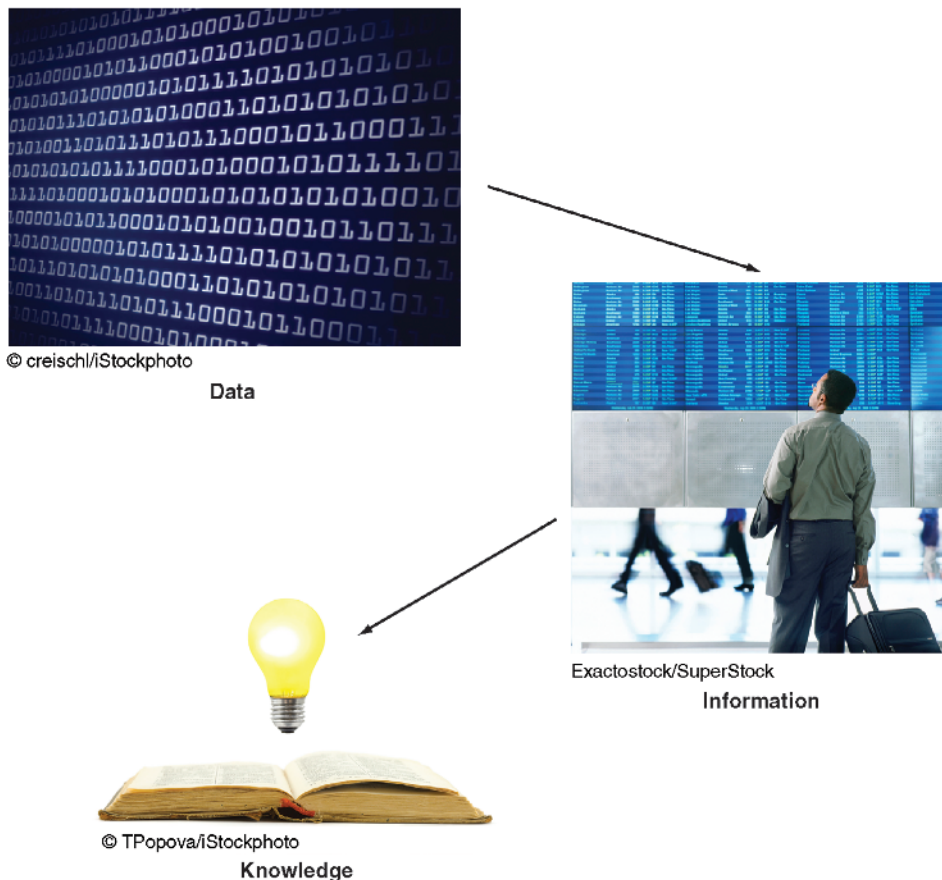


FIGURE 1.2 Data, Information, and Knowledge

conclusions and implications from the information. Consider the examples of data provided in the preceding paragraph. Within the context of a university, the numbers could be grade point averages, and the letters could be grades in an Introduction to MIS class.

Knowledge consists of data and/or information that have been organized and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current business problem. For example, suppose that a company recruiting at your school has found over time that students with grade point averages over 3.0 have experienced the greatest success in its management program. Based on this accumulated knowledge, that company may decide to interview only those students with GPAs over 3.0. This example presents an example of knowledge because the company utilizes information—GPAs—to address a business problem—hiring successful employees. As you can see from this example, organizational knowledge, which reflects the experience and expertise of many people, has great value to all employees.

Consider this example:

Data	Information	Knowledge
[No context]	[University context]	
3.16	3.16 + John Jones = GPA	* Job prospects
2.92	2.92 + Sue Smith = GPA	* Graduate school prospects
1.39	1.39 + Kyle Owens = GPA	* Scholarship prospects
3.95	3.95 + Tom Elias = GPA	

Data	Information	Knowledge
[No context]	[Professional baseball pitcher context]	
3.16	3.16 + Ken Rice = ERA	
2.92	2.92 + Ed Dyas = ERA	* Keep pitcher, trade pitcher, or send pitcher to minor leagues
1.39	1.39 + Hugh Carr = ERA	* Salary/contract negotiations
3.95	3.95 + Nick Ford = ERA	

GPA = Grade point average (higher is better)

ERA = Earned run average (lower is better); ERA is the number of runs per nine innings that a pitcher surrenders.

You see that the same data items, with no context, can mean entirely different things in different contexts.

Now that you have a clearer understanding of data, information, and knowledge, let’s shift our focus to computer-based information systems. As you have seen, these systems process data into information and knowledge that you can use.

A **computer-based information system (CBIS)** is an information system that uses computer technology to perform some or all of its intended tasks. Although not all information systems are computerized, today most are. For this reason the term “information system” is typically used synonymously with “computer-based information system.” The basic components of computer-based information systems are listed below. The first four are called **information technology components**. **Figure 1.3** illustrates how these four components interact to form a CBIS.

- **Hardware** consists of devices such as the processor, monitor, keyboard, and printer. Together, these devices accept, process, and display data and information.
- **Software** is a program or collection of programs that enable the hardware to process data.
- A **database** is a collection of related files or tables containing data.

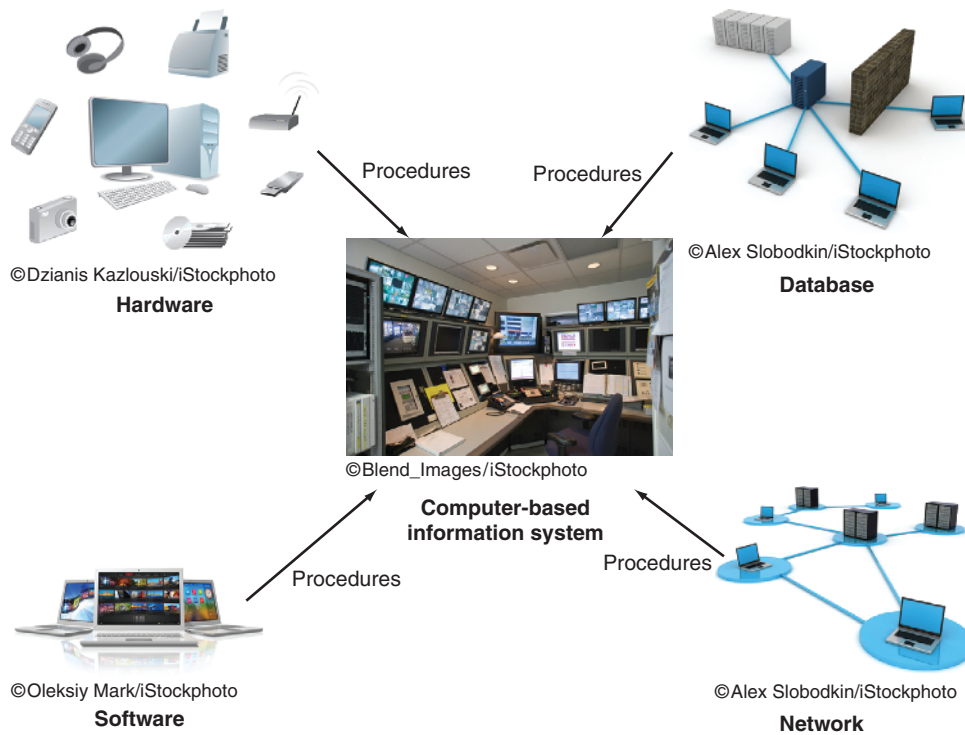


FIGURE 1.3 It takes technology (hardware, software, databases, and networks) with appropriate procedures to make a CBIS useful for people.

- A **network** is a connecting system (wireline or wireless) that permits different computers to share resources.
- **Procedures** are the instructions for combining the above components to process information and generate the desired output.
- **People** use the hardware and software, interface with it, or utilize its output.

Figure 1.4 illustrates how these components are integrated to form the wide variety of information systems found within an organization. Starting at the bottom of the figure, you see that the IT components of hardware, software, networks (wireline and wireless), and databases

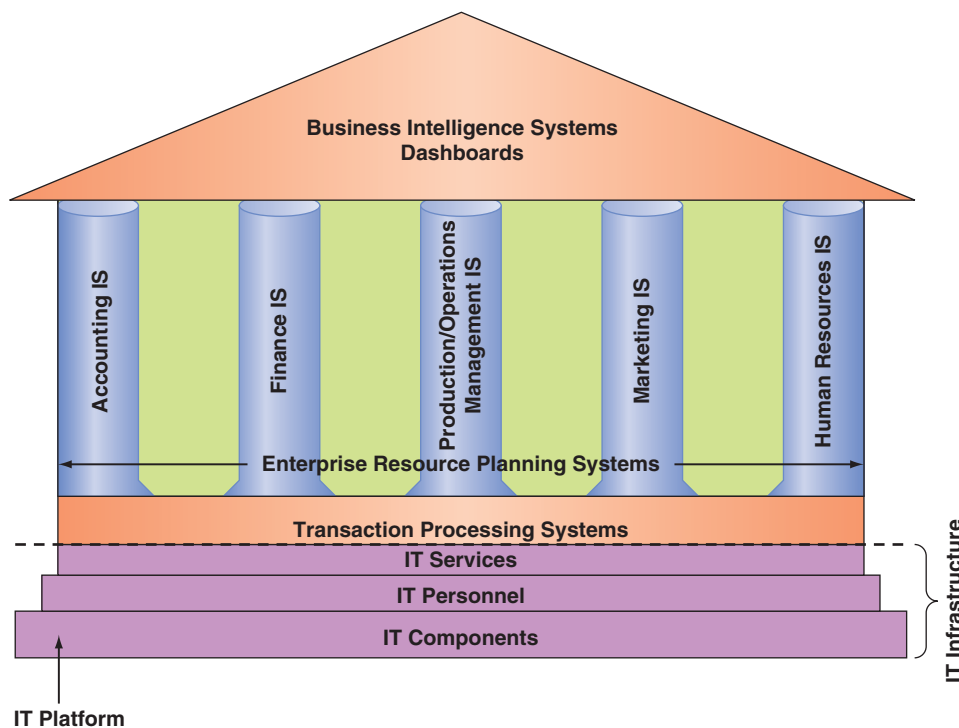


FIGURE 1.4 Information technology inside your organization.

form the **information technology platform**. IT personnel use these components to develop information systems, oversee security and risk, and manage data. These activities cumulatively are called **information technology services**. The IT components plus IT services comprise the organization's **information technology infrastructure**. At the top of the pyramid are the various organizational information systems.

Computer-based information systems have many capabilities. **Table 1.3** summarizes the most important ones.

Information systems perform these various tasks via a wide spectrum of applications. An **application** (or **app**) is a computer program designed to support a specific task or business process. (A synonymous term is **application program**.) Each functional area or department within a business organization uses dozens of application programs. For instance, the human resources department sometimes uses one application for screening job applicants and another for monitoring employee turnover. The collection of application programs in a single department is usually referred to as a **departmental information system** (also known as a **functional area information system**). For example, the collection of application programs in the human resources area is called the **human resources information system (HRIS)**. There are collections of application programs—that is, departmental information systems—in the other functional areas as well, such as accounting, finance, marketing, and production/operations.

Types of Computer-Based Information Systems

Modern organizations employ many different types of information systems. Figure 1.4 illustrates the different types of information systems that function *within* a single organization, and **Figure 1.5** shows the different types of information systems that function *among* multiple organizations. You will study transaction processing systems, management information systems, and enterprise resource planning systems in Chapter 11. You will learn about customer relationship management (CRM) systems in Chapter 12 and supply chain management (SCM) systems in Chapter 13.

In the next section you will learn about the numerous and diverse types of information systems employed by modern organizations. You will also read about the types of support these systems provide.

Breadth of Support of Information Systems. Certain information systems support parts of organizations, others support entire organizations, and still others support groups of organizations. This section addresses all of these systems.

Recall that each department or functional area within an organization has its own collection of application programs, or information systems. These **functional area information systems (FAISs)** are supporting pillars for the information systems located at the top of Figure 1.4, namely, business intelligence systems and dashboards. As the name suggests, each FAIS supports a particular functional area within the organization. Examples are accounting IS, finance IS, production/operations management (POM) IS, marketing IS, and human resources IS.

Consider these examples of IT systems in the various functional areas of an organization. In finance and accounting, managers use IT systems to forecast revenues and business activity,

ACCT

FIN

TABLE 1.3 Major Capabilities of Information Systems

Perform high-speed, high-volume numerical computations.

Provide fast, accurate communication and collaboration within and among organizations.

Store huge amounts of information in an easy-to-access, yet small space.

Allow quick and inexpensive access to vast amounts of information, worldwide.

Analyze and interpret vast amounts of data quickly and efficiently.

Automate both semiautomatic business processes and manual tasks.

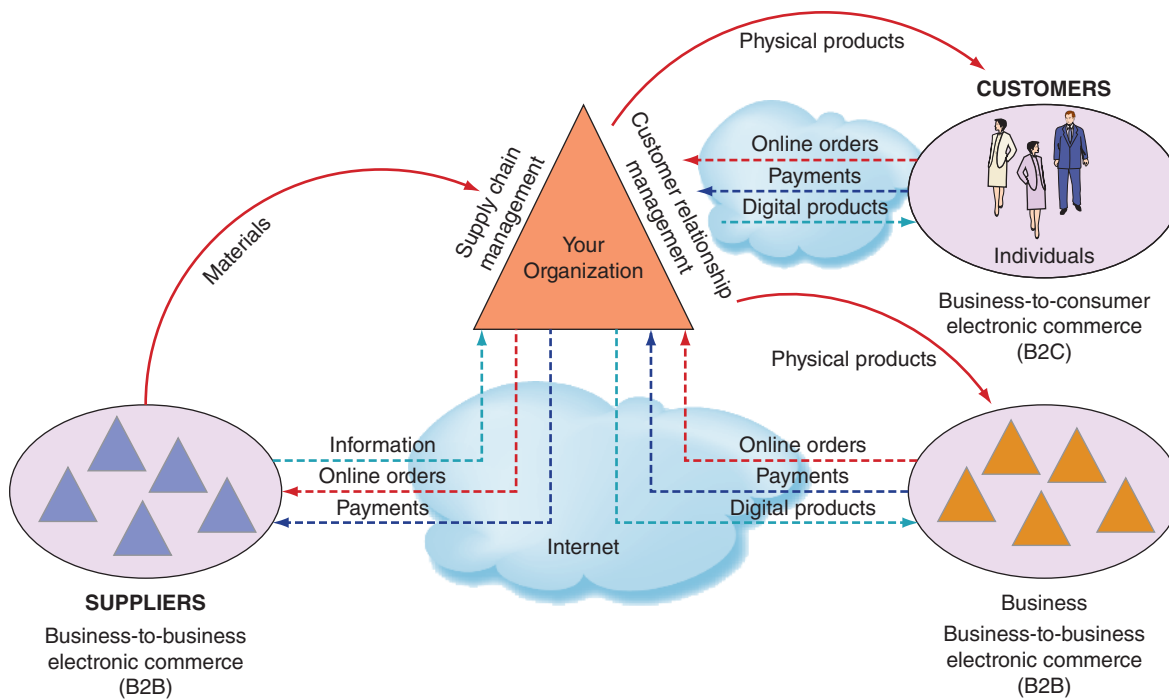


FIGURE 1.5 Information systems that function among multiple organizations.

to determine the best sources and uses of funds, and to perform audits to ensure that the organization is fundamentally sound and that all financial reports and documents are accurate.

In sales and marketing, managers use information technology to perform the following functions:

MKT

- *Product analysis*: Developing new goods and services.
- *Site analysis*: Determining the best location for production and distribution facilities.
- *Promotion analysis*: Identifying the best advertising channels.
- *Price analysis*: Setting product prices to obtain the highest total revenues.

Marketing managers also use IT to manage their relationships with their customers. In *manufacturing*, managers use IT to process customer orders, develop production schedules, control inventory levels, and monitor product quality. They also use IT to design and manufacture products. These processes are called *computer-assisted design (CAD)* and *computer-assisted manufacturing (CAM)*.

POM

Managers in *human resources* use IT to manage the recruiting process, analyze and screen job applicants, and hire new employees. They also employ IT to help employees manage their careers, to administer performance tests to employees, and to monitor employee productivity. Finally, they rely on IT to manage compensation and benefits packages.

HRM

Two information systems that support the entire organization, enterprise resource planning systems and transaction processing systems, are designed to correct a lack of communication among the functional area ISs. For this reason Figure 1.4 shows ERP systems spanning the FAISs. ERP systems were an important innovation because the various functional area ISs were often developed as standalone systems and did not communicate effectively (if at all) with one another. ERP systems resolve this problem by tightly integrating the functional area ISs via a common database. In doing so, they enhance communications among the functional areas of an organization. For this reason, experts credit ERP systems with greatly increasing organizational productivity.

A **transaction processing system (TPS)** supports the monitoring, collection, storage, and processing of data from the organization's basic business transactions, each of which generates

data. When you are checking out at Walmart, for example, a transaction occurs each time the cashier swipes an item across the bar code reader. Significantly, within an organization, different functions or departments can define a transaction differently. In accounting, for example, a transaction is anything that changes a firm's chart of accounts. The information system definition of a transaction is broader: A transaction is anything that changes the firm's database. The chart of accounts is only part of the firm's database. Consider a scenario in which a student transfers from one section of an Introduction to MIS course to another section. This move would be a transaction to the university's information system, but not to the university's accounting department (the tuition would not change).

The TPS collects data continuously, typically in *real time*—that is, as soon as the data are generated—and it provides the input data for the corporate databases. TPSs are considered critical to the success of any enterprise because they support core operations. Significantly, nearly all ERP systems are also TPSs, but not all TPSs are ERP systems. In fact, modern ERP systems incorporate many functions that previously were handled by the organization's functional area information systems. You study both TPSs and ERP systems in detail in Chapter 11.

ERP systems and TPSs function primarily within a single organization. Information systems that connect two or more organizations are referred to as **interorganizational information systems (IOSs)**. IOSs support many interorganizational operations, of which *supply chain management* is the best known. An organization's **supply chain** is the flow of materials, information, money, and services from suppliers of raw materials through factories and warehouses to the end customers.

Note that the supply chain in Figure 1.5 shows physical flows, information flows, and financial flows. Digitizable products are those that can be represented in electronic form, such as music and software. Information flows, financial flows, and digitizable products go through the Internet, whereas physical products are shipped. For example, when you order a computer from www.dell.com, your information goes to Dell via the Internet. When your transaction is completed (that is, your credit card is approved and your order is processed), Dell ships your computer to you. (We discuss supply chains in more detail in Chapter 13.)

Electronic commerce (e-commerce) systems are another type of interorganizational information system. These systems enable organizations to conduct transactions, called business-to-business (B2B) electronic commerce, and customers to conduct transactions with businesses, called business-to-consumer (B2C) electronic commerce. E-commerce systems typically are Internet-based. Figure 1.5 illustrates B2B and B2C electronic commerce. Electronic commerce systems are so important that we discuss them in detail in Chapter 7, with additional examples interspersed throughout the text. IT's About Business 1.1 shows how information systems have enabled two roadside assistance companies to grow rapidly via e-commerce.

IT's About Business 1.1

Disrupting the Roadside Assistance Industry

Roadside assistance is a \$10-billion industry in the United States, encompassing a range of services including accidents, dead batteries, flat tires, towing services, tire services, fuel services, and locksmith services. Today, the industry faces disruption from technology companies that are replacing call centers with algorithms that dispatch the nearest vehicle to help a driver who is locked out of his car or to winch a car out of a ditch. These companies provide an on-demand alternative to paying for insurance plans that drivers might not use or to having to call a tow company without knowing how much it charges.

Two of these companies, Urgent.ly (<http://urgent.ly>) and Honk (www.honkforhelp.com), offer flat rates, promise quick response times, and provide maps in their apps that display the location of the company vehicle, with real-time updates. The companies do not charge annual membership fees, unlike the American Automobile Association (AAA; www.aaa.com).

Customers are not limited to particular tow-truck operators. The companies call the closest service vehicle to the customer, which can arrive in less than half the time and cost up to half the amounts charged by industry competitors. A basic roadside service costs \$49. Before users click for service, they are informed in advance of the total fee, which they pay via credit card.

These app-based roadside assistance services also benefit tow-truck drivers, most of whom work as independents or for small operators. The traditional towing industry relies on receiving bookings from a central dispatcher, such as the AAA. Those drivers get an average of \$23 per call, even though customers are typically charged \$200. Drivers for Urgent.ly and Honk earn nearly double the traditional fee, mostly because these services don't need call centers. These drivers can also complete more calls in a day because the apps use algorithms for dispatching and the drivers use GPS-enabled smartphones.

Drivers for Urgent.ly and Honk work as contractors, not employees, using the apps to find customers. The services only work with established towing companies, which must have their own business licenses and insurance, so that they are covered in the event of accidents or other mishaps. The drivers must also add Urgent.ly and Honk to their insurance policies and get extra insurance for general liability. The apps check out towing companies' customer reviews before signing them on to the services.

Urgent.ly and Honk face intense competition from both the AAA and car manufacturers that offer roadside assistance. Well-known examples are General Motors' OnStar (www.onstar.com), BMW, Volvo, Lexus, Acura, Mazda, Audi, and Ferrari. The AAA, a nonprofit organization, is a federation of 43 motor clubs dispersed throughout the United States. The organization responds to more than 30 million calls per year. Members typically receive travel discounts or other membership perks. In addition, the AAA offers members four free tows per year.

Each AAA motor club can customize its offerings. For example, in late 2014, the Mid-Atlantic club launched RescueMeNow (www.rescuemenow.co), a Web-based on-demand service for nonmembers, which comes with a follow-up contract enticing users to join the organization.

The AAA does not disclose how much its towing-service contractors are paid. However, tow-truck operators state that the amount is about \$25 per call. One towing-service company owner claimed he makes about \$75 if the same call comes through his Urgent.ly app. Like Uber, both startups take about 25 percent of the total cost, and the driver keeps the rest.

How intense is the competition between the established organizations and the disrupters? Honk maintains that it received a

number of call-and-cancel orders in 2014 that it traced to AAA employees. An AAA spokesperson acknowledged that the organization does "mystery shop" to determine how the comparable services compare.

Sources: Compiled from A. Goodwin, "Urgent.ly Is Like Uber for Roadside Assistance," *CNET*, June 11, 2015; J. Biggs, "Urgent.ly Is Uber for When Your Ride Breaks Down," *TechCrunch*, February 14, 2015; "Honk for Help: The Roadside Assistance Startup," *Insurance Zebra*, February, 12 2015; R. Rudnansky, "Roadside Assistance Apps Challenging AAA," *Travel Pulse*, December 11, 2014; K. Oworm, "Watch Out, CAA: New Roadside Assistance Apps Seeking to 'Revolutionize' Towing Industry," *Financial Post*, December 9, 2014; C. Elliott, "Have Roadside Assistance Apps Replaced AAA?" *Outside*, December 4, 2014; K. Steinmetz, "There's an App for the Next Time Your Car Breaks Down," *Time*, December 1, 2014; M. Carney, "Forget AAA: Honk Is a Nationwide On-Demand Towing Platform Fueled by Technology," *Pando*, November 19, 2014; R. Gray, "Honk Is a New App that Offers Help on the Highway," *Fox News*, November 19, 2014; <http://urgent.ly>, www.honkforhelp.com, accessed July 19, 2015.

Questions

1. Discuss how information technology enables the business models of the Urgent.ly and Honk apps.
2. Describe the advantages and disadvantages of Urgent.ly and Honk for customers and for tow-truck operators.
3. Would you use Urgent.ly or Honk? Why or why not?
4. If you were the CEO of AAA, how would you compete with Urgent.ly and Honk? Provide specific examples in your answer.

Support for Organizational Employees. So far, you have concentrated on information systems that support specific functional areas and operations. Now you will learn about information systems that typically support particular employees within the organization.

Clerical workers, who support managers at all levels of the organization, include bookkeepers, secretaries, electronic file clerks, and insurance claim processors. *Lower-level managers* handle the day-to-day operations of the organization, making routine decisions such as assigning tasks to employees and placing purchase orders. *Middle managers* make tactical decisions, which deal with activities such as short-term planning, organizing, and control.

Knowledge workers are professional employees such as financial and marketing analysts, engineers, lawyers, and accountants. All knowledge workers are experts in a particular subject area. They create information and knowledge, which they integrate into the business. Knowledge workers, in turn, act as advisors to middle managers and executives. Finally, *executives* make decisions that deal with situations that can significantly change the manner in which business is done. Examples of executive decisions are introducing a new product line, acquiring other businesses, and relocating operations to a foreign country.

Office automation systems (OASs) typically support the clerical staff, lower and middle managers, and knowledge workers. These employees use OASs to develop documents (word processing and desktop publishing software), schedule resources (electronic calendars), and communicate (e-mail, voice mail, videoconferencing, and groupware).

Functional area information systems summarize data and prepare reports, primarily for middle managers, but sometimes for lower-level managers as well. Because these reports typically concern a specific functional area, report generators (RPGs) are an important type of functional area IS.

Business intelligence (BI) systems provide computer-based support for complex, non-routine decisions, primarily for middle managers and knowledge workers. (They also support lower-level managers, but to a lesser extent.) These systems are typically used with a data

warehouse, and they enable users to perform their own data analysis. You learn about BI systems in Chapter 5.

Expert systems (ES) attempt to duplicate the work of human experts by applying reasoning capabilities, knowledge, and expertise within a specific domain. They have become valuable in many application areas, primarily but not exclusively areas involving decision making. For example, navigation systems use rules to select routes, but we do not typically think of these systems as expert systems. Significantly, expert systems can operate as standalone systems or be embedded in other applications. We examine ESs in greater detail in Plug IT In 5.

Dashboards (also called **digital dashboards**) are a special form of IS that support all managers of the organization. They provide rapid access to timely information and direct access to structured information in the form of reports. Dashboards that are tailored to the information needs of executives are called *executive dashboards*. Chapter 5 provides a thorough discussion of dashboards.

Table 1.4 provides an overview of the different types of information systems used by organizations.

TABLE 1.4 Types of Organizational Information Systems

Type of System	Function	Example
Functional area IS	Supports the activities within specific functional area.	System for processing payroll
Transaction processing system	Processes transaction data from terminal	Walmart checkout point-of-sale business events
Enterprise resource planning	Integrates all functional areas of the organization.	Oracle, SAP system
Office automation system	Supports daily work activities of individuals and groups.	Microsoft® Office
Management information system	Produces reports summarized from transaction data, usually in one functional area.	Report on total sales for each customer
Decision support system	Provides access to data and analysis tools.	“What-if” analysis of changes in budget
Expert system	Mimics human expert in a particular area and makes decisions.	Credit card approval analysis
Executive dashboard	Presents structured, summarized information about aspects of business important to executives.	Status of sales by product
Supply chain management system	Manages flows of products, services, and information among organizations.	Walmart Retail Link system connecting suppliers to Walmart
Electronic commerce system	Enables transactions among organizations and between organizations and customers.	www.dell.com

Before you go on...

1. What is a computer-based information system?
2. Describe the components of computer-based information systems.
3. What is an application program?
4. Explain how information systems provide support for knowledge workers.
5. As we move up the organization’s hierarchy from clerical workers to executives, how does the type of support provided by information systems change?

Apply the Concept 1.2

LEARNING OBJECTIVE 1.2 Classify the activities supported by various types of computer-based information systems in an organization.

STEP 1: Background

Section 1.2 discussed the various functional areas in which you most likely will be employed and the different IS that support them. It should be no surprise that these are the majors you can choose from in most colleges of business. The four major functional areas are marketing/sales, finance/accounting, manufacturing, and human resources. Often, these areas will use the same database and networks within a company, but they will use them to support their specific needs. This activity will help you develop a solid understanding of the role of IS within the different functional areas.

STEP 2: Activity

Review the section material that describes the major functions of the four major functional areas. Then, review the basic functions of the following types of information systems: transaction processing, management information, and decision support.

After you have acquired a solid understanding of the functional areas and information systems that support them, you are ready to move forward with the activity!

STEP 3: Assignment

Create a table like the one shown below, and classify the activities supported by various types of computer-based information systems. To assist you, we have prefilled one item in each type of system. After you complete your chart, submit it to your professor.

	Transaction Processing	Management Information System	Decision Support System
Marketing/Sales	Enter Sales Data		
Accounting/Finance			
Human Resources			Comply with EEOC
Manufacturing		Inventory Reporting	

1.3 How Does IT Impact Organizations?

Throughout this text you will encounter numerous examples of how IT affects various types of organizations, which will give you an idea just how important IT actually is to organizations. In fact, for the vast majority of organizations, if their information systems fail, they cease operations until the problems are found and fixed. Consider these examples:

- In July 2015, United Airlines flights were grounded worldwide for about two hours due to a computer problem in the airline's reservation system. United canceled 61 flights and another 1,162 flights were delayed.
- Also in July 2015, the New York Stock Exchange suspended trading for almost four hours due to a software upgrade.

This section provides an overview of the impact of IT on modern organizations. As you read this section you will learn how IT will affect you as well.

IT Impacts Entire Industries

As of mid-2015, the technology required to transform industries through software had been developed and integrated and could be delivered globally. In addition, software tools and Internet-based services enabled companies in many industries to launch new software-powered startups without investing in new infrastructure or training new employees. For example, in 2000, operating a basic Internet application cost businesses approximately \$150,000 per month. In mid-2015, operating that same application in Amazon's cloud (we discuss cloud computing in detail in Plug IT In 4) cost less than \$1,000 per month.

In essence, software is impacting every industry, and every organization must prepare for these impacts. Let's examine a few examples of software disruption across several industries. Many of these examples focus on two scenarios: (1) industries where software disrupted the

previous market-leading companies and (2) industries where a new company (or companies) used software to achieve a competitive advantage.

The Book Industry. What is the largest book publisher and bookseller in the United States today? Would it surprise you to learn that the answer is Amazon, a software company? Amazon's core capability is its software engine, which can sell virtually anything online without building or maintaining any retail stores. Now, even books themselves have become software products, known as electronic (or digital) books, or eBooks. (In mid- 2015, electronic books were gaining in popularity, but approximately 80 percent of book sales were still for print books.)

- Consider the Borders bookstore chain. In 2001, Borders agreed to hand over its online business to Amazon because Borders was convinced that online book sales were nonstrategic and unimportant. Ten years later, Borders filed for bankruptcy.

The Music Industry. Total U.S. album sales peaked at 785 million in 2000, which was the year after Napster was created. (Recall that Napster allowed anyone with a computer and a reasonably fast Web connection to download and trade music for free.) From 2000 to 2015, the major music labels (companies) worked diligently to eliminate illegal downloading and sharing, but album sales continued to decline. The result was that the music labels earned about \$8 billion less in annual retail sales in 2015 than they did in 2000. In addition, prior to 1999 six major music labels dominated the industry. By 2015, a series of mergers had created the “Big Three” music labels: Warner Music Group (www.wmg.com), Universal Music (www.universal-music.com), and Sony (www.sonymusic.com).

These large changes in the music industry were due to the emergence of digital music streaming technologies over the Internet. Two digital-streaming business models emerged: Internet radio companies such as Pandora (www.pandora.com) that allow subscribers to passively listen to music that is customized for their tastes and interactive companies such as Spotify (www.spotify.com) and Apple's iTunes (www.apple.com/itunes) that allow users to pick songs. Internet radio companies can operate under a government-mandated license that dictates how much they have to pay. In contrast, interactive companies must make deals with labels and music publishers in order to license music for legal use in the United States.

Responding to these disruptions, the Big Three music labels have been buying stakes in digital entertainment startups, such as established streaming services Spotify (www.spotify.com) and Rdio (www.rdio.com). The labels buy stakes very cheaply, and then often give themselves the right to buy larger amounts at deep discounts to market at a later date. The labels have purchased parts of startups such as choose-your-own-adventure music video seller Interlude (<https://interlude.fm>), song-recognition company Shazam (www.shazam.com), and SoundCloud (<https://soundcloud.com>). Industry analysts estimate that the three labels have amassed positions in digital music startups valued at some \$3 billion.

The Video Industry. Blockbuster—which rented and sold videos and ancillary products through its chain of stores—was the industry leader until it was disrupted by a software company, Netflix (www.netflix.com). In mid-2015, Netflix had the largest subscriber base of any video service with millions of subscribers. Meanwhile, Blockbuster declared bankruptcy in February 2011 and was acquired by satellite television provider Dish Network (www.dish.com) a month later.

MIS

The Software Industry. Incumbent software companies such as Oracle and Microsoft are increasingly threatened by software-as-a-service (SaaS) products (e.g., Salesforce.com) and Android, an open-source operating system developed by the Open Handset Alliance (www.openhandsetalliance.com). (We discuss operating systems in Plug IT In 2 and SaaS in Plug IT In 4.)

The Videogame Industry. Today, the fastest growing entertainment companies are videogame makers—again, software. Examples are: Zynga (www.zynga.com), the creator of FarmVille; Rovio (www.rovio.com), the maker of Angry Birds; and Minecraft (www.minecraft.net), now owned by Microsoft (www.microsoft.com).

The Photography Industry. This industry was disrupted by software years ago. Today it is virtually impossible to buy a mobile phone that does not include a software-powered camera. In addition, people can upload photos automatically to the Internet for permanent archiving and global sharing. Leading photography companies include Shutterfly (www.shutterfly.com), Snapfish (www.snapfish.com), Flickr (www.flickr.com), and Instagram (www.instagram.com). Meanwhile, the longtime market leader, Kodak—whose name was almost synonymous with cameras—declared bankruptcy in January 2012.

The Marketing Industry. Today's largest direct marketing companies include Facebook (www.facebook.com), Google (www.google.com), and Foursquare (www.foursquare.com). All of these companies are using software to disrupt the retail marketing industry.

MKT

The Recruiting Industry. LinkedIn (www.linkedin.com) is disrupting the traditional job recruiting industry. For the first time, employees and job searchers can maintain their resumes on a publicly accessible Web site that interested parties can search in real time.

HRM

The Financial Services Industry. Software has transformed the financial services industry. Practically every financial transaction (for example, buying and selling stocks) is now performed by software. Also, many of the leading innovators in financial services are software companies. For example, Square (<https://squareup.com>) allows anyone to accept credit card payments with a mobile phone.

FIN

The Motion Picture Industry. The process of making feature-length computer-generated films has become incredibly IT intensive. Studios require state-of-the-art information technologies, including massive numbers of servers, sophisticated software, and an enormous amount of storage (all described in Plug IT In 2).

Consider DreamWorks Animation (www.dreamworksanimation.com), a motion picture studio that creates animated feature films, television programs, and online virtual worlds. For a single motion picture, the studio manages more than 500,000 files and 300 terabytes (a terabyte is 1 trillion bytes) of data, and it uses about 80 million central processing unit (CPU; described in Plug IT In 2) hours. As DreamWorks executives state, "In reality, our product is data that looks like a movie. We are a digital manufacturing company."

Software is also disrupting industries that operate primarily in the physical world. Consider these examples:

- **The Automobile Industry:** In modern cars, software is responsible for running the engines; controlling safety features; entertaining passengers; guiding drivers to their destinations; and connecting the car to mobile, satellite, and GPS networks. Other software functions in modern cars include Wi-Fi receivers, which turn your car into a mobile hot spot; software, which helps maximize fuel efficiency; and ultrasonic sensors, which enable some models to parallel-park automatically.

The next step is to network all vehicles together, a necessary step toward the next major breakthrough: self-driving or driverless cars. The creation of software-powered driverless cars is already being undertaken at Google as well as at several major car companies, and interestingly, Apple.

- **The Agriculture Industry:** Agriculture is increasingly powered by software, including satellite analysis of soils linked to per-acre seed selection software algorithms. In addition, precision agriculture makes use of automated, driverless tractors controlled by global positioning systems and software. (Precision agriculture is based on observing, measuring, and responding to inter- and intra-field variability.)
- **National Defense:** Even national defense is increasingly software based. The modern combat soldier is embedded in a web of software that provides intelligence, communications, logistics, and weapons guidance. Software-powered drone aircraft launch airstrikes without placing human pilots at risk. Intelligence agencies perform large-scale data mining with software to uncover and track potential terrorist plots.

- **The Fashion Industry:** Women have long “borrowed” special-occasion dresses from department stores, buying them and then returning them after wearing them for one evening. Now, Rent the Runway (www.renttherunway.com) has redefined the fashion business, making expensive clothing available to more women than ever before. The firm is also disrupting traditional physical retailers. After all, why buy a dress when you can rent one for a very low price? Some department stores feel so threatened by Rent the Runway that they have reportedly told vendors that they will remove floor merchandise if it ever shows up on that company’s Web site.
- **Education:** College graduates owe approximately \$1 trillion in student debt, a crippling burden for many recent graduates. Consider UniversityNow (www.unow.com), founded to make college more accessible to working adults by offering online, self-paced degrees. Two key characteristics distinguish UniversityNow from an increasing number of rivals: (1) very low fees (as little as \$2,600, which includes tuition and books for as many courses as students can complete in one year) and (2) fully accredited degrees, from an associate’s degree to an M.B.A.
- **The Legal Profession:** Today, electronic discovery (e-discovery) software applications can analyze documents in a fraction of the time that human lawyers would take, at a fraction of the cost. For example, Blackstone Discovery (www.blackstonediscovery.com) helped one company analyze 1.5 million documents for less than \$100,000. That company estimated that the process would have cost \$1.5 million had it been performed by lawyers.

IT Reduces the Number of Middle Managers

IT makes managers more productive, and it increases the number of employees who can report to a single manager. Thus, IT ultimately decreases the number of managers and experts. It is reasonable to assume, therefore, that in coming years organizations will have fewer managerial levels and fewer staff and line managers. If this trend materializes, promotional opportunities will decrease, making promotions much more competitive. Bottom line: Pay attention in school!

IT Changes the Manager’s Job

One of the most important tasks of managers is making decisions. A major consequence of IT has been to change the manner in which managers make their decisions. In this way, IT ultimately has changed managers’ jobs.

IT often provides managers with near-real-time information, meaning that managers have less time to make decisions, making their jobs even more stressful. Fortunately, IT also provides many tools—for example, business analytics applications such as dashboards, search engines, and intranets—to help managers handle the volumes of information they must deal with on an ongoing basis.

So far in this section, we have been focusing on managers in general. Now, let’s focus on you. Due to advances in IT, you will increasingly supervise employees and teams who are geographically dispersed. Employees can work from anywhere at any time, and teams can consist of employees who are literally dispersed throughout the world. Information technologies such as telepresence systems (discussed in Chapter 4) can help you manage these employees even though you do not often see them face-to-face. For these employees, electronic or “remote” supervision will become the norm. Remote supervision places greater emphasis on completed work and less emphasis on personal contacts and office politics. You will have to reassure your employees that they are valued members of the organization, thereby diminishing any feelings they might have of being isolated and “out of the loop.”

Will IT Eliminate Jobs?

One major concern of every employee, part-time or full-time, is job security. Relentless cost-cutting measures in modern organizations often lead to large-scale layoffs. Put simply,

organizations are responding to today's highly competitive environment by doing more with less. Regardless of your position, then, you consistently will have to add value to your organization and to make certain that your superiors are aware of this value.

Many companies have responded to difficult economic times, increased global competition, demands for customization, and increased consumer sophistication by increasing their investments in IT. In fact, as computers continue to advance in terms of intelligence and capabilities, the competitive advantage of replacing people with machines is increasing rapidly. This process frequently leads to layoffs. At the same time, however, IT creates entirely new categories of jobs, such as electronic medical record keeping and nanotechnology.

IT Impacts Employees at Work

Many people have experienced a loss of identity because of computerization. They feel like “just another number” because computers reduce or eliminate the human element present in noncomputerized systems.

The Internet threatens to exert an even more isolating influence than have computers and television. Encouraging people to work and shop from their living rooms could produce some unfortunate psychological effects, such as depression and loneliness.

IT Impacts Employees' Health and Safety. Although computers and information systems are generally regarded as agents of “progress,” they can adversely affect individuals' health and safety. To illustrate this point, we consider two issues associated with IT: job stress and long-term use of the keyboard.

HRM

An increase in an employee's workload and/or responsibilities can trigger *job stress*. Although computerization has benefited organizations by increasing productivity, it also has created an ever-expanding workload for some employees. Some workers feel overwhelmed and have become increasingly anxious about their job performance. These feelings of stress and anxiety can actually diminish rather than improve workers' productivity while jeopardizing their physical and mental health. Management can help alleviate these problems by providing training, redistributing the workload among workers, and hiring more workers.

On a more specific level, the long-term use of keyboards can lead to *repetitive strain injuries* such as backaches and muscle tension in the wrists and fingers. *Carpal tunnel syndrome* is a particularly painful form of repetitive strain injury that affects the wrists and hands.

Designers are aware of the potential problems associated with the prolonged use of computers. To address these problems, they continually attempt to design a better computing environment. The science of designing machines and work settings that minimize injury and illness is called ergonomics. The goal of ergonomics is to create an environment that is safe, well lit, and comfortable. Examples of ergonomically designed products are antiglare screens that alleviate problems of fatigued or damaged eyesight and chairs that contour the human body to decrease backaches. **Figure 1.6** displays some sample ergonomic products.

IT Provides Opportunities for People with Disabilities. Computers can create new employment opportunities for people with disabilities by integrating speech-recognition and vision-recognition capabilities. For example, individuals who cannot type can use a voice-operated keyboard, and individuals who cannot travel can work at home.

Going further, adaptive equipment for computers enables people with disabilities to perform tasks they normally would not be able to do. For example, the Web and graphical user interfaces (GUIs; e.g., Windows) can be difficult for people with impaired vision to use. To address this problem, manufacturers have added audible screen tips and voice interfaces, which essentially restore the functionality of computers to the way it was before GUIs become standard.

Other devices help improve the quality of life in more mundane, but useful, ways for people with disabilities. Examples are a two-way writing telephone, a robotic page turner, a hair brusher, and a hospital-bedside video trip to the zoo or the museum. Several organizations specialize in IT designed for people with disabilities.

FIGURE 1.6 Ergonomic products protect computer users.



Media Bakery



Media Bakery



Media Bakery



Media Bakery

Before you go on...

1. Why should employees in all functional areas become knowledgeable about IT?
2. Describe how IT might change the manager's job.
3. Discuss several ways in which IT impacts employees at work.

Apply the Concept 1.3

LEARNING OBJECTIVE 1.3 Discuss ways in which information technology can affect managers and nonmanagerial workers.

STEP 1: Background

Section 1.3 demonstrated that the essential reason businesses use information systems is to add value to their daily activities. In fact, IS have radically transformed the nature of both managerial and nonmanagerial work. Managers employ IT to instantly track information that previously was available only in monthly reports. Support staff can view calendars and schedules for all employees and can schedule meetings more easily. Sales representatives can view current product information while visiting with clients. This list does not even scratch the surface of the countless ways technology has added value to modern businesses.

STEP 2: Activity

Consider the restaurant industry. You have probably visited some “old school” restaurants where your order is written

down on a piece of paper and never entered into a computer system for preparation. You have most likely also been to a very modern restaurant where you enter your own order with a tablet, smartphone, or other piece of equipment. Visit <http://www.wiley.com/go/rainer/MIS4e/applytheconcept> and watch the two videos about using the restaurant table as the menu and ordering stem.

STEP 3: Assignment

Imagine that you are a manager in each type of restaurant. How does working without technology impact how you do your job? How does adding the technology change your performance? Based on your thoughts from Step 2, imagine that you are explaining to your friend the ways that restaurants could benefit from IT. Prepare a paragraph or two that will discuss the ways that the traditional job of a restaurant manager and other employees has been changed by IT.

1.4 Importance of Information Systems to Society

This section explains in greater detail why IT is important to society as a whole. Other examples of the impact of IT on society appear throughout the text. IT's About Business 1.2 illustrates how IT is impacting one society—Cuba—in its entirety.

IT's About Business 1.2

Information Technology Has the Potential for “Revolutionizing” Cuba

In recent years, Cuba's private sector has been undergoing a huge transformation. Hundreds of thousands of Cubans have obtained licenses to operate small businesses, but only in a limited set of service categories such as restaurants, hair salons, and translation services. Despite the limitations, by the end of 2014, the number of licensed entrepreneurs—called *cuentapropistas* in Cuba; roughly translated as “those who are on their own”—rose to more than 471,000.

Unfortunately, the vast majority of these entrepreneurs do not use the Internet because they do not have access to it. In fact, experts estimate that only about 5 percent of Cuba's citizens have even periodic Internet access. As of mid-2015, only the “elite” had easy Internet access, and only 5 percent of Cubans could access the Internet from home. The public can visit cybercafés that are sanctioned by the government. However, it costs more than \$5 per hour to access sites outside the country. To put this in perspective, the average Cuban earns \$20 a month. Another barrier to Internet access is that visitors to cybercafés must sign agreements that their Internet use will not harm “public security.”

As we discuss below, Cuba is a country of memory sticks and human middlemen, physically sent to conduct what in the developed world are frictionless digital transactions. In Cuba, smartphones are common, but they do not have data connections. Further, there is no legal way to send or receive payments using credit cards or PayPal.

Young, highly motivated Cuban entrepreneurs, the country's millennials, are circumventing these enormous hindrances by using digital technologies in different ways. Let's consider four examples: Revolico, AlaMesa, El Paquete Semanal, and Vistar.

MKT **Revolico** (www.revolico.com). Black markets have been commonplace in Cuba for many years, but it was difficult for buyers and sellers to find each other. In December 2007, a young Cuban anonymously created Revolico, a Web site for classified ads that quickly became the Craigslist of Cuba.

Three months after the site's launch, the government blocked it. Revolico got around the blocks by changing the Web address for its servers and e-mailing personalized URLs to its users. The back-and-forth between Revolico and the government continues as of this writing (July 2015). Despite these tensions, however, Revolico has become part of the daily life of many Cubans.

By July 2015, Revolico had approximately 8 million page views per month and 25,000 new listings daily. About half of its

traffic came from outside Cuba—most of it from south Florida, which houses a large Cuban population—where the site makes some money selling ads. In Cuba, Revolico has no legal standing. The site charges for premium listings, which it promotes. Associates of Revolico collect payment for those listings unofficially, in cash.

MKT **AlaMesa** (www.alamesacuba.com). AlaMesa is a Web site and Android app that promotes Cuban culinary culture (think Yelp and OpenTable). Going door-to-door, AlaMesa staff members check out restaurants, examine their menus, and, if the restaurants agree, list them on the Web site and app. More than 600 restaurants in nine Cuban provinces have agreed to be listed. Roughly 30 percent of these restaurants pay, in cash, to be promoted on the site and app. Foreigners planning a trip to Cuba can download the app while at home. In Cuba, devoted fans spread the app by physically passing memory sticks to one another.

El Paquete Semanal. El Paquete Semanal (“the weekly package”) is the “Internet-in-a-box” for a nonconnected country. More precisely, it is the Internet on a portable hard drive. El Paquete is a large digital collection of recent movies, TV shows, magazines, apps, software updates, and other digital content made available to Cubans. It is copied and distributed on portable hard drives to 100 people, who then distribute it to 1,000 people, and so on. El Paquete is delivered through an informal network of human “mules” who travel in public buses to every corner of the island. Most customers get the drive at home, where they exchange it for last week's drive. Customers pay more for more recent material and they pay based on the amount of material they receive.

Vistar (www.vistarmagazine.com). In 2013, the Cuban government's Office of Periodicals and Publications turned down a young Cuban's application to start an online magazine focusing on Cuba's youth culture. The young man decided to publish the magazine anyway, without identifying the magazine's creators. The first issue of *Vistar* came out in March 2014. It contained excellent photography and articles on food, music, ballet, art, and celebrities. By July 2015, *Vistar* had published sixteen monthly issues and even listed the magazine's staff on the masthead. Significantly, the government has not yet officially objected.

Although *Vistar's* readers have not been harassed by the government, they have to deal with their country's lack of connectivity. As a result, they access the magazine by sharing memory sticks and hard drives. The magazine's staff support themselves through advertising. This process is noteworthy because advertising that is not linked to the government has been almost nonexistent for 50 years. *Vistar*, which now publishes in English as well as Spanish, has

more than 100,000 downloads, with 60 percent of them originating outside Cuba.

Cuba's relations with the United States are improving, following President Obama's decision in December 2014 to begin normalizing relations between the two countries. Under the proposal, Cuban citizens could enjoy much improved access to communications technology. However, the Internet is still strictly controlled under the Raúl Castro regime, and there are economic barriers as well as political ones, so it's not certain whether and when Cubans will have inexpensive and open Internet access.

And the bottom line? Cuban citizens continue their entrepreneurial activities, not knowing whether the government will shut them down. Meanwhile, in June 2015, the Cuban government announced it would sanction 35 Wi-Fi hotspots around the country, which Cubans can access for \$2 per hour. Cubans wryly note that this is "good news, bad news." The good news is that the government is allowing any Wi-Fi hotspots at all. The bad news is that most Cubans still cannot afford to use them.

Sources: Compiled from A. Popescu, "Cuban Web Entrepreneur Endures a Murky Status," *MIT Technology Review*, October 6, 2015; I. Lakshmanan, "Where the Internet Revolution Is Waiting to Happen," *Bloomberg BusinessWeek*, September 14, 2015; M. Helft, "Cuba's Tech Revolutionaries," *Forbes*, July 21, 2015; J. Hamre, "Cuba, an Internet Laggard, Opens Wi-Fi Hotspots across Country," *Reuters*, July

2, 2015; V. Burnett, "Cuba Offers Its Citizens Better Access to Internet," *The New York Times*, June 18, 2015; "Cuba to Expand Internet Access to Battle Country's Dire Lack of Connectivity," *Associated Press*, June 18, 2015; D. Renwick and B. Lee, "U.S.-Cuba Relations," *Council on Foreign Relations*, May 29, 2015; S. Marshall, "This Is What It's Like Using the Internet in Cuba," *ABC News*, March 31, 2015; N. Young, "Cuba's Underground Alternative to the Internet," *www.cbc.ca*, January 25, 2015; T. Johnson, "No Internet in Cuba? For Some, Offline Link to World Arrives Weekly," *McClatchyDC*, January 9, 2015; D. Talbot, "Cuba's Internet Revolution Faces Economic and Political Realities," *MIT Technology Review*, December 21, 2014; S. Fernandes and A. Halkin, "Do Cubans Really Want U.S.-Style Internet Freedom?" *nacla.org*, December 20, 2014; P. Baker, "U.S. to Restore Full Relations with Cuba, Erasing a Last Trace of Cold War Hostility," *The New York Times*, December 17, 2014.

Questions

1. Describe the "work-arounds" that Cuban entrepreneurs must perform to use digital technologies in the four examples discussed in this case.
2. Discuss how free, open access to high-speed Internet connections would transform the operations of each of the four examples.
3. Why would the Cuban government limit access to the Internet? Provide specific examples in your answer.

IT Affects Our Quality of Life

IT has significant implications for our quality of life. The workplace can be expanded from the traditional 9-to-5 job at a central location to 24 hours a day at any location. IT can provide employees with flexibility that can significantly improve the quality of leisure time, even if it doesn't increase the total amount of leisure time.

From the opposite perspective, however, IT also can place employees on "constant call," which means they are never truly away from the office, even when they are on vacation. In fact, surveys reveal that the majority of respondents take their laptops and smartphones on their vacations, and 100 percent took their cell phones. Going further, the majority of respondents did some work while vacationing, and almost all of them checked their e-mail regularly.

The Robot Revolution Is Here Now

Once restricted largely to science fiction movies, robots that can perform practical tasks are becoming more common. Around the world, quasi-autonomous devices have become increasingly common on factory floors, in hospital corridors, and in farm fields. Let's look at two examples: Baxter and drones.

Baxter Baxter is a new kind of industrial robot by Rethink Robotics (www.rethinkrobotics.com) that sells for \$25,000. Humans share a workspace with Baxter, making it an excellent example of a social, collaborative robot. Baxter works right out of the box and can be integrated into a factory's workflow in about one hour. Another benefit of Baxter is that other factory workers can train it.

In November 2014 Rethink Robotics announced its new Robot Positioning System for Baxter. This system enables Baxter to adapt to changing, real-world environments, such as tables and benches being moved. The new system highlights a huge advantage for companies that acquire Baxter. Because so much of Baxter's capabilities are contained in its software, when the robot is upgraded it tends to *increase in value*.

However, Baxter does raise the question of the future of low-skilled labor in the United States: How fast will Baxter replace these workers, and what will they do after they are replaced?

Drones A *drone* is an unmanned aerial vehicle (UAV) that either is controlled by pilots from the ground or autonomously follows a preprogrammed mission. Commercial drones are used for a wide variety of business purposes, in contrast to drones used by hobbyists for recreational purposes. Let's examine five industries that are currently employing drones.

Sensors on drones, coupled with data analytics (see Chapter 12), are extending *precision agriculture* beyond simply monitoring crops. Drones help farmers increase crop yields by optimizing the fertilizer mix for different parts of a field down to the square meter. They similarly help winemakers increase yields by precisely controlling drip irrigation down to the individual vine.

POM

On large-scale *construction* sites, envisioning the overall "picture" presents a major challenge for contractors. Drones enable project managers from construction giants such as Bechtel (www.bechtel.com) and DPR (www.dpr.com) to monitor progress and supply stockpiles on a real-time basis.

POM

The *energy* industry uses drones for applications beyond monitoring and inspecting pipelines. In Alaska, BP (www.bp.com) uses drones to monitor its gravel-extraction operations to comply with environmental guidelines. ConocoPhillips (www.conocophillips.com) and Chevron (www.chevron.com) use drones in the Arctic to help search for new sources of oil. First Solar (www.firstsolar.com) uses drones to inspect for faulty solar panels.

POM

Large *mining* companies such as Rio Tinto (www.riotinto.com) are reducing risk to their workers by using drones to detect potential landslides and to inspect safety infrastructure, as well as to more accurately monitor how much mineral their workers are extracting.

POM

American *film and television* studios, such as 20th Century Fox (www.foxmovies.com) and Warner Bros (www.warnerbros.com), have been using drones in their overseas productions because they were allowed to do so by foreign governments. When the FAA allowed them to use drones in U.S. airspace, these studios began to move their operations back to the United States.

POM

It probably will be a long time before we see robots making decisions by themselves, handling unfamiliar situations, and interacting with people. Nevertheless, robots are extremely helpful in various environments, particularly those that are repetitive, harsh, or dangerous to humans.

Improvements in Healthcare

IT has brought about major improvements in healthcare delivery. Medical personnel use IT to make better and faster diagnoses and to monitor critically ill patients more accurately. IT also has streamlined the process of researching and developing new drugs. Expert systems now help doctors diagnose diseases, and machine vision is enhancing the work of radiologists. Surgeons use virtual reality to plan complex surgeries. They also employ surgical robots to perform long-distance surgery. Finally, doctors discuss complex medical cases via videoconferencing. New computer simulations recreate the sense of touch, allowing doctors-in-training to perform virtual procedures without risking harm to an actual patient.

Information technology can be applied to improve the efficiency and effectiveness of healthcare. In IT's About Business 1.3 you will see how Apricot Forest is using information technology to improve healthcare in China.

IT's About Business 1.3

MIS Apricot Forest Helps China's Physicians

In China, entry-level doctors earn about as much as taxi drivers—roughly \$500 a month. Most work in state-operated hospitals and see up to 60 patients per day. Not only are their caseloads potentially overwhelming, but doctors also face violence from patients. In 2012, each Chinese hospital experienced an average of 27 patient assaults of healthcare providers. In some cases, they beat, stabbed, or even killed doctors who didn't meet their expectations.

Needless to say, there was an opportunity for technology to help Chinese physicians manage their caseload and work environment. Essentially, such tools must provide China's physicians with more data—about patients, their records, and their illnesses—as well as easier access to those data. Further, the tools must allow physicians and their patients to communicate seamlessly.

Apricot Forest (<http://www.xingshulin.com>) is a Beijing-based startup company that developed three apps to help Chinese physicians. The main app is MedClip, the Swiss army knife of applications. It allows doctors to take photos of patient records, dictate notes, and store and organize patient charts. It links up with the popular Chinese messaging system Weixin (“WeChat”) to send reminders and health information to patients. Doctors can also consult with each other regarding more challenging cases. Apricot Forest's second medical app, e-Pocket, is a database that doctors can refer to with information on drug formulations and specialized calculators. Medical Journals, the third app, gives doctors access to articles in medical journals. The company notes that all these apps allow doctors to make house calls, accessing patient and other information at the touch of a button.

With China's doctors earning so little money, how does Apricot Forest get revenues? It goes beyond the app sales for other revenue streams. For example, it charges drug companies for advertisements inside the apps. It earns a commission on the books and other publications purchased through the e-Pocket and Medical Journals apps. The company plans to charge patients for using MedClip to contact their doctors, which is difficult under the existing health care system. Doctors would benefit from keeping their phone numbers private and controlling the amount of contact with

patients. Another potential moneymaker from the apps is to aggregate and analyze the data that doctors upload to MedClip and sell reports to companies that make medical products.

And the results? By early 2015, roughly 1 in 4 of China's 2.5 million physicians were using at least one of Apricot Forest's apps.

Sources: Compiled from “The Healthcare System and Medical Device Market in China,” *PR Newswire*, February 17, 2015; “Most Innovative Companies 2015,” *FastCompany*, March 2015; L. Qi and L. Burkitt, “Falling through the Cracks of China's Health-Care System,” *The Wall Street Journal*, January 4, 2015; S. Shankar, “Hospital Attack in Northern China's Beidaihe Town Kills 7 People, Including 6 Nurses,” *International Business Times*, November 20, 2014; C. Beam, “Under the Knife,” *The New Yorker*, August 25, 2014; E. Rauhala, “Why China's Doctors Are Getting Beaten Up,” *Time*, March 7, 2014; P. Bischoff, “Apricot Forest Wants to Streamline Your Hospital Visits,” *TechinAsia*, June 6, 2013; www.xingshulin.com, accessed February 25, 2015.

Questions

1. Explain how Apricot Forest's apps will help improve the relationship between physicians and patients in China.
2. Explain how Apricot Forest's apps will help improve overall healthcare in China.
3. Discuss potential disadvantages of Apricot Forest's apps to patients.
4. Discuss potential disadvantages of Apricot Forest's apps to physicians.

Among the thousands of other healthcare applications, administrative systems are critically important. These systems perform functions ranging from detecting insurance fraud, to creating nursing schedules, to financial and marketing management.

The Internet contains vast amounts of useful medical information (see www.webmd.com, for example). Despite the fact that this information exists on the Internet, physicians caution against self-diagnosis. They maintain that people should use diagnostic information obtained from Google and medical Web sites such as WebMD (www.webmd.com) only to ask questions of their physicians.

Before you go on...

1. What are some of the quality-of-life improvements made possible by IT? Has IT had any negative effects on our quality of life? If so, explain, and provide examples.
2. Describe the robotic revolution, and consider its implications for humans.
3. Explain how IT has improved healthcare practices.

Apply the Concept 1.4

LEARNING OBJECTIVE 1.4 Identify positive and negative societal effects of the increased use of information technology.

STEP 1: Background

As you have just read, the increased use of IS has had a significant impact on society. Section 1.4 focused on three areas—quality of life improvements, robotics, and healthcare—to spark your interest in the ways our lives are being touched. Unfortunately, the technologies that provide quality-of-life improvements can also create economic and political problems. For example, robots that make production more streamlined also eliminate jobs. Similarly, healthcare improvements raise concerns regarding shared data and privacy violations.

STEP 2: Activity

Conduct a Web search for “technology and work/life balance.” Look for programs, articles, research, suggestions, and other

materials that help you understand the positive and negative effects of the increased use of information technologies.

STEP 3: Assignment

Create a table that identifies the positive and negative effects for the following areas: quality of life, robotics, healthcare, and work/life balance. Set your table up as in the example below, and submit it to your instructor.

	Positive	Negative
Quality of Life		
Robotics		
Healthcare		
Work/Life Balance		

What's in IT for me?

In Section 1.2, we discussed how IT supports each of the functional areas of the organization. Here we examine the MIS function.

MIS For the MIS Major

The MIS function directly supports all other functional areas in an organization. That is, the MIS function is responsible for providing the

information that each functional area needs in order to make decisions. The overall objective of MIS personnel is to help users improve performance and solve business problems using IT. To accomplish this objective, MIS personnel must understand both the information requirements and the technology associated with each functional area. Given their position, however, they must think “business needs” first and “technology” second.

Summary

1. Identify the reasons why being an informed user of information systems is important in today's world.

The benefits of being an informed user of IT include the following:

- You will benefit more from your organization's IT applications because you will understand what is “behind” those applications.
- You will be able to provide input into your organization's IT applications, thus improving the quality of those applications.
- You will quickly be in a position to recommend, or participate in the selection of IT applications that your organization will use.
- You will be able to keep up with rapid developments in existing information technologies, as well as the introduction of new technologies.
- You will understand the potential impacts that “new and improved” technologies will have on your organization and therefore will be qualified to make recommendations concerning their adoption and use.
- You will play a key role in managing the information systems in your organization.

- You will be in a position to use IT if you decide to start your own business.

2. Describe the various types of computer-based information systems in an organization.

- Transaction processing systems (TPS) support the monitoring, collection, storage, and processing of data from the organization's basic business transactions, each of which generates data.
- Functional area information systems (FAISs) support a particular functional area within the organization.
- Interorganizational information systems (IOSs) support many interorganizational operations, of which supply chain management is the best known.
- Enterprise resource planning (ERP) systems correct a lack of communication among the FAISs by tightly integrating the functional area ISs via a common database.
- Electronic commerce (e-commerce) systems enable organizations to conduct transactions with other organizations (called

business-to-business (B2B) electronic commerce), and with customers (called business-to-consumer (B2C) electronic commerce).

- Office automation systems (OASs) typically support the clerical staff, lower and middle managers, and knowledge workers, by enabling them to develop documents (word processing and desktop publishing software), schedule resources (electronic calendars), and communicate (e-mail, voice mail, videoconferencing, and groupware).
- Business intelligence (BI) systems provide computer-based support for complex, nonroutine decisions, primarily for middle managers and knowledge workers.
- Expert systems (ESs) attempt to duplicate the work of human experts by applying reasoning capabilities, knowledge, and expertise within a specific domain.

3. Discuss ways in which information technology can affect managers and nonmanagerial workers.

Potential IT impacts on managers:

- IT may reduce the number of middle managers;
- IT will provide managers with real-time or near real-time information, meaning that managers will have less time to make decisions;
- IT will increase the likelihood that managers will have to supervise geographically dispersed employees and teams.

- Potential IT impacts on nonmanagerial workers:
- IT may eliminate jobs;
- IT may cause employees to experience a loss of identity;
- IT can cause job stress and physical problems, such as repetitive stress injury.

4. List positive and negative societal effects of the increased use of information technology.

Positive societal effects:

- IT can provide opportunities for people with disabilities;
- IT can provide people with flexibility in their work (e.g., work from anywhere, anytime);
- Robots will take over mundane chores;
- IT will enable improvements in healthcare.

Negative societal effects:

- IT can cause health problems for individuals;
- IT can place employees on constant call;
- IT can potentially misinform patients about their health problems.

Chapter Glossary

application (or app) A computer program designed to support a specific task or business process.

business intelligence (BI) systems Provide computer-based support for complex, nonroutine decisions, primarily for middle managers and knowledge workers.

computer-based information system (CBIS) An information system that uses computer technology to perform some or all of its intended tasks.

dashboards A special form of IS that support all managers of the organization by providing rapid access to timely information and direct access to structured information in the form of reports.

data items An elementary description of things, events, activities, and transactions that are recorded, classified, and stored but are not organized to convey any specific meaning.

database A collection of related files or tables containing data.

electronic commerce (e-commerce) systems A type of interorganizational information system that enables organizations to conduct transactions, called business-to-business (B2B) electronic commerce, and customers to conduct transactions with businesses, called business-to-consumer (B2C) electronic commerce.

enterprise resource planning (ERP) systems Information systems that correct a lack of communication among the functional area ISs by tightly integrating the functional area ISs via a common database.

ergonomics The science of adapting machines and work environments to people; focuses on creating an environment that is safe, well lit, and comfortable.

expert systems (ES) Attempt to duplicate the work of human experts by applying reasoning capabilities, knowledge, and expertise within a specific domain.

functional area information systems (FAISs) ISs that support a particular functional area within the organization.

hardware A device such as a processor, monitor, keyboard, or printer. Together, these devices accept, process, and display data and information.

information Data that have been organized so that they have meaning and value to the recipient.

information system (IS) Collects, processes, stores, analyzes, and disseminates information for a specific purpose.

information technology (IT) Relates to any computer-based tool that people use to work with information and support the information and information-processing needs of an organization.

information technology components Hardware, software, databases, and networks.

information technology infrastructure IT components plus IT services.

information technology platform Formed by the IT components of hardware, software, networks (wireline and wireless), and databases.

information technology services IT personnel use IT components to perform these IT services: develop information systems, oversee security and risk, and manage data.

informed user A person knowledgeable about information systems and information technology.

interorganizational information systems (IOSs) Information systems that connect two or more organizations.

knowledge Data and/or information that have been organized and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current problem or activity.

knowledge workers Professional employees such as financial and marketing analysts, engineers, lawyers, and accountants, who are experts in a particular subject area and create information and knowledge, which they integrate into the business.

network A connecting system (wireline or wireless) that permits different computers to share resources.

procedures The set of instructions for combining hardware, software, database, and network components in order to process information and generate the desired output.

software A program or collection of programs that enable the hardware to process data.

supply chain The flow of materials, information, money, and services from suppliers of raw materials through factories and warehouses to the end customers.

transaction processing system (TPS) Supports the monitoring, collection, storage, and processing of data from the organization's basic business transactions, each of which generates data.

Discussion Questions

- Describe a business that you would like to start. Discuss how information technology could: (a) help you find and research an idea for a business, (b) help you formulate your business plan, and (c) help you finance your business.
- Your university wants to recruit high-quality high school students from your state. Provide examples of (a) the data that your recruiters would gather in this process, (b) the information that your recruiters would process from these data, and (c) the types of knowledge that your recruiters would infer from this information.
- Can the terms data, information, and knowledge have different meanings for different people? Support your answer with examples.
- Information technology makes it possible to “never be out of touch.” Discuss the pros and cons of always being available to your employers and clients (regardless of where you are or what you are doing).
- Robots have the positive impact of being able to relieve humans from working in dangerous conditions. What are some negative impacts of robots in the workplace?
- Is it possible to endanger yourself by accessing too much medical information on the Web? Why or why not? Support your answer.
- Describe other potential impacts of IT on societies as a whole.
- What are the major reasons why it is important for employees in all functional areas to become familiar with IT?
- Given that information technology is impacting every industry, what does this mean for a company's employees? Provide specific examples to support your answer.
- Given that information technology is impacting every industry, what does this mean for students attending a college of business? Provide specific examples to support your answer.
- Is the vast amount of medical information on the Web a good thing? Answer from the standpoint of a patient and from the standpoint of a physician.

Problem-Solving Activities

- Visit some Web sites that offer employment opportunities in IT. Prominent examples are: www.dice.com, www.monster.com, www.collegerecruiter.com, www.careerbuilder.com, www.jobcentral.com, www.job.com, www.career.com, www.simplyhired.com, and www.truecareers.com. Compare the IT salaries to salaries offered to accountants, marketing personnel, financial personnel, operations personnel, and human resources personnel. For other information on IT salaries, check *Computerworld's* annual salary survey.
- Enter the Web site of UPS (www.ups.com).
 - Find out what information is available to customers before they send a package.
 - Find out about the “package tracking” system.
 - Compute the cost of delivering a 10" × 20" × 15" box, weighing 40 pounds, from your hometown to Long Beach, California (or to Lansing, Michigan, if you live in or near Long Beach). Compare the fastest delivery against the least cost. How long did this process take? Look into the business services offered by UPS. How do they make this process easier when you are a business customer?
- Surf the Internet for information about the Department of Homeland Security (DHS). Examine the available information, and comment on the role of information technologies in the department.
- Access www.irobot.com, and investigate the company's Education and Research Robots. Surf the Web for other companies that manufacture robots, and compare their products with those of iRobot.

Closing Case 1

POM The United States Postal Service Utilizes Information Technology to Modernize

The Problems

Every American is a customer of the United States Postal Service (USPS; www.usps.gov), an agency that delivers 158 billion pieces of mail per year. Despite its importance to U.S. citizens, however, the agency faces multiple challenges, including:

- Electronic mail has contributed to a decrease in the volume of first-class (or stamped) mail. This decrease has led to a decline in USPS revenue.
- Another cause of declining revenues is competition from private delivery companies like FedEx (www.fedex.com) and UPS (www.ups.com). These businesses are taking customers away from USPS's package delivery service while sometimes relying on the agency for last-mile delivery. Last-mile delivery is the final and typically most expensive leg of a delivery route.
- Other companies are also developing services that could disrupt the USPS's parcel delivery service. For example, Matternet (<http://mtrr.net>), Amazon (Amazon Prime Air), and Google (Project Wing) have developed unmanned aerial vehicles, or drones, that can deliver packages and letters.
- Transportation has long been the essential skill at the USPS. Nevertheless, the agency has approximately 160,000 delivery vehicles that are 20 years old and need to be replaced.
- In contrast to transportation skills, digital technology has *not* been an essential skill at the USPS. One major example that illustrates this problem occurred in November 2014, when the USPS became a victim of a cyberattack that threatened to put the names, addresses, and social security numbers of 800,000 of its employees at risk.

Further, USPS efforts to utilize cloud computing to reduce costs have raised concerns. In September 2014, the USPS inspector general (IG) criticized the agency for not properly controlling applications in its cloud environment with regard to information accessibility and data security.

The USPS has long recognized these problems, and it has tried to introduce cost-saving measures. However, even though the agency is part of the executive branch of the federal government, Congress has enormous power over it. (The USPS is not funded by taxpayers.) Specifically, Congress has rejected proposals to eliminate Saturday delivery of first-class mail, and it has prevented the USPS from consolidating little-used post offices in rural areas. These moves would have helped the agency reduce costs. Congress has also required the USPS to make regular payments into its future retirees' health benefits, a mandate that imposed financial burdens on the agency.

The USPS also has massive amounts of data on every piece of mail exchanged among millions of Americans as well as the companies that sell to them. However, the agency must meet the privacy statutes that apply to federal agencies. As a result, the agency cannot sell its data to businesses to help them better target consumers and therefore increase sales revenues.

And the result of these numerous and diverse problems? Despite taking measures to reduce costs, such as closing processing centers and reducing employee working hours, 2015 was the USPS's ninth consecutive year of losses.

A Variety of Solutions

To address these problems, the USPS is implementing a variety of solutions. The agency is redesigning its mail-tracking system to encode as much information as possible on its letter and parcel bar codes with its Intelligent Mail bar code (IMB) system. The IMB uses automatic scanning devices and sorting equipment to scan bar codes to capture billions of data points and transmit them to a central database. Data range from the type of mail being delivered to a parcel's final destination. The IMB enables the agency's postal processing facilities to operate more efficiently.

In addition to supporting this real-time responsiveness, the USPS is also using data to enhance mail delivery. Accurately tracking how mail moves around the country, from the moment a delivery vehicle arrives at a dock to the second a letter reaches a delivery point, provides the agency with massive amounts of data. Data analytics enables the USPS to develop *dynamic routing*—the use of sophisticated algorithms to map out the most efficient and cost-effective mail delivery routes.

In addition, mobile computing is driving innovation at the USPS. The agency has been replacing letter carriers' cellphones with mobile delivery devices (MDDs). These handheld devices access multiple wireless networks to track parcels in real time. In addition, the MDDs provide the USPS with location data from its delivery vehicles. This process helps the agency to ensure its employees' safety, predict delivery times, and pick up urgent materials from its customers.

In the fall of 2014, the agency introduced an augmented reality technology designed to convert standard print ads into interactive experiences. The system enables consumers to use a free Android or iOS app to view digital presentations when they scan special icons that marketers attach to advertising brochures sent through the mail.

In November 2013, Amazon entered into an arrangement with the USPS to deliver packages on Sundays in select cities. The partnership created an opportunity for the USPS to establish a stronger foothold in the growing package-delivery market. Consequently, its package revenue increased 12 percent from 2012 to 2014.

In response to the Inspector General's criticisms regarding cloud applications, the USPS is utilizing the Federal Cloud Credential Exchange. The exchange is a cloud-based clearing service that acts as a hub for validating the digital credentials of people who want access to online government services. As a result, the Exchange also provides a high level of security for USPS applications running in the cloud.

And the largest missed opportunity for a possible solution? If federal privacy guidelines allowed the practice, the USPS could use the IMB to help retailers and catalog companies create successful marketing campaigns. Consider a retailer that receives an e-mail or a text message alert from the USPS that a particular customer has just received the company's catalog. The retailer could immediately e-mail the customer a digital coupon or a promotional offer in an effort to drive sales and enhance the overall customer experience.

The Results

The CIO of the USPS notes that information technology has become a core function within the agency. That is, IT is no longer a cost center. Instead, it adds essential value to the organization. However, the success or failure of these diverse initiatives remains to be seen. That is, can the USPS stop losing so much money each year, or at least slow the hemorrhage?

Sources: Compiled from D. Leonard, “From: Postmaster General; To: Amazon,” *Bloomberg BusinessWeek*, August 3-9, 2015; S. Tracy, “Autonomous Vehicles Will Replace Taxi Drivers, but That’s Just the Beginning,” *Huffington Post*, June 12, 2015; “Intelligent Mail Barcode for Mailpieces,” *United States Postal Service*, May 4, 2015; S. Edelstein, “U.S.P.S. ‘Long Life’ Vehicles Last 25 Years, But Age Shows Now,” *Green Car Reports*, February 17, 2015; J. Williams, “Heading into 2015, USPS Looks to Tech to Reshape Model,” *fedscope*, December 31, 2014; C. Waxer, “Digital SOS: How Technology Can Save the USPS,” *Computerworld*, December 8, 2014; C. Waxer, “Modernizing the Mail,” *Computerworld*, December, 2014; J. Williams, “USPS Cloud Systems Don’t Comply with Established Standards, OIG Says,” *fedscope*, September 10, 2014; M. Ashley, “Why Amazon Locker Is Better Than Home Delivery,” *TechHive*, July 28, 2014; “U.S. Postal Service Parcel Delivery Lockers,” *Office of Inspector General, United States Postal Service*; December 2013; J. Edgar, “How Technology Is Changing the USPS,” *The Wall Street Journal*, October

10, 2013; W. Jackson, “USPS Set to Put Federal ID System to the Test,” *GCN.com*, August 22, 2013; www.usps.gov, accessed July 14, 2015.

Questions

1. Provide specific examples of how information technology is negatively impacting the USPS.
2. Provide specific examples of how information technology is positively impacting the USPS.
3. Describe how information technology both positively and negatively impacts your university.
4. Is it possible to generalize and describe information technology as a “two-edged” sword for all organizations? Why or why not?

Closing Case 2

POM New Delivery Services Use Information Technology

The Problem

Webvan, an online grocery business that went bankrupt in 2001, is considered to be the largest dotcom failure in history. The company’s business model was to deliver products to customers’ homes within 30 minutes of a time they chose.

Today, busy consumers are increasingly looking for the convenience of having many items delivered on demand, with food being the largest category. In fact, despite the well-known failure of Webvan, many same-day, third-party delivery providers are emerging to compete in the \$70 billion delivery business. Delivery services are an excellent strategy for small businesses to differentiate themselves from their competitors and to compete with giant online retailers.

Delivery service providers include some of the largest firms in technology and retail, as well as specialized startups. The major challenge facing these companies is how to deliver groceries and other items door-to-door without incurring unmanageable costs.

A Variety of Rapid Delivery-Service Solutions

These companies use information technology such as apps on GPS-enabled smartphones to bypass the need for warehouses and delivery fleets in their attempt to serve customers who are willing to pay a bit extra to have things done quickly. In addition, these companies often do not hire their workers. Rather, they use independent contractors who are willing to forgo benefits packages (e.g., health insurance, 401 K plans) for jobs they can perform whenever they want to.

The delivery services differ from more established grocery delivery companies such as FreshDirect (www.freshdirect.com), Peapod (www.peapod.com), and AmazonFresh (<https://fresh.amazon.com>) because they do not actually sell groceries directly to you. Instead, you select what you want online or via an app and choose a delivery time. The service then sends a contractor to the store to pick up your order and deliver it to your door. Let’s take a look at some of these services.

Instacart. Instacart (www.instacart.com) delivers items from chains such as Safeway, Whole Foods, and Costco as well as local markets. Instacart has no physical infrastructure. In fact, the company consists of two grocery-delivery smartphone apps.

Customers place orders using Instacart’s Web site or mobile app. A separate app, used by more than 4,000 personal shoppers whom Instacart has hired across 15 cities, guides the shoppers to stores from which they buy goods. The app actually identifies the aisle and the shelf where an item is located. The goal is to deliver orders within one hour of the order being placed.

Personal shoppers fill several orders at once as they go from store to store. The app suggests the optimal driving route to a customer’s home, taking into account weather, traffic, sporting events, and local construction. Instacart charges a premium based on the size of each purchase. The company also offers a \$99-per-year membership that waives the delivery fee for orders greater than \$35.

Postmates. Postmates (<https://postmates.com>) works like this: The company’s 13,000 couriers receive orders on their smartphones. For example, a customer wants 18 pounds of crushed ice, and Postmates offers the courier \$4.80 to pick up the ice and deliver it. When the courier accepts the job, his phone guides him to the grocery store and then to the customer.

The majority of deliveries made by Postmates are hot meals. The company analyzes data such as food-preparation times to become more effective at *stacking*—as their couriers drop off one order, their next pickup is already assigned and being prepared.

Although roughly 80 percent of Postmates’ orders are prepared food, the company is expanding to deliver other commodities; for example, healthcare and beauty products. In addition, in mid-2015 the company reached a deal with Apple to deliver MacBooks and other products the same day that customers purchase them online.

Uber. In 2015, Uber (www.uber.com) launched a meal-delivery service, called UberEats, in New York and Chicago. The items on UberEats come from a range of local restaurants, with the offerings changing every day. The option to order from UberEats shows up on the Uber app only when a user is in an area that is covered.

Sidecar. Sidecar (www.side.cr) is leveraging people who are already on the road. The app, which allows people to pay for rides in other people’s cars, requires all users to enter in a destination before they get a ride. In February 2015, Sidecar announced that it was going to begin

using those data to combine ride sharing with delivery. Doubling up means more money for both Sidecar and the driver.

GrubHub/Seamless. GrubHub/Seamless (www.grubhub.com) is a leading provider of digital ordering services, with 35,000 restaurant partners. The app allows customers to browse menus, place orders, and pay for delivery online or via a mobile app. In 2015, the company acquired delivery providers Restaurants on the Run and DiningIn. These acquisitions enable GrubHub/Seamless to own the “last mile” of delivery and become a one-stop shop for food, from ordering to delivery.

Ola Cabs. Ola Cabs (Ola; <https://www.olacabs.com>) provides different types of cab service in India. Customers can reserve a cab through a Web browser or a mobile app. The company commands about 60 percent of the market share in India. In 2015, Ola launched a grocery delivery service, Ola Store, that offers customers a choice of 12,000 products across 13 categories, including fruits, vegetables, eggs, dairy, frozen goods, and baby items.

The Results

These companies do experience challenges. To begin with, the workforce that is essential to this business model may present a problem. That is, their labor costs will probably rise. In addition, several on-demand companies are being sued for classifying their couriers as independent contractors rather than as employees to avoid providing them with benefits packages. In June 2015, California’s labor commissioner ruled that a driver for Uber should be classified as a company employee.

Another challenge is that convenience can be expensive because delivery charges can vary greatly. For example, Instacart offers flat rates, where Postmates’ fees depend on the distance of the delivery. Besides delivery costs, Instacart charges a premium for items from some of the stores it delivers from. Another downside is that shoppers may miss out on using coupons or browsing for cheaper alternatives in the store. Also, the orders do not always go according to plan. For example, if an item is sold out, then the delivery person has to call the customer for instructions on what to do.

Perhaps the most serious challenge in the delivery market is competition from many large, established companies that offer delivery services. Consider these examples:

- Amazon (www.amazon.com) is considering a crowdsourced (see Chapter 4) delivery solution that uses individuals to deliver packages and existing retailers to store them, all powered by a mobile app.
- Walmart (www.walmart.com), which generates half of its business from food, is testing the online grocery concept.

- Safeway grocery stores (<https://shop.safeway.com>) offers its “fresh to your door” delivery service.
- Starbucks (www.starbucks.com) offers a delivery service.

With the intense competition in the delivery services market, it is too early to predict any results. However, the companies discussed in this case are receiving large amounts of venture capital funding.

Sources: Compiled from J. Russell, “India’s Ola Takes a Leaf Out of Uber’s Book with New Grocery-Delivery Service,” *Tech Crunch*, July 21, 2015; L. Rao, “Instacart Is Asking Its Customers to Do Something New,” *Fortune*, June 26, 2015; K. Kokalitcheva, “Why On-Demand Delivery Startup Postmates Really Raised \$80 Million,” *Fortune*, June 25, 2015; M. Kosoff, “\$2 Billion Grocery Delivery Startup Instacart Is Reclassifying Some of Its Workers as Employees,” *Business Insider*, June 22, 2015; G. Bensinger, “Amazon’s Next Delivery Drone: You,” *The Wall Street Journal*, June 16, 2015; L. Heller, “Amazon’s Uber-Like Delivery Service Could Be Coming Soon,” *Forbes*, June 16, 2015; A. Connolly, “Amazon Considers Copying Postmates with New Crowdsourced Delivery Service,” *The Next Web*, June 16, 2015; P. Vasani, “Tech Giants Serving Up Real Competition for FreshDirect,” *CNBC*, June 12, 2015; J. Pinsker, “What Does the On-Demand Workforce Look Like?” *The Atlantic*, May 20, 2015; L. Jennings, “New Services Disrupt Restaurant Delivery Landscape,” *Nation’s Restaurant News*, May 18, 2015; K. Taylor, “We Tested Chipotle and McDonald’s New Delivery Services. Here’s What Happened,” *Entrepreneur*, May 6, 2015; R. Tepper, “Watch Out Seamless: New Delivery Services Are Invading Your Turf,” *Yahoo*, May 1, 2015; A. Stevenson, “Death to Amazon? Postmates’ Boost to Small Business,” *CNBC*, April 29, 2015; P. Sawers, “Uber Launches a Curated Meal-Delivery Service in New York and Chicago,” *Venture Beat*, April 28, 2015; K. Steinmetz, “Go Fetch,” *Time*, March 16, 2015; B. Solomon, “America’s Most Promising Company: Instacart, the \$2 Billion Grocery App,” *Forbes*, January 21, 2015; D. Matthews, “Watch Out, Seamless and GrubHub – Amazon Is Coming for You,” *Fast Company*, December 3, 2014; K. Spors, “What Starbucks’ New Delivery Service Means for Local Businesses,” *American Express*, November 3, 2014; J. Mangalindan, “Shop Till You’re on Top,” *Fortune*, October 27, 2014; J. Bercovici, “The Same-Day War,” *Forbes*, May 5, 2014.

Questions

1. Describe the information technology used and developed by the entrepreneurs who founded Instacart, Postmates, GrubHub/Seamless, Uber, Sidecar, and Ola Cabs. What is the impact of these technologies on the costs of starting a business?
2. What are the advantages and disadvantages of being an independent contractor for a company?
3. Would you consider a job as a courier for one of these companies? Why or why not?